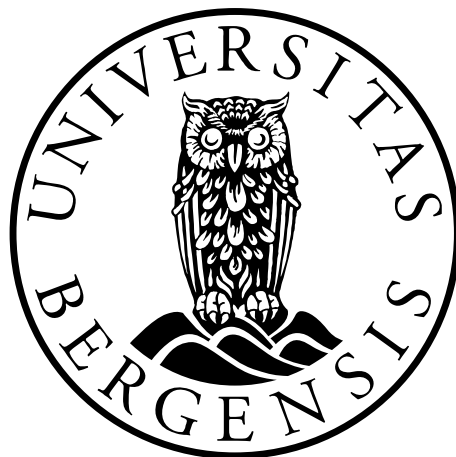


# **Long-term sick leave and work rehabilitation - prognostic factors for return to work**

**Irene Øyeflaten**



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## Scientific environment

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The Norwegian National Center for Occupational Rehabilitation in Rauland has been my main employer and scientific environment throughout the whole study-period. The research group of Stress, Health, and Rehabilitation at Uni Research Health in Bergen has been in charge of the supervision. Since January 2015, I have had an additional employment as a researcher at Uni Research Health.

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## Abstract

The main objective of this thesis is to examine individual prognostic factors for return to work (RTW) after work rehabilitation, for workers on long-term sick leave with common musculoskeletal and mental health complaints. The process of returning to work after long-term sick leave may be complex, and is often influenced by other factors than health complaints and diagnoses alone. The primary hypothesis in this thesis was that individual's cognitions about health and illness would be central for returning to work or not, after work rehabilitation. A second hypothesis was that socioeconomic status (SES) through education or occupation would predict RTW after work rehabilitation. A third hypothesis was that the process of returning to work would be complex and differ between subgroups of work rehabilitation participants.

Cognitions, such as illness perceptions and fear avoidance beliefs may be a matter of beliefs about cure, control, and expectancies, thus of coping. Coping, as defined in the Cognitive activation theory of stress (CATS), was applied in this thesis. In the CATS, coping is defined as positive response outcome expectancies, in contrast to negative response outcome expectancies (hopelessness) or no response outcome expectancies (helplessness).

In Norway, comprehensive inpatient work rehabilitation may be offered to individuals on long-term sick leave. Participants in inpatient work rehabilitation programs typically have sick leave diagnoses related to musculoskeletal and mental health complaints, often characterized by non-specific conditions, mostly subjective health complaints, with few objective medical findings. Individuals with subjective health complaints may believe that their complaints are harmful and may therefore try to avoid activities they believe will harm them, such as work. Experiencing distress and poor functional ability may lead to vicious circles of hopelessness and helplessness, i.e. poor coping. Maladaptive illness perceptions and fear avoidance beliefs about work may contribute to prolonged disability and time out of work. The aim of work rehabilitation is to alter such vicious circles through positive experiences and cognitive processes, and facilitate RTW. This is done by interdisciplinary

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assessments, education, physical activities, and cognitive behavior modifications offered in a combination of individual and group-based sessions. In addition, collaboration with external stakeholders, such as health care providers, the employer, or the local social insurance office (NAV-office) are important elements during work rehabilitation.

In this thesis, individual prognostic factors for RTW after work rehabilitation were investigated in three different samples of work rehabilitation participants. Predictive information was extracted from questionnaires and patient journals while information of work and sick leave were measured by self-reports and official register data of The Norwegian labor and welfare administration (NAV).

The primary and secondary hypotheses were investigated in the first paper, where the aim was to examine whether health complaints, illness perceptions, fear avoidance beliefs, coping, and education predicted non-working 3 and 12 months after participating in work rehabilitation, and to assess the relative importance and inter-relationship of these factors. Logistic regression analysis was conducted. The results showed that fear avoidance beliefs for work were the most important predictor for non-working both at 3 months, and at 12 months follow-up after participating in work rehabilitation. A multiple regression analysis displayed that almost half of the variance in fear avoidance beliefs for work were explained by the amount of musculoskeletal and pseudoneurological health complaints, i.e. tiredness, sadness/depression, and anxiety, and by illness perceptions and education. For illness perceptions, the components concerning perceived duration, consequences, and personal control of the illness were the most important. Coping did not contribute to explain any variance in fear avoidance beliefs for work. In conclusion, high levels of fear avoidance beliefs for work were a strong predictor for non-working after work rehabilitation. However, the intervening mechanisms between fear avoidance beliefs and subsequent avoidance behavior, in terms of avoiding the workplace when sick, are still poorly understood.

The primary and secondary hypotheses were investigated in the second paper, where the aim was to test if fear avoidance beliefs for work would mediate the relationships between musculoskeletal and pseudoneurological complaints, functional ability, level of education, and number of days on sickness benefits during 3-year follow-up after work rehabilitation. Structural equation modeling (SEM) was used to test a predefined mediation model for direct and indirect effects between the hypothesized predictors and days on sickness benefits during follow-up. As hypothesized, fear avoidance beliefs for work mediated the effect of musculoskeletal complaints and education on sick leave during follow-up. There was however, no direct effect of musculoskeletal complaints on fear avoidance beliefs, as this relationship was fully mediated by poor physical function, in terms of moving ability and lifting/carrying ability. Fear avoidance beliefs for work did not mediate the relationship between pseudoneurological complaints or mental function, in terms of coping/interaction ability and sick leave during follow-up. Pseudoneurological complaints had a small direct effect, and length of previous sick leave had a strong independent effect on days on sickness benefits after work rehabilitation. In conclusion, the mechanisms involved in the process of returning to work are complex and involve several intervening factors including health and functional ability, education, previous sick leave, and fear avoidance beliefs for work.

The second and third hypotheses were investigated in the third paper. Here the aim was to examine if gender, age, diagnosis, occupation, and length of previous sick leave predicted differences in the process of returning to work, in terms of being at work or registered with sickness benefits, and transitions in and out of work and sickness benefits, during a 4-year follow-up after work rehabilitation. Proportional hazard regression analysis was used to explore the probabilities of being at work, or of receiving sickness benefits, or disability pension, and differences in the transitions between any of these states during follow-up. Regression models based on transition intensities detected differences in the risk factors of entering and leaving a given state. For example among women, the lower probability of being at work than men, could be explained by a lower probability of transitions to work, and not by a higher



probability of leaving work. In addition, the probabilities of being at work, and of receiving sickness benefits, and disability pension differed between men and women, age groups, diagnostic category, type of work, and previous history of sick leave. Being a female, having diagnoses other than mental and musculoskeletal, having blue-collar work, and receiving long-term sick leave before entering work rehabilitation, increased the risk of not returning to work and of receiving disability pension during follow-up. The use of novel statistical methods made it possible to understand more of the different patterns in or out of work or of receiving sickness benefits, and how the prognosis differed between groups.

The results from this thesis show that the process of returning to work after long-term sick leave and work rehabilitation depends on the interplay between multifaceted prognostic factors related to the history of previous sick leave, age, gender, SES, health, function, and cognitions in terms of illness perceptions and fear avoidance beliefs for work. These findings may have implications for selection criteria into work rehabilitation, for tailoring actions during a work rehabilitation program, and may guide follow-up actions aiming at RTW in collaboration with stakeholders outside the work rehabilitation clinic.

## List of publications

- Paper 1      Øyeflaten I, Hysing M, Eriksen HR. Prognostic factors associated with return to work following multidisciplinary vocational rehabilitation. *J Rehabil Med* 2008;40(7):548-54.
- Paper 2      Øyeflaten I, Opsahl J, Eriksen HR, Braathen TN, Lie SA, Brage S, Ihlebæk CM, Breivik K. Subjective health complaints, functional ability, fear avoidance beliefs and days on sickness benefits after work rehabilitation – a mediation model. Submitted to *BMC Musculoskeletal Disorders*.
- Paper 3      Øyeflaten I, Lie SA, Ihlebæk CM, Eriksen HR. Prognostic factors for return to work, sickness benefits, and transitions between these states: a 4-year follow-up after work-related rehabilitation. *J Occup Rehabil* 2014;24(2):199-212.

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## **Abbreviations used in this thesis**

CATS - Cognitive Activation Theory of Stress

CFA - Confirmatory factor analysis

CFI - Comparative Fit Index

EFA - Exploratory factor analysis

FABQ - fear avoidance beliefs questionnaire

IA-agreement - Cooperation Agreement on a More Inclusive Working Life

ICF - The International Classification of Functioning, Disability, and Health

ICPC - International Classification of Primary Care

LBP - Low back pain

MR - Medical rehabilitation allowance

NAV - The Norwegian Labour and Welfare Administration

NAV-office - The local social insurance office

NSD - Norwegian Social Science Data Services

NYK-code - Nordic Classification of Occupations

OECD - Organization for Economic Co-operation and Development

REK - Medical Ethics Committee

RMSEA - Root Mean Square Error of Approximation

RTW - Return to work

SEM - Structural Equation Modeling

SES - Socioeconomic status

SHC - Subjective health complaints

SSB - Statistics Norway

TDP - Time-limited disability pension

UCL - Utrecht coping list

VR - Vocational rehabilitation allowance

WAA - Work assessment allowance

WHO - World Health Organization

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# 1 Introduction and theoretical framework

## 1.1 Introduction

Comprehensive work rehabilitation programs aim to improve function and work ability amongst individuals at risk of permanently falling out of work [1]. Participants in work rehabilitation are mainly individuals on long-term sick leave with common musculoskeletal and mental health problems [2]. Work rehabilitation comprises elements from medical, vocational, occupational, and social rehabilitation [1]. Successful rehabilitation processes are believed to rely on interdisciplinary collaboration and understanding from a diverse range of stakeholders including health professionals, social workers, the workplace, and the participant involved [3]. However, knowledge about the effects of such interventions or about prognostic factors for work resumption after rehabilitation is still limited, and we do not know which patients will benefit most from comprehensive work rehabilitation efforts [4]. Norway differs from most other countries in offering inpatient work rehabilitation to individuals on long-term sick leave with composite health problems. Individuals referred to comprehensive inpatient work rehabilitation have not managed to return to work (RTW) on their own or with assistance from the primary health service. They will typically have more complex needs and problems, not only due to the health problems, but also related to the work and home situation, or other social factors [5]. 2015). The main objective of this thesis is to investigate individual prognostic factors for RTW after inpatient work rehabilitation, for individuals on long-term sick leave with common musculoskeletal and mental health complaints, and to explore the relative influence of health complaints, socioeconomic status (SES), and cognitions on RTW.

### 1.1.1 The process of returning to work

RTW after sick leave may be an evolving, complex, and sometimes nonlinear process [6], where the sick-listed may have multiple transitions between working, and partial, or full sick leave during follow-up after work rehabilitation [7]. Throughout this

thesis, RTW will be used as a broad term referring to RTW as a goal, an outcome, and an evolving process [3, 8, 9]. The complex aspects of RTW are described more in detail in section 1.2.6.

### **1.1.2 Prognostic factors**

The terms “risk factors”, “prognostic factors”, and “predictive factors” are often used interchangeably in the literature, but are seldom defined [10]. A risk factor is in epidemiological studies described as a determinant existing before the occurrence of a disease. “A risk factor is any attribute, characteristic, or exposure of an individual that increases the likelihood of developing a disease or injury” [11]. Examples of important risk factors for common diseases as cancer, heart disease, and diabetes are typically related to genes, environment, and lifestyle, or the interaction between these factors. A prognostic or predictive factor is a characteristic of an individual after the occurrence of a disease, associated with clinical outcome. In medical research, a prognostic factor is mainly associated with the natural history of a disease, in the absence of therapy [10]. While a predictive factor is associated with response or lack of response to a particular therapy [10]. In this thesis, both the prognostic and predictive terms will be used, since these terms are in current usage in studies on RTW after sick leave and work rehabilitation. However, it may also be that potentially confounding determinants or risk factors prior to the current sick leave incidence may influence the prognostic factors of RTW after receiving work rehabilitation. It is not possible to control for the interplay between all associated variables.

Most of the literature on prognostic factors for RTW concerns low back pain (LBP) and other musculoskeletal conditions [12]. Apart from possible disease-specific health problems, it is recognized that similar factors will predict outcomes on work and sick leave, regardless of the diagnosis [12-14]. Factors involved in the prognosis for RTW after work rehabilitation may be complex and multidimensional [15]. There



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are however, very few studies on prognostic factors for RTW after participating in work rehabilitation actions [4], in particular after inpatient work rehabilitation. The dominating knowledge is on prognostic factors for prolonged sick leave or disability pension after long-term sick leave, for common musculoskeletal disorders [12, 16-18] and for common mental disorders [19-21]. Typically, studies tend to seek more information about sick-listed with a poor prognosis for RTW, instead of characteristics of individuals with a good prognosis, who actually RTW [22]. This distinction might be more important to consider than thought at first glance.

Knowledge of good and poor prognosis for RTW is essential to select candidates for more intensive and tailored interventions and follow-up actions and to leave out those who will manage on their own [23]. As an example, Haldorsen et al. [24] found that giving intensive multidisciplinary treatment to a subgroup of patients with the best prognosis for RTW had a worse RTW outcome than giving a light treatment.

Ideally, knowledge of good and poor prognosis for RTW among sick-listed individuals should be inclusion criteria for decisions on interventions aiming at RTW. Although there may be a lack of systematic criteria for allocating participants to comprehensive work rehabilitation in Norway today, there is still reason to believe that participants in work rehabilitation programs have needs that are more complex compared to sick-listed in general. Work rehabilitation participants may therefore have poorer prognosis for RTW, than other individuals on sick leave. However, the actual factors with prognostic value for RTW or prolonged sick leave or disability pension may be similar between long-term sick-listed with or without receiving work rehabilitation interventions. Consequently, in the following, relevant studies on individual prognostic factors for RTW, prolonged sick leave, and disability pension after sick leave are included, whether the sick-listed population have received work rehabilitation or not. Included studies are however limited to the target group of work rehabilitation programs in Norway, which mainly consists of individuals on sick leave due to common musculoskeletal and mental health complaints, and co-morbid

conditions. Studies on prognostic factors for RTW after brain injury, stroke, neurological diseases, cancer etc. are therefore not included.

## 1.2 Background and problem area

The number of people on long-term sick leave and disability pension is undesirably high in many industrialized countries [25]. So far, medical reasons have failed to fully explain why many people are receiving sick leave benefit or disability pension [26]. On the contrary, the general health has never been better in many western countries, when it comes to mortality and life expectancy [27]. The level of individuals on long-term sick leave and disability pension is high in Norway compared to most western countries [25, 28]. At the end of 2013, 17.8% of the working age population received sickness benefits [29]. Sickness benefits in Norway include sick leave benefit, work assessment allowance, and disability pension. The amount of individuals receiving a sick leave benefit has been relatively stable between 5 to 7% in the last 15 years [30]. In the third quarter of 2015 approximately 130 000 employees (5.4%) were absent from work due to doctor-certified sickness. Adjusted for partial sick leave, the share of employees on sick leave benefit was 4.6% [31].

For several years, it has been a political issue to reduce long-term sick leave and withdrawal from working life [32, 33]. However, there is no clear agreement among stakeholders why so many are situated outside work or how these problems should be handled [34]. Underlying causes for why workers become sick-listed can be studied in different disciplines and from different theoretical perspectives, where medical, economical, and sociological perspectives are dominant [26, 34]. Within the medical perspective, clinical research primarily investigate the course and prognosis of a disease on an individual level, whereas epidemiological research investigate the corresponding associations at a group level [26]. Within the economical perspective, the emphasis is typically on economic incentives to stay or withdraw from working

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life [26]. This is a so-called pull or attraction model stating that the worker tend to make rational choices between work and sick leave based on personal economic gain [34]. Within the sociological perspective, the emphasis is typically on how conditions in society, such as working and living conditions are associated with sick leave, both at an individual and group level [26]. It is suggested that the sociological perspective gives support to a so-called push or exclusion model focusing on how exposure to e.g. negative work environmental factors may lead to health problems and involuntary sick leave [34]. Covering several of these perspectives, a generous welfare system [35-37], high work participation due to low unemployment [38], and a high proportion of female employees [39] are among the proposed explanations for the high numbers on sickness benefits. A higher proportion of work participation may imply a higher proportion of individuals with health limitations and disabilities at work. Some voices have claimed that an unhealthy workforce is the price to pay for the high share of employment [40]. As mentioned, medical explanatory models are however insufficient to understand why so many are not able to participate in working life [26]. This is a paradox because medical assessments are fundamental in the sick-listing process. When writing a medical certification, the physician certifies that a disease is present and that the patient's ability to work is impaired to an extent that hinders work participation, and warrants economic compensation [26]. For individuals with composite and non-specific health problems, the physician often considers the doctor-patient relationship [41, 42], and the sickness certification process problematic and challenging [43]. It is argued that individuals with composite health problems often report co-morbid complaints with no or few verifiable criteria of a disease [43, 44]. Due to multiple health complaints, there may be substantial variation in which diagnosis a physician gives to the same patient [44]. When there are no objective criteria or signs of a disease, the sickness certification process will be patient-driven, and mainly based on the patient's reports of illness and discomfort [43, 45]. In these cases, the decisions will often be affected by the physicians own attitudes, beliefs, and personalities [43]. Lack of biomedical criteria in the practice of granting sick leave may challenge the legal basis for social insurance claims, which require that the reduced functional ability should be caused by disease or injury [45].

The requirement of a diagnosis on the medical certificate may lead to an unfortunate medicalization of life problems and social problems, when there is a need of sick leave [45].

### **1.2.1 Health complaints**

Common health complaints, such as musculoskeletal, mild and moderate mental health, and cardiorespiratory conditions, account for two-thirds of long-term sick leave and disability pension [46]. In Norway, the most common diagnoses associated with long-term sick leave and disability pension are related to musculoskeletal and mental health complaints [47-49]. These diagnoses amount to around 50% of the sick-listed and 60% of the disability pension recipients. Among the musculoskeletal complaints, LBP is the most frequent single cause of sick leave (11%) and disability pension (9%) [50]. The number on sick leave benefits with mental diagnoses is increasing in all age groups, except among sick-listed above 60 years [51]. The increase is highest among young people, aged 20 to 29 years, with an increase from 12.5% in 2010 to 13.8% in 2014. However, the musculoskeletal diagnoses are still the largest group, and amounted to 25.1% of the sick leave in 2014 in the young age group [51]. Common sick leave diagnoses are often considered more by symptoms and distress than by consistently demonstrable tissue abnormalities [52, 53]. There are often no or very few objective medical explanations for these symptoms, and therefore, these are sometimes named subjective health complaints [52, 54-56]. In particular, for the musculoskeletal complaints, up to 85% of cases are non-specific [57]. For these non-specific conditions, there are high rates of co-morbidity with other subjective health complaints [58-60]. The intensity of subjective health complaints form a continuum from normal complaints to conditions that require medical care and are incompatible with participation in social and working life [61]. Thus, there is no obvious cut-off point to indicate what constitutes a disease [61].

The prevalence of subjective health complaints is high in the general adult population, varying from 75% in a Nordic population [62] to 91% in a Norwegian population [63]. In another sample, 80% reported musculoskeletal complaints, 65% reported pseudoneurological complaints, such as tiredness, sadness/depression, and anxiety, and 60% reported gastrointestinal complaints [61]. In a working population, the prevalence of subjective health complaints was found to be stable over a period of seven years whilst the number of workers on sick leave increased [48]. Level of complaints could not explain why a higher number of individuals were receiving sickness benefits in the same period [48]. The results show that there is no straightforward association between measures of illness, such as subjective health complaints, and sick leave [48]. The English distinction between illness, disease, and sickness may be useful to understand the complex picture of how the health dimension is related to sick leave (Figure 1). Illness refers to the individual's own experiences of ill health, a disease refers to conditions that medical science can label with a diagnosis, and sickness refers to the social role the individual with illness takes, or are given in different areas of life [64].

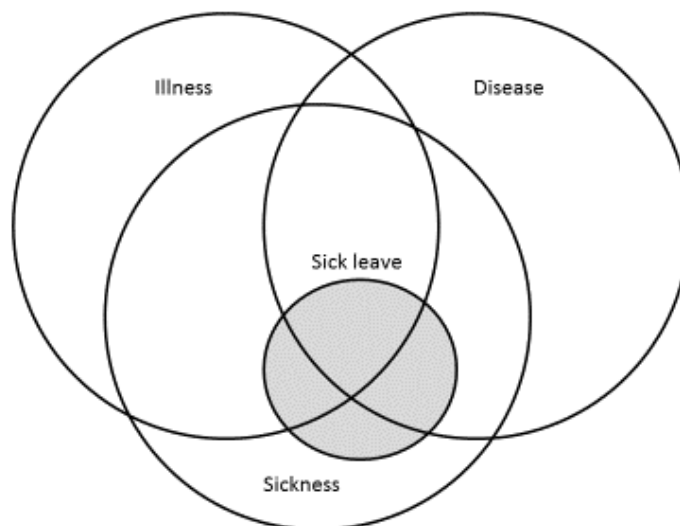


Figure 1. The relationship between illness, disease, sickness, and sick leave [64].

Generally, workers experiencing illness, sickness, and/or having a disease, go to work [64]. There is a low degree of overlap of reports between illness, disease, and sickness absence, indicating that they are different concepts of ill health [65]. Sick leave can be used as a combined measure of physical, psychological, and social functioning in working populations [66]. The mechanisms that lead to sick leave are still poorly understood. It is important to distinguish between what causes illness and disease, what causes sick leave [64], and what causes RTW. High level of sick leave is likely to be explained by multifactorial causes [48], and require multifaceted analyses from various perspectives [26]. The complex etiology of sick leave will accordingly also influence the prognosis of work resumption after a period of sick leave.

There are few studies on disorder-related prognostic factors for RTW after sick leave [67]. Self-reported physical and mental health are shown to be more important in explaining work status during follow-up, than sick leave diagnosis and objective measures in individuals with chronic LBP [68] and in employees with mental health problems [69]. The severity and duration of mental health complaints [19, 70], multiple pain sites, higher level of pain, and widespread pain [71-73] have been found to predict poor work outcomes after sick leave. In addition, co-morbid musculoskeletal and mental health complaints may have a negative impact on RTW [21, 74, 75]. For individuals with common mental health problems, there is a wide range of prognostic factors, and a large variability in populations and conditions studied, making it unclear which factors might enhance or hinder RTW after sick leave [19-21]. However, the co-morbid presence of anxiety and depression is found to predict longer duration and higher recurrence of sick leave episodes [76].

### **1.2.2 Long-term sick leave**

Long-term health-related absence from work is a major burden for the individual, the family, and the workplace, and is costly for the society [9, 77, 78]. Although sick

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leave may have both positive and negative consequences for health, work, and social life, most focus has been on the negative parts [79]. Among negative and unwanted individual consequences of being sick-listed are reduced work motivation, social isolation, stigmatization, changed self-image, economical strain, and secondary health problems [80]. Long-term sick leave is usually defined as sickness absence of more than 4 to 8 weeks [13, 22, 81]. There is, however, no agreed demarcation between short and long sick leave [82], making comparison between studies difficult [83]. Long-term sick leave represents a significant proportion of the sick-listed population as a whole [84, 85], as long-term sick leave accounts for up to one-third of the days off, and 75% of the sickness absence [84].

RTW after participating in work rehabilitation interventions is shown to be better for participants with the shortest sick leave before the intervention [4, 86]. Previous sick leave is associated with increased time to RTW during follow-up [87], and is an independent prognostic factor for long-term sick leave [20], and disability pension [88-93]. The risk of receiving disability pension is associated with length of previous sick leave, as well as annual repetitive sick leave spells and length of the intervals between the spells [88]. However, individuals sick-listed with only one long sick leave spell ( $\geq 28$  days) may have good prognosis for remaining at work during follow-up [22]. Number of episodes on sick leave seems to be a stronger predictor of subsequent sick leave than the duration of the sick leave [94, 95]. The predictive value of the specific length of previous sick leave seems to vary between studies, from seven days [92] to seven months, for predicting a disability pension during follow-up after sick leave [49]. The discrepancy between study results, may be due to time to follow-up, which in these two studies varied between three years [49] and 13 years [92].

### *1.2.2.1 Age and gender*

Socio-demographic factors, such as age and gender are likely to impact on work resumption after long-term sick leave and work rehabilitation. However, age and gender are often added as confounders in statistical models, resulting in limited information about the prognostic estimates for these variables. A reason for not including age and gender as independent variables in analyses of RTW is often that these variables are considered not modifiable [23].

High age is a strong risk factor for sick leave [38], and there is a well-known and strong relationship between higher age and disability pension [91, 96]. Higher age predicts lack of RTW after an episode of sick leave across diagnoses [4, 13, 17, 18, 20, 87, 97-99]. However, a recent review found inconsistent evidence for age predicting time until RTW, during follow-up in individuals sick-listed with LBP [23]. In a work rehabilitation sample, the youngest group had best chances for work resumption at follow-up [86]. Over many years, there have been an increase in young people on disability pension in Norway [100], showing a higher prevalence of disability pension than in other OECD countries [101]. The increase in disability pension among young people is partially explained by mental health conditions, which could possible benefit from work-related interventions and actions [100]. Although many studies describe age as a significant risk factor, both for sick leave, disability pension, and for RTW, research on potential causal mechanisms are lacking [38].

Women have higher rates of sick leave and disability pension than men [102-104]. Moreover, female gender predicts reduced probability of RTW after an episode of sick leave across diagnoses [4, 87, 97, 102]. However, there is inconsistent evidence for gender predicting time until RTW, for individuals sick-listed with LBP [23]. Besides, after various work-related rehabilitation interventions, studies on prognostic factors for RTW show contradictory results between genders [17]. Some studies found better outcomes for men [4, 105], some found better outcomes for women



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[106, 107], and some found no gender differences [86, 99]. Several hypotheses have been proposed to explain why women have higher level of sick leave and disability pension than men [103, 104]. Higher level of sick leave among women have been associated with pregnancy, having children, marital status, working conditions, and whether the workplace is male dominant or equally balanced in gender distribution [38]. It is suggested that sick leave may also be due to social causes both at home and work, and that men and women may present different causal explanations [108]. While women experience a double burden from work and home, and report that family burdens and caring responsibilities may influence their sick leave, men more often seem to attribute their sick leave to stress and conflicts at the workplace [108]. Moreover, higher risk of disability pension among women has been associated with poor self-reported health, mental distress, poor working conditions, and low levels of income [109]. However, studies have also found moderate effects for self-perceived health, whilst family situation and work factors did not explain women's higher likelihood of disability pension [104]. Results seem to differ between studies and little is still known of the gender divide [38, 103, 104]. Until now, few studies have tried to explain more in depth the associations described for genders and sick leave [38]. A recent study did however investigate if gender differences in sick leave could be explained by attitudes, norms, and preferences, but did not find any support for this hypothesis [110].

#### *1.2.2.2 Socioeconomic status (SES)*

There is a consistent social gradient in physical and mental health [77, 111-113]. Paradoxically, socioeconomic inequalities in health persist and even widen in Western Europe [114], as is also the case in highly developed welfare states as Norway [115]. It is documented that sick leave increases with decreasing SES [38, 116-119]. The relationship between SES and sick leave seems to be strongest for the long-term absence [116, 120]. These findings are however inconsistent [117]. An opposite effect has also been suggested, where the worklessness in itself may lead to inequalities in health [121].

SES is the individual's position within a hierarchical social structure, and may depend on a combination of variables. Level of education and type of occupation are most often used as proxies for SES [111, 112, 122, 123]. Level of education is highly interrelated with occupational class and type of work [111, 112, 122, 123]. Education and occupational class have been found to be stronger determinants of sick leave than income [122]. Individuals on long-term sick leave and disability pension have more frequently low education and blue-collar work [49, 124-126]. These occupations are typically associated with higher physical strain and less decision latitude [123, 124]. Workers with skilled and unskilled blue-collar work have a substantial higher risk of disability pension compared to administrators and professionals [125].

There is a strong association between low SES, expectancies of coping, and self-rated health [127]. Workers with self-rated low SES, in terms of level of education, type of job, and income, may experience failure to cope with challenges in life (hopelessness), and may expect no predictable relationship between what they do and what actually happens (helplessness) [127]. Socioeconomic differences in health may be explained by the individual's learned expectancies of being able to influence their health condition [128, 129]. Lower education may be associated with less psychosocial resources [128, 129] and with less skills and qualifications [113].

The association between low education and sick leave may additionally be explained by physical work environment, such as physical work positions and workload, [116, 118, 120, 130], physical work ability [118], and health behavior/lifestyle factors [116, 130]. The contribution of physical and psychosocial work factors and of health factors are, however, inconsistent between studies [117, 120, 130]. Furthermore, results on factors explaining the association between education and sick leave seem to differ between genders [116, 118]. The discrepancy between results may be due to

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different study populations and differences in study design. Most studies seem to describe associations, and are thus not able to document causal mechanisms behind the socioeconomic differences in sick leave [38]. Workers with low education and blue-collar occupations may have fewer opportunities to change work tasks and workplace when becoming sick [131]. This may be a reason why SES not only is a risk factor for sick leave and disability pension, but also an important predictor for RTW after sick leave. Low education is a prognostic factor for longer time to RTW after sick leave for individuals with mental disorders [19, 20]. Independent of diagnosis, low education and having skilled and unskilled blue-collar work is associated with increased time to RTW after an episode of sick leave [87]. However, there was good a prognosis for work resumption for young workers employed in the industry, after participating in job training as a work rehabilitation program [86]. Furthermore, long-term sick-listed women, working in blue-collar and service/care occupations, had higher work resumption than men during follow-up after work rehabilitation [106]. In addition, educational level had no influence on RTW during follow-up among individuals who had passed one year on sick leave benefits at inclusion [99]. Among individuals with neck, back, and shoulder problems, workers with higher education had higher probability of RTW after participating in work rehabilitation interventions [17].

To summarize, there is a clear negative association between SES, sick leave, and disability pension, however little is known about the mechanisms through which the socioeconomic factors affect sick leave and the prognosis for RTW [38, 130]. It is suggested that psychological and learning factors contribute to the socioeconomic gradient in health [127-129].

### **1.2.3 Legislations and actions**

The working age population is entitled to sickness benefits from The Norwegian Labour and Welfare Administration (NAV), if they have been in paid work for the

last 4 weeks before the sickness incident. In general, employees receive 100% of their salary in sickness compensation from the first day of reported sick and up to one year. The employer pays for the first 16 days of a sick leave period, and thereafter NAV covers the disbursement. NAV do not cover sickness benefits over the maximum of six times the National Insurance basic amount per year, which is 555 456 NOK per May 1<sup>st</sup> 2016. Sick leave can be graded from 20 to 99% independent of the proportion of employment; full or part-time work. If the employee does not RTW after one year, he or she may receive a transition benefit, which has an upper limit of four years. Before March 2010, this transition benefit was labeled medical or vocational rehabilitation allowance, or time-limited disability pension. At the present date it is labeled work assessment allowance (WAA). As a main rule, the allowance constitutes approximately two-thirds of the salary. To be eligible for a WAA, the individual's work ability must be reduced with at least 50%. WAA is granted with an upper limit of four years for individuals going through medical treatment or rehabilitation, or who is supposed to benefit from vocational actions to RTW. Disability pension may be granted to individuals with permanent incapacity for work due to a disease or injury, after fulfilling WAA requirements. Permanent incapacity for work is defined as having work ability reduced with at least 50%.

In Norway, inpatient work rehabilitation has been offered individuals on long-term sick leave for more than 30 years, alongside an expansion of multiple work-related actions, involving stakeholders at the system level, in the health sector and at the workplace. Since the early nineties political initiatives and efforts have been implemented to lower the number of people on long-term sick leave and disability pension in Norway. The period from 1990-1999 has therefore been named the "working-line" (arbeidslinja). In a white paper report to the Government, the message was that working should be economically worthwhile, resulting in incentives to support the sick-listed returning to work [132]. An example was "active sick leave" (1993-2011), where the sick-listed employee could return to alternative or modified duties at the workplace and still receive 100% of the normal wages paid by the social

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insurance office [133]. In 2001, a letter of intent called “The agreement of a more inclusive working life” (IA-avtalen), was signed by The Government and the employer/employees unions [32]. One of three main aims of this agreement was to reduce the amount of individuals on sick leave and disability pension. The agreement was prolonged in 2005, 2010, and 2014, and the last letter of intent is valid until the end of 2018 [33]. During this period, in 2004, the Government introduced changes in The National Insurance legislations on sick leave. The changes included stricter requirements for the doctor, the sick-listed, and the employer on early actions toward work (within 4 to 8 weeks), more documentation of function/work ability, and increased use of partial sick leave [134]. In 2006, the so-called “sick leave committee” proposed a set of interventions aimed to reduce the costs related to sickness absence [135]. Improvements in the follow-up management of people on sick leave, including dialogue meetings between the physician, the employee, the employer, and the social insurance office, and more clarified roles among different stakeholders, was among the suggested interventions. Furthermore, to achieve faster treatment and rehabilitation to work after sick leave, the Government allocated a large sum to a program entitled “a faster return” (raskere tilbake) in 2007 [136]. To accomplish this challenge several work rehabilitation programs were established. Later on, in 2010, an expert group report initiated renewed focus on several factors from the legislation changes in 2004 [137]. A closer connection to the workplace while sick, and generally, more use of partial sick leave was among the important elements. Furthermore, a suggestion was to strengthen NAV in terms of control and sanctions toward the stakeholders. The establishing of NAV in 2006 was itself an action to achieve better and more coordinated services. Recently, in 2014, the Government appointed a new committee aiming to identify possible bottlenecks in NAV and to suggest actions to achieve better user participation, less bureaucracy, and better use of resources [138]. NAVs general goal and motto is to have more people working and fewer on benefits. To achieve these goals, it was recommended that stakeholders within NAV should be less bureaucratic and system-oriented, and to concentrate the activity more toward the sick-listed workers, the workplace, and the employers [138]. Furthermore, the National center for occupational rehabilitation has

since it was established in 2005, had a defined aim to reinforce the development of expertise and clinical knowledge in the chain of treatment within work-related rehabilitation actions.

In sum, there has been large efforts over the last 25 years to reduce long-term sick leave and withdrawal from working life due to health problems. Actions and interventions related to the system level on legislations and collaboration between involved stakeholders, such as physicians, employers, and NAV, have been dominating. The establishment of a National service within occupational rehabilitation and “a faster return” action are the only initiatives with increased focus on work rehabilitation. A “faster return” action at the workplace, including education, peer support, and access to an outpatient clinic, were effective in reducing sick leave for employees with LBP, compared to employees receiving no intervention [139]. However, a recent report, conclude that although “faster return” actions reduce waiting time for treatment, they are not cost effective in reducing productivity loss due to sick leave. [140]. During these years, several advices and actions have been implemented simultaneously, making evaluation of each action complicated. Nevertheless, none of the initiatives and actions seem to have had the desired effect, when it comes to numbers in the statistics, since the sick leave in Norway has been relatively stable for many years [30].

#### **1.2.4 Work participation**

Two possible mechanisms are suggested to explain the relationship between work and health [141]. The causation hypothesis suggests that RTW leads to health benefits and the selection hypothesis suggests that health is a necessary condition for RTW [141]. Most support is found for the causation hypothesis; the mechanisms may however interact and reinforce each other [141]. A premise for addressing RTW after work rehabilitation is the assumption that work participation is good for health and well-being [77, 141, 142]. For individuals with common health problems i.e. musculoskeletal and cardio-respiratory conditions, and mild to moderate mental

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health problems, there is strong evidence for the beneficial effects of work [77]. The positive effects might outweigh possible risk factors of being in work [77]. Although the economical compensations in Norway are relatively good, employment is fundamental to achieve an acceptable standard of living. To be working meets psychosocial needs and is central to individual identity, social roles, and social status [77]. Hence, long-term sick leave and disability pension may produce social inequalities and poorer health. Financial self-support is an established norm in our society and it may therefore be a burden to be situated outside the working arena [77].

There will however, always be cases and circumstances that are incompatible with work participation and where long-term sick leave and eventually disability pension may be the best solution for the individual's health and well-being [77]. Individuals receiving disability pension may experience multiple difficulties and barriers when trying to RTW [143, 144], not only related to their health condition [77]. Non-medical barriers for RTW, for individuals with poor health and functional impairment, may be related to a lack of possibilities for accommodations and adjustments at the workplace and few possibilities for job mobility, e.g. due to low educational and vocational skills [77]. Obstacles interfering with poor health may also be due to older age, high rates of unemployment, and long geographical distance from the labor market [77].

It has been argued that early RTW after sick leave, may conflict with sustainability and work function later on, and that early RTW may produce ill health [145]. The length of a sick leave spell should be adapted to the individual's resources and work demands, and there may be cases where a longer period of sick leave is needed, relevant, and well-motivated [80]. In an intervention study among physicians with distress and burnout, a period of sick leave after the intervention was found to have a positive predictive effect on reduction of emotional exhaustion three years later [146]. If the worker returns too early to work after sick leave, this may cause new sick leave

spells and will consequently prolong absence from work [145]. Unfortunate consequences of work participation may be due to the phenomenon of sickness presence or presenteeism [147, 148]. This phenomenon is when workers decide to go to work despite complaints and ill health, which should require rest and absence from work [147]. Presenteeism may occur both in the period before sick leave and during a period after returning to work [149]. Little is known of possible causal pathways between sickness presenteeism and future ill health and prolonged sick leave [150]. Workers may have different reasons for going to work when feeling so ill that they should have taken out sick leave [151], and it is found that groups with high presenteeism also may have a high level of sick leave [147]. This concurrence could be due to a health selection effect, as individuals with illness who are often sick, will have higher probabilities both of going to work and stay at home when feeling ill [150, 152].

There are continuous political initiatives in Norway for early actions toward work for people on sick leave. This includes more contact with the workplace and extended use of partial sick leave [134]. Part-time work has been shown to be beneficial, and it is a feasible way to integrate individuals with reduced work ability in working life, in particular if the alternative is complete absence from work [153-155]. Some studies have found that partial sick leave combined with part-time RTW improves the sick-listed chances of returning to full regular work [156], and it may also provide a faster and more sustainable return to full duties [157]. However, there are contradictory results for the use of partial sick leave and there is an ongoing discussion around the effects of using partial sick leave on RTW. A recent randomized trial found prolonged time to full RTW after sick leave for workers who received an approach with gradual increase in work exposure, compared to usual follow-up from the occupational physicians [158].



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### 1.2.5 Work rehabilitation

The majority of individuals with common health complaints remain in work, and do not need any assistance to RTW after a period of sick leave [2, 159]. In one study, a proportion of 10% of the employees in a workplace was in sum responsible for more than 80% of the sick leave during a period of six months [160]. Corresponding numbers for all annual sick leave spells in Norway was that 11-12% of the workforce in employment constituted 80% of the sick leave [161]. There are however, large replacements in the group on long-term sick leave from year to year, indicating that this group does not assemble a minor and permanent population [161]. Long-term sick-listed individuals in need of more coordinated support, such as comprehensive work rehabilitation, constitute only a small, but significant group of people [159].

Occupational and vocational rehabilitation are often used with equal meaning [2], but may be interpreted differently. Therefore, in this thesis, the broader term work rehabilitation has been applied, which covers both occupational and vocational rehabilitation, and is in current usage [2]. Nevertheless, no clear definition exists on what work rehabilitation is, neither in Norway nor in the international literature. Due to diverse systems and legislations, the services and interventions of work rehabilitation will differ between countries, making comparison and joint definitions challenging. In a broad perspective, work rehabilitation may be described as “whatever helps someone with a health problem to stay at, return to, or remain in work” [2, p.8]. Rehabilitation, has by WHO been defined as “a set of measures that assist individuals who experience, or are likely to experience, disability to achieve and maintain optimal functioning in interaction with their environments” [162, p.96]. A Norwegian definition of rehabilitation emphasizes rehabilitation as a process, where collaboration and clear goal achievements are central elements. “Rehabilitation is timed and planned processes with clear goals and means, where several stakeholders cooperate in providing necessary support to the patient or user`s own effort to achieve optimal functional and coping skills, independence, and participation in everyday life and in society” [163]. The main goal of work rehabilitation is that the participant should RTW. WHO have proposed specific definitions for work

rehabilitation: “Work rehabilitation is a multi-professional evidence-based approach that is provided in different settings, services, and activities to working age individuals with health-related impairments, limitations or restrictions with work functioning, and whose primary aim is to optimize work participation” [164]. The same research group has also suggested a similar but shorter definition of work rehabilitation. “Work rehabilitation is an interdisciplinary and multi-stakeholder process, which aims to reduce or eliminate the burden of work disability and facilitate work participation” [165]. This is a comprehensive definition, which should cover the variation in how work rehabilitation is organized within and between countries.

Comprehensive work rehabilitation provide interdisciplinary rehabilitation to address the behavioral, functional, medical, physical, psychological, and vocational components of employability and RTW. [5]. Work rehabilitation should be offered within the frame of a biopsychosocial rehabilitation model [166-168], and a combination of physical exercise, education, and cognitive behavioral modification are recommended [169, 170]. The term interdisciplinary is in the literature often used interchangeably with multidisciplinary, but although overlap in contents, the terms have quite different meanings [171]. Both terms include involvement of several health care providers, but an important distinction is that interdisciplinary rehabilitation teams have to be co-located [171]. Co-location may facilitate closer and more frequent collaboration and communication, and should imply active involvement from the patient, shared goals and philosophy of rehabilitation, and taking the contribution from other disciplines into account [171]. Due to the lack of co-location in multidisciplinary rehabilitation, close communication and integration of services may be difficult to achieve [171]. Individuals admitted to comprehensive work rehabilitation programs tend to have more complex needs, not only due to the health problems, but also related to length of sick leave, circumstances at home, or at work [5]. Within the specialized health services in Norway, rehabilitation services are divided into regular rehabilitation (ICD-10; code: Z50.89) and comprehensive rehabilitation (ICD-10; code: Z50.80) [172]. The only difference between the two classifications is on the number of health care professions included in the

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interdisciplinary team. In regular rehabilitation, the typical number is four, whereas in complex rehabilitation the typical number is six health care professions [172].

Professions included in the rehabilitation teams will usually be physicians, work consultants, nurses, physiotherapists, sport pedagogues, occupational therapists, and psychologists.

In Norway, work rehabilitation is organized both as inpatient and outpatient rehabilitation services. The study population in this thesis have been participating in interdisciplinary inpatient work rehabilitation administrated within the specialized health care. Admittance to work rehabilitation clinics is mainly based on referrals from their general practitioners. Inpatient work rehabilitation programs in Norway are offered in private rehabilitation clinics, but are financed either by the regional health authorities or by the local social insurance office (NAV-office). Yearly tender processes influence how many clinics will have contracts with the authorities and will offer work rehabilitation programs. Content of the programs are in general the same at different clinics, and include a combination of individual and group based sessions with guided physical activity, psycho education related to work and lifestyle, and different cognitive approaches. The main aims of the programs are to achieve improved physical and mental function, and work ability, and to make goals and plans for future work participation. Collaboration with relevant stakeholders outside the rehabilitation clinic is important during and after a work rehabilitation program. At the end of the program, a follow-up plan toward work is developed together with the participant, with RTW as the main goal. This plan could include future participation from several stakeholders outside the rehabilitation setting, e.g. different health care providers, the workplace, or the NAV-office. Individuals with unsettled claims for disability pension and individuals with known alcohol or drug abuse are usually not admitted to inpatient work rehabilitation in Norway.

Effect studies on work rehabilitation are scarce, and study populations, interventions, and outcome measures vary between studies, and in particular between countries, making it difficult to draw conclusions across study populations [173]. More concretely, the study-population is often limited to a particular patient group, most

often patients with LPB, musculoskeletal pain, or mental health problems. Furthermore, rehabilitation interventions aiming at RTW may be outpatient or inpatient, multidisciplinary or interdisciplinary, with different professionals involved, and the content of the rehabilitation program may vary. Outcome measures may be self-reported or register based, cross-sectional or longitudinal, giving different information. In sum, such differences restrict the possibilities for comparison between extant studies.

For many years, workers on sick leave with LBP have been the most studied patient group, and evidence for effect of RTW interventions is often limited to this group of patients [1, 2, 16, 107, 168, 169, 174-176]. However, the same principles for RTW after sick leave seem to apply to most people with other common musculoskeletal disorders [2]. Yet, the effect on work outcomes after work rehabilitation, for individuals with non-specific musculoskeletal complaints, vary between studies [177]. Some studies report inconsistent findings [177, 178], whereas others report strong evidence for RTW after participating in work rehabilitation [2]. A recent Norwegian study found no differences in RTW outcomes among sick-listed with common back and neck pain, after being randomized to either a multidisciplinary or a brief intervention [179]. When it comes to individuals on sick leave with common mental health complaints, there are few studies on comprehensive work rehabilitation, and still no clear evidence for effects of treatment on work outcomes [2, 84, 180-182]. Studies on the effect of work rehabilitation tend to distinguish between musculoskeletal or mental diagnoses, and to the very best of my knowledge, there are no studies on RTW outcomes for individuals on sick leave with composite and co-morbid health complaints. It is however recognized that mechanisms and actions present in work rehabilitation programs for participants with musculoskeletal conditions may concern workers with mental health complaints as well [183]. Building on the same idea, work rehabilitation programs tend to be universal across diagnostic groups and co-morbid conditions, with room for individual tailoring.

Effective work rehabilitation may depend both on the content of the programs, and on how they are organized. The strongest evidence of helpful components in work rehabilitation are physical activity and exercises, psychological interventions such as cognitive behavioral approaches [177,180, 184], and education/advice about activity and work [184]. Interventions that include interdisciplinary or multidisciplinary teams seem to be more effective and cost-effective than single modality interventions across diagnoses [173, 180, 184]. Significant elements in work rehabilitation are communication and coordination between all stakeholders involved, including the sick-listed individual, healthcare services, and the workplace [2, 184]. Interventions that include a workplace component are more likely to report a successful result regarding RTW than others [185], especially when using a RTW-coordinator [186-188].

In general, programs of comprehensive inpatient work rehabilitation are time-consuming and expensive, and demand large human resources. Work rehabilitation clinics in Norway aim at offering evidence based programs, building on available research and best practice, to facilitate RTW among individuals on long-term sick leave. The participants in these comprehensive programs are a complex group of individuals, often on long-term sick leave with common musculoskeletal and mental health complaints, and co-morbid conditions. It is however, not known who will benefit from these programs and who will not. Knowledge of prognostic factors for RTW may identify those in need of closer follow-up, and those who will manage to RTW on their own, or with usual care. Therefore, a deeper understanding of the mechanisms and prognosis for RTW after inpatient work rehabilitation for these complex health conditions is needed.

### **1.2.6 Return to work (RTW)**

Most of the literature on work rehabilitation addresses RTW as a main goal [2]. RTW is not an isolated event, but rather a process with several phases before and after work re-entry [3, 6, 8, 9]. After a period of sick leave, most people return directly to full work [2, 159]. However, after long-term sick leave, the process of returning to work may take several years with transitions in and out of work and sickness benefits, comprising graded benefits combined with part-time work [7, 189]. Still, follow-up studies tend to distinguish only between those working and those out of work at a single point in time, and we have as of yet not reached a good way to capture and understand the complex process of returning to work after work disability [3].

Moreover, the complexity in RTW-outcomes may be influenced by differences in the legal system, the labor market, and work environment in different countries [3, 82]. For instance, in the Nordic countries there have been political initiatives for expanded use of partial sick leave [153, 154, 156, 157, 190-193]. It may be challenging to quantify the grading of partial sick leave and partial work, making comparison of RTW results between studies more difficult.

There is no clear agreement among researchers about how sickness absence and successful RTW should be measured [9, 82], and terminology and chosen measurements vary between studies [82]. RTW as an outcome may be measured in several ways. When applying cross-sectional data, it is common to use single-episodes of RTW [194]. However, this measure may overestimate the effects, since the worker shortly after might be sick-listed again [22]. In particular, in samples with chronic and recurrent conditions, it has been suggested to register all sick leave spells for each person during a longer period of time [22]. There is, however, no common consensus on how long the follow-up period should be [22]. RTW measurements should therefore be chosen with care, since the results may be influenced by type of measure being used [195]. Choice of RTW-definitions should depend on the purpose of the study [8, 194], but will also depend on access to data. Some countries have sound sick leave data from employers' registers, whereas access to official register

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data is achievable in other countries [83]. There are, however, large intra-national variations in the quality of data available and in how the data on sick leave is registered [83]. Register data may give detailed information about all sick leave spells and other sickness benefits over time [194]. Access to register data may also arrange for using multistate models, a method which gives expanded information about the complex process in and out of work over time [7, 189, 196, 197]. Intermediary information is often needed to determine if the individual is on the path to success and likely to achieve a good RTW outcome [3]. Additionally, data on transitions between work and sickness benefits may be useful to develop better predictive models of RTW-outcomes [196, 197].

Employees with long lasting health problems are often at risk of recurrent sick leave, therefore RTW measures should focus on sustainability [198, 199, 200].

Sustainability may be defined as having returned to work for a period of at least six months without relapses [201]. Register data may achieve good measurement of sustainability on RTW [194]. Sometimes access to register data are lacking or restricted due to ethical reasons [202, 203]. Self-reports may be a good measure of the current work and benefit situation [202, 203], but should be limited to cross-sectional information [205], because self-reports are less reliable in retrospective data, when there are long recall periods [202, 206], or elongated episodes of sick leave [203, 207]. In addition, number of respondents have a tendency to decline, and will often do so proportionally with the time of follow-up [205]. Lower response rate in self-reports may be an important source of selection bias and response bias, and can limit external validity of the data. When using self-reported data, it is impossible to capture the complexity and combinations of different sickness benefits, and partial or adjusted work.

RTW is a common measure of effect after work rehabilitation interventions, and a central outcome in prediction studies. However, prediction studies frequently focus on risk of disability, such as continued sickness benefits and non-RTW, rather than

on predictors for actual RTW [208]. Predictors of disability and predictors of RTW may differ, and more knowledge of differences in prediction models is warranted [208].

In sum, the term “RTW” is utilized both as a process and an outcome, and there is no clear definition on how sustainable RTW should be measured. The perspectives and measurements of RTW vary within and between countries and is dependent on the legal system, stakeholders involved, and access to data, registers or self-reports. It is important to be aware of these challenges in the interpretation and comparison of results on RTW, and when examining prognostic factors for RTW.

### 1.3 A biopsychosocial model

In this thesis, a biopsychosocial perspective is used, because this perspective might provide a broader and more accurate understanding of predictors of work participation than a traditional biomedical model [21]. A comprehensive biopsychosocial perspective advocates the integration of individual and psychosocial environmental factors into a systems-based approach [208]. In this thesis, the biopsychosocial perspective includes bio-psychological components in terms of illness, disease, and functional ability, and psychosocial components in terms of coping, illness perceptions, and fear avoidance beliefs. In addition, prognostic factors related to age, gender, education, occupation, and previous sick leave were studied.

#### **1.3.1 The International classification of functioning, disability, and health (ICF)**

The ICF is based on the biopsychosocial model, and provides a coherent view of different perspectives of health: biological, individual, and social [209]. ICF represents a paradigm shift from a biomedical to an integrated biopsychosocial model



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of human functioning and disability [209]. ICF offers a conceptual framework to classify different components of functioning in individuals with health problems [164]. The ICF framework is also a scientific tool in research on disability and functioning [209], where disability and function are viewed as outcomes of interactions between health conditions and contextual factors, incorporating environmental and personal factors [14]. Contextual factors are within the ICF framework defined as environmental and personal factors [209]. Environmental factors are external factors and may include family, the workplace, social attitudes, legal and social structures, whereas personal factors are internal factors including sociodemography, SES, coping, previous experiences, behavior, and how disability is experienced by the individual. A weakness however, is that personal factors are yet not classified within the ICF framework [15, 164].

Functional ability in terms of physical and mental functioning related to the workplace, are crucial for participating in working life [68, 210, 211], and may predict work outcomes after sick leave. During the recent years, increased focus has been on work ability in the assessment of sickness absence necessities, and on individual's resources and functional abilities rather than health deficits and restrictions [212]. Measures of functioning, together with information of health complaints, may provide a broader picture of the overall health situation, in interaction with contextual factors [2, 213]. Systematic information about the level of functioning of the sick-listed worker can guide clinicians within rehabilitation services, when deciding what interventions to apply [214]. Functional ability in terms of physical and mental functioning is essential in this thesis and should be understood within the framework of ICF.

The ICF, has however been criticized for not being based on theory. The framework of ICF is built on a social consensus approach of model building rather than on specific theory [214]. ICF is biopsychosocial in its intent, but WHO has not specified

the content of biopsychosocial theory underlying the model [208]. A theory may be defined as a set of interrelated concepts and definitions that present a systematic view of events or situations by specifying relations among these variables [215, p.26]. The aim of a theory is to explain and predict events or situations [215, p.26]. Theories are by their nature abstract, meaning that they do not have a specified content or topic area, and should be general and possible to test [215, p.26]. There are often overlap between theories e.g. on health behavior, and some theories may fit within broader models [216, p.406]. Generally, it is beneficial if theories are used and integrated with a more comprehensive framework [216, p.406].

The biopsychosocial model is together with the ICF framework meant to be a basis for the prognostic model in this thesis. In the following, the Cognitive activation theory of stress (CATS) [217] will be used to explain possible mechanisms for why and how biopsychosocial variables may predict work outcomes after long-term sick leave and work rehabilitation.

#### 1.4 The cognitive activation theory of stress (CATS)

For workers on long-term sick leave, the process of RTW may depend more on psychosocial components related to the situated context and the individual's understanding of their health complaints, than on the severity of the illness and disease [208]. The CATS offers a psychobiological explanation for the assumed relationship between external and internal stressors, and health complaints [217]. Within the CATS, the term '*stress*' may refer to the stress stimuli or stressor, the experience of the stress stimuli, the stress response, or the experience of the stress response [217]. The CATS postulates possible mechanisms for how and why people react differently to external and internal stressors and stimuli [217, 218]. Whether a stress stimulus is experienced as pleasant or threatening depends on how the individual interprets the situation based on previous experiences and expectancies of the outcome. This cognitive evaluation of the situation is dependent on previous

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learning. How we may react to the situation rest on previous experiences with a similar situation, and on our expectancy to the situation and to the outcome [217]. If previous experiences have been positive, e.g. being physically active in spite of pain, the sick-listed will typically have a positive response outcome expectancy, and may believe that physical activity will be beneficial. Likewise, if previous experiences have been negative, e.g. at the workplace, the sick-listed will have a negative response outcome expectancy, and may expect more pain and discomfort if going back to work [219]. Within the CATS, believing in a good result in terms of a positive response outcome expectancy is the definition of coping. The opposite, having a negative response outcome expectancy (hopelessness) or no response outcome expectancy (helplessness) is considered poor coping.

An advantage with this definition of coping is that it makes it less interesting to discuss the feature of words, such as coping, mastery, and efficacy, because these terms to a great extent may cover the same dimensions [217]. When defining coping as positive response outcome expectancy, the concept may acquire predictive value for outcomes related to health and illness [220], and work participation [217].

The CATS postulates that learned stimulus and response outcome expectancies determine psychobiological responses, such as emotions, muscle-tension, and discomfort [128, 217]. It is however important to bear in mind that the CATS deal with normal responses to external and internal stressors, and stimuli related to situations in work and daily life [217]. In the CATS, the stress response is described as increased arousal or activation. The activation is a general psychobiological response and apply to normal reactions in normal situations. Short-term activation is necessary for being awake and concentrated when fulfilling duties in work and daily life, and is an essential element in the total adaptive system of the body, required for performance and survival [128]. However, if an individual does not have required coping resources to deal with the external and internal stressors, the psychobiological

response may remain over time, in terms of sustained activation. Sustained activation may be due to psychobiological or cognitive sensitization [55, 221] and individual vulnerability [222, 223]. The sensitization mechanisms may be activated through a cognitive system of feedback loops [56]. Sensitization mechanisms at a psychological-behavioral level may maintain maladaptive beliefs, e.g. toward the illness and work opportunities and may cause vicious circles of avoidance behavior [55]. Cognitive sensitization may cause increased pain and discomfort due to prolonged stress-related affective and psychological activation [221]. Sustained activation can be unhealthy and may be an important factor for the development of intolerable subjective health complaints, and sick leave [56, 224].

In the current thesis, it is proposed that the concept of coping defined within the CATS may have transfer value to other measures of cognitions, perceptions, and beliefs. Measures of illness perceptions and fear avoidance beliefs contain elements of stimulus and response outcome expectancies in terms of perceived causation and expectancy of cure and control.

### **1.4.1 Coping**

Coping is a generic term, which in lay use may refer to profiles, strategies, abilities, expectancies, and outcomes when dealing with stressors or demanding life events. The concept of coping is an umbrella term covering different theoretical approaches, measurements, and interpretations [128]. Furthermore, coping may be represented by other terms, such as self-efficacy, mastery, perceived control, and self-esteem [128]. In this thesis, the understanding of coping corresponds with the description provided by the CATS, where coping is defined as positive response outcome expectancies [217]. It is independent of type of strategy, but depends on your belief that the strategy chosen will produce a positive result.

At least three essential elements related to the concept of coping are relevant across different theoretical approaches and definitions. First, it is questioned whether coping is specific to a certain domain or not. Although coping often is referred to in terms of the ability to cope with life in general, it is claimed that the coping ability to a greater extent may be linked to specific demands, situations, and tasks [225]. A second and related question is whether the coping ability may have transfer value from one situation to another and if the ability is linked to an individual's personality as a stable trait [225, 226]. A third important element refers to how coping is related to the perception of being in control [227].

#### *1.4.1.1 Coping strategies*

In their “ways of coping” model, Lazarus and Folkman (228) emphasize the coping strategy selected to deal with a stressor, often referred to as a process of coping. Coping in this model is defined as constant shifting of cognitive and behavioral efforts to manage with specific external and internal stressors that may exceed the individual's resources [228]. The coping strategy chosen to take control over the situation is more important than the outcome [228]. This definition of coping is founded on stress theory, and it is claimed that demands and strain produce stress, but that the interpretation and responses to these stressors may differ due to individual vulnerability and sensitivity [228]. The model include two central coping strategies, problem-focused strategies and emotion-focused strategies, as measured in this thesis [229, 230]. The problem-focused strategies cover actions directed toward doing something with the source of stress. The goal of the emotion-focused strategies is to regulate emotional consequences owed to the event. Problem-focused strategies have been found to be used most frequently in situations appraised by the individuals as changeable, whereas emotion-focused strategies most frequently are used in unchangeable situations [231]. However, individuals appear to use both strategies in almost every kind of stressful situation, therefore a full description of coping requires that both strategies are assessed [232]. Coping, defined as a process, is primarily not bound to a static trait or coping style [232]. Still, some coping strategies have been

found to be more stable across stressful situations than others, indicating a more stable coping disposition [233]. The tendency to be optimistic or pessimistic is shown to influence the way an individual copes with a stressor, implicating a personality trait in the coping process [233, 234].

#### *1.4.1.2 Self-efficacy*

The self-efficacy concept refers to individuals own beliefs about their competence and ability to achieve certain goals through cognitive processes [235]. The concept emphasizes self-efficacy expectations of perceived personal capabilities as central for coping behavior [227]. Self-efficacy is embedded in the social cognitive theory and an agency perspective, where individuals are viewed as proactive agents that choose their own actions [236]. These actions are closely related to the capacity to exercise control [236]. The theory distinguish between self-efficacy expectancies and outcome expectancies, because individuals can believe that a particular course of action will produce a certain outcome and at the same time doubt whether they can perform the necessary activities, and thus the outcome expectancies will necessarily not influence their behavior [227]. Self-efficacy beliefs and the subsequent behavior are supposed to be influenced by a reciprocal relationship between the surroundings, personal factors, and cognitive skills [235]. The concept of self-efficacy beliefs is not viewed as a global trait, but rather as a differentiated set of self-beliefs linked to specific fields of functioning [237]. Nevertheless, generalized self-efficacy measures have been developed, and are in frequent usage [238-241], as in this thesis. Individuals on sick leave are found to report low self-efficacy [242]. Besides, perceived self-efficacy may play a role in the process of returning to work after sick leave [242-244].

However, general self-efficacy has not been found to predict RTW after sick leave. [242]. Lack of prediction may be explained by the use of a generalized scale, as specific self-efficacy beliefs are found more predictive than general self-efficacy [245]. Return-to-work-self-efficacy has a significant impact on RTW [244], indicating that return-to-work-self-efficacy should be measured when RTW is the outcome.

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There are some parallels between the coping theories and models described above. The concept of self-efficacy is similar with coping defined within the CATS, as the concepts share an element of expectancy [226]. Coping expectancies and coping strategies are different ways of interpreting the coping concepts, but have been found to be correlated [127].

### **1.4.2 Illness perceptions**

Illness perceptions are the individual's cognitive representations, in terms of organized patterns of beliefs about their illness [246], and may be explained as the individuals' common-sense interpretation of health threats [247, 248]. When confronted with a health threat, such as health complaints or a diagnosis, individuals will typically build cognitive models of this threat, which in turn will determine how they respond and behave [249]. The theoretical basis of illness representations was Leventhal's self-regulation model, where five common components related to cognitive models of illness were described [247, 248, 250]. The five components include representations at a personal level, about how the illness was caused, how long it will last, the individual's illness identity, consequences of the illness for the individual and their family, and perceived personal control or cure by treatment [247, 251]. The five components of cognitive representations have been assessed as illness perceptions in a theoretically generated questionnaire [252]. In a revised version of the questionnaire, which was used in the current thesis, three components were added related to cyclical timeline perceptions, illness coherence, and emotional representations [253]. The rationale for developing the new scale was that the self-regulation model of Leventhal [248], emphasized that when facing a health threat, the individual would develop parallel cognitive and emotional representations [253, 254]. The cognitive representations are directly connected to emotional responses and may explain the variety of illness adjustments to similar diseases [249, 255]. Illness perceptions are related to adherence to treatment in terms of coping behavior [249, 255] and to work participation [256]. Thus, illness perceptions may be important precursors of sick leave.

Individuals build their own cognitive models of illness and disease based on previous experiences of being ill, the influence from significant others being ill, and on information from health professionals and the media [251]. All individuals with illness will usually construct cognitive models of their illness, and illness perceptions are therefore not limited to those with pathological responses to their illness [255]. Among a variety of illnesses and diagnoses, illness perceptions are related to a range of health outcomes, such as functioning, health care utilization, and survival [251], and have been found to predict RTW among individuals with myocardial infarction [257]. Adaptive illness perceptions may prompt adherence to treatment and recovery, whereas maladaptive illness perceptions may predict a poor clinical outcome e.g. in terms of distress and disability [251, 255]. A maladaptive illness perception profile does typically cluster around three major components related to perceived consequences of the illness, low personal control or cure beliefs, and longer timeline perceptions [246, 258, 259]. The patients' own view of their illness and health complaints may differ considerably from the view of the health professionals, and is seldom asked for in medical interviews [249]. This fact indicates that there is a huge potential for influencing the patients' illness beliefs through education, information, and cognitive interventions [246].

### **1.4.3 Fear avoidance beliefs**

The fear avoidance model describes how individuals develop chronic musculoskeletal pain as a result of avoidance behavior based on fear avoidance beliefs [260, 261]. Fear avoidance beliefs may be the result of psychological and cognitive processes in the experience and interpretation of pain and discomfort [262, 263]. The experience of pain comprises sensory as well as cognitive, affective, behavioral, and social aspects [264, 265]. The assessment of fear avoidance beliefs were based on a biopsychosocial model [265]. Focus was specifically on patients' beliefs about how activity and work would affect their back pain [265], and it was recognized that



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biomedical factors alone did not explain the reasons for neither sick leave nor RTW [48, 265, 266]. High fear, accompanied with avoidance behavior is found to be essential in the path from acute to chronic LBP, particularly in individuals with non-specific LBP [261, 267]. For individuals with sub-acute non-specific LBP, fear avoidance beliefs are strong predictors for non-RTW [267-269], and it is in particular the fear avoidance beliefs for work, which is associated with work disability [265]. It is still unclear how pain-related fear occurs in the first place [270, 271]. Theories on personality, vulnerability, and sensitization have been proposed to explain differing pain responses and fear avoidance beliefs among different individuals [261]. To fully understand the neural mechanisms of fear avoidance beliefs, the perspective should also be broadened to include avoidance behavior in context [270, 272]. Contextual circumstances, such as negative experiences at the workplace or with a specific work task may enhance work avoidance behavior [219], for instance in the form of sickness absence.

## **2 Aims of the thesis**

The process of returning to work after long-term sick leave and work rehabilitation may be complex and is not due to health complaints and diagnoses alone.

Multifaceted biopsychosocial factors related both to the individual and to the context might also have an impact on RTW. The main objective of this thesis was to evaluate if individual factors, in form of health complaints, diagnosis, functional ability, SES, coping, illness perceptions, fear avoidance beliefs, age, gender, and length of previous sick leave predicted RTW after work rehabilitation.

The thesis has three overarching hypotheses, which were tested across three specific research questions. The primary hypothesis was that the participants' cognitions about health and illness would be more important for RTW after work rehabilitation than diagnosis and health complaints. This hypothesis is elucidated in research question 1 (Paper 1) and research question 2 (Paper 2). A second hypothesis was that

SES measured as education or occupation would predict RTW after work rehabilitation. This hypothesis is elucidated in research question 1 (Paper 1), research question 2 (Paper 2), and research question 3 (Paper 3). A third hypothesis was that the process of returning to work or of receiving sickness benefits would be complex, and that the probability of working would be different between different subgroups of rehabilitation participants based on socio-demographic characteristics. This hypothesis is elucidated in research question 3 (Paper 3).

A biopsychosocial model was used as a framework for the thesis, integrating individual and environmental factors. The CATS was used as a basis for the prognostic models. This theory may explain the mechanisms behind the prognosis of returning to work after work rehabilitation. The theory suggests that situational behavior depends on the individuals' experiences and learning from previous situations, and on how the individual evaluates his or hers own opportunities to cope with the current situation. Individuals with a positive response outcome expectancy toward work may have learned to cope with their health problems and with challenges at the workplace. Whereas individuals with negative or no response outcome expectancies toward work may have learned to avoid the workplace and will often experience hopelessness and helplessness about returning to work.

Building on existing empirical evidence, a biopsychosocial model, and the theoretical position for the prognostic models, the following research questions were formulated:

#### Research question 1

Does health complaints, education, illness perceptions, fear-avoidance beliefs, and coping predict non-working, 3 months and 12 months after completing work rehabilitation?

- What are the relative importance and inter-relationship between these variables?

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- Which of the included variables explain the highest variance in the main predictor for non-working?

### Research question 2

Does fear avoidance beliefs for work mediate the effect of musculoskeletal and pseudoneurological health complaints, poor functional ability, and level of education on number of days on sickness benefits during a 3-year follow-up after work rehabilitation?

- Will poor physical function mediate the relationship between musculoskeletal complaints and continued sickness benefits during a 3-year follow-up after work rehabilitation?

- Will length of previous sick leave have an independent effect on continued sick leave during a 3-year follow-up after work rehabilitation?

### Research question 3

Does age, gender, diagnosis, occupation, and length of previous sick leave predict different probabilities of being at work and for registered sickness benefits, and differences in the transitions between any of these states, during a 4-year follow-up period after work rehabilitation?

## **3 Material and methods**

A schematic overview of the material and methods employed in the three papers is given in Table 1 in Appendix. A more detailed description is presented in the following section of the thesis.

### **3.1 Design and study population**

The thesis constitute three separate papers based on three different samples of work rehabilitation participants on long-term sick leave. To examine prognostic factors for

RTW and continued sick leave after work rehabilitation, longitudinal designs were used. The independent variables were obtained in the beginning of the rehabilitation program, and outcome variables on work and sick leave during different times of follow-up. The study populations in Paper 1 and Paper 3 were recruited from a large national work rehabilitation clinic in Norway, whereas the study population in Paper 2 constitute participants from eight different work rehabilitation clinics from all over Norway.

- In the first paper, 135 (79%) out of 172 consecutive work rehabilitation participants participated in the study during the autumn of 2002. They answered comprehensive questionnaires at the start of the program and posted self-reported information about work and sickness benefits 3 and 12 months after the program. The response rate after 3 months were 84% (n=113), and 70% after 12 months (n=95).

- In the second paper, 1178 (90%) out of 1304 consecutive work rehabilitation participants participated in the study between April 2007 and Mars 2009, all answering questionnaires at arrival to the clinic. In this sample, information about work and sickness benefits was obtained from official registers. Due to data incongruence between ID-information from the clinics and the registers (n=12), and deceased during follow-up (n=11), a final study sample of 1155 participants (89%) was included.

- In the third paper, 586 (95%) out of the 2001 cohort of 615 work rehabilitation participants, consented to obtain data from patient journals and official registers for 4 years after work rehabilitation. Register data were missing for two individuals, resulting in a study sample of 584 participants.

### **3.1.1 Data sources**

In the current thesis, three different data sources, and a combinations of sources for the independent and dependent variables, were used. Data sources for the independent variables came from self-reported questionnaires (Paper 1 and Paper 2),

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from patient journals at the work rehabilitation clinic (Paper 1 and Paper 3), and from official registers (Paper 2). All the official register data was obtained from NAV. In all three papers, RTW, in terms of working or continued sickness benefits was the main dependent variable. RTW was however operationalized differently in the three different papers (see 3.1.2). Data sources for the RTW variable was self-reported information (Paper 1) and information from official registers (Paper 2 and Paper 3).

### 3.1.1.1 Questionnaires

***The Subjective health complaints (SHC) Inventory*** (Paper 1 and 2).

Common somatic and psychological health complaints over the last 30 days were measured with the SHC Inventory [54]. The SHC Inventory consists of 29 questions rated on a four-point scale from 0-3, where 0 is no complaints and 3 is severe complaints. Five sub-scales and a total score are calculated. In paper 1, all five subscales were used: musculoskeletal complaints, pseudoneurological complaints, gastrointestinal complaints, allergy, and flu. In paper 2, only the two first sub-scales were used, since they represent the most common musculoskeletal and mental sick leave diagnoses [48]. A high score indicates severe health complaints.

***The Fear-avoidance beliefs questionnaire (FABQ)*** (Paper 1 and 2).

The FABQ was created to measure pain-related fear and fear-avoidance behavior in patients with chronic back pain [265]. The FABQ consists of 11 statements rated on a seven-point scale from 0-6, where 0 is strongly disagree and 6 is strongly agree [273]. Two subscales are calculated. In paper 1, both subscales were used: fear-avoidance beliefs for physical activity (FABQ-PA) and fear-avoidance beliefs for work (FABQ-W). In paper 2, only the FABQ-W subscale was used, since this subscale has a stronger association to work loss than the FABQ-PA subscale [265, 267]. In paper 2, the questionnaire was slightly modified to concern individuals with pain in general, and not only back pain. Introductorily in the questionnaire, one question was added, asking whether the respondents were bothered with pain or not, and it was followed

by a multiple response question on pain location (back, shoulder/arm, neck, leg/feet, head, chest, or other). A high score indicates high fear avoidance beliefs.

***The Norwegian function assessment scale (NFAS)*** (Paper 2).

Functional ability during the last week was measured with the NFAS. The questionnaire was developed based on the ICF, and has been found to capture functional limitations among workers on sick leave [212, 274]. The original NFAS consists of 39 items rated on a four-point scale from 1-4, where 1 is no functional limitations and 4 is cannot perform. The original scale consists of seven subscales. In this thesis, three new subscales were derived based on 18 items (for details see Paper 2). Two scales measured physical function: moving ability and lifting/carrying ability, and one scale measured mental function: coping/interaction ability. A high score indicates poor functioning.

***The Revised illness perceptions questionnaire (IPQ-R)*** (Paper 1).

The IPQ-R is a revised version of the Illness perception questionnaire (IPQ) [252, 255], originally developed to assess the five components of illness representations in Leventhal's self-regulatory model [248, 250]. The IPQ-R consists of nine scales [253, 254]. The first subscale; identity, consists of 14 symptoms with two response alternatives; yes or no. The subsequent seven subscales; timeline acute/chronic, timeline cyclical, consequences, personal control, cure control, illness coherence, and emotional representations consists of 38 items rated on a five-point scale from 1-5, where 1 is strongly disagree and 5 is strongly agree. The ninth scale; cause, should not be used as a scale, but as separate items, and was not included in the analyses for paper 1. A high score indicates high level of illness representations.

***The General perceived self-efficacy scale (GPSES)*** (Paper 1).

The GPSES was created to assess a general sense of perceived self-efficacy, with the aim of predicting coping with daily hassles as well as adaptation after different kinds of stressful life events [238, 239]. The GPSES consists of 10 questions rated on a

four-point scale from 1-4, where 1 is completely wrong and 4 is completely right. A high score indicates high level of self-efficacy.

***The Utrecht coping list (UCL)*** (Paper 1).

The UCL was developed to measure the coping strategies the individual use in stressful situations, either life events or daily hassles [229, 230]. The UCL consists of 47 statements rated on a four-point scale from 1-4, where 1 is seldom or never and 4 is very often. The test yields two major factors based on seven subscales: instrumental mastery-oriented coping (IMOC) and emotion-focused coping (EMOC). A high score on IMOC indicates high coping. A high score on EMOC indicates high emotional-focused coping.

***The Coping query*** (Paper 1).

The Coping query was created to assess coping expectancy and how the individual considers his or hers own abilities and beliefs about the future [275, 276]. The Coping query consists of seven statements rated on a four-point scale from 1-4, where 1 is strongly agree and 4 is strongly disagree. A high score indicates low coping expectancy.

***Hopelessness*** (Paper 1).

The Hopelessness query measures negative expectancies about oneself and the future [277]. The Hopelessness query consists of two statements rated on a five-point scale from 1-5, where 1 is strongly agree and 5 is strongly disagree. A high score indicates high level of hopelessness.

***Socio-demographic characteristics***

Self-reported information about age (year of birth), gender, and education were used in Paper 1 and Paper 2. Level of education was measured by a single question about total completed years of schooling/studies, counted from the first year of primary/elementary school.

### *3.1.1.2 Patient journals*

Certain socio-demographic information was obtained from patient journals. This information included age and gender (Paper 3), length of previous sick leave, diagnosis, and occupation (Paper 1 and Paper 3).

The patient journals contained sick leave diagnoses based on the International Classification of Primary Care (ICPC), assigned by the general practitioner. In Paper 1, the ICPC-diagnoses were categorized into musculoskeletal, psychiatric, and no specific diagnosis. In Paper 3, the ICPC-diagnoses were categorized into musculoskeletal, mental, and other diagnoses.

Information about occupation in the patient journals was coded according to a classification system based on the Nordic Classification of Occupations (Nordisk Yrkesklassifisering (NYK)) [278], a system developed for the Labour Market Administration, where each occupation had a five-digit number. In Paper 1 and Paper 3, each of the participants' "NYK-code" was placed in one of five occupational groups based on a previous classification in Ihlebæk and Eriksen [279]. They divided individual "NYK-codes" into five groups according to the nature of the participants work and the common view of occupational sectors [279].

### *3.1.1.3 Register data*

Length of previous sick leave during the last two years before admittance to the work rehabilitation program was obtained from the official registers (Paper 2). The register data contained start and end date for all included sickness benefits and information about partial benefits from 20 to 99%. Mean days on sickness benefits were calculated adjusted for receiving partial benefits and for overlap between benefits.

## **3.1.2 Measures of work and sick leave**

Follow-up time varied between the three studies, and work outcome and continued sick leave were measured differently.



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- In Paper 1, the work rehabilitation participants answered a comprehensive questionnaire about work and sickness benefits at three months and 12 months follow-up. Working was defined as “work-related activity”, and included return to ordinary work, return with adjusted work tasks, new work tasks with the same employer, new employer, and “work related re-employment”, the latter paid by the public health insurance or labour-agency. Non-working included sickness benefits, unemployment, studying, participating in “active sick-leave” or vocational training, or other reasons. The outcome variable was dichotomized into two groups, working or non-working at the specific time of follow-up.
  
  - In Paper 2, the work rehabilitation participants were followed for three years and four months (1217 days), with official register data. The work and sickness benefit situation was measured by total adjusted days on sickness benefits during the follow-up period of 1217 days. Registered sickness benefits in this paper, included sick leave (SL) benefit, medical rehabilitation allowance (MR), vocational rehabilitation allowance (VR), time-limited disability pension (TDP), work assessment allowance (WAA), and disability pension (DP). (Note: during the follow-up period from Mars 2009 – July 2012, the National regulations on sickness benefits were reformed, and MR, VR, and TDP were combined into WAA March 1<sup>st</sup> 2010).
  
  - In Paper 3, the work rehabilitation participants were followed with official register data for four years. Seven different outcome variables were defined, based on obtainable information from the official registers: 1) full work, 2) partial SL or partial MR, 3) full SL, 4) full MR, 5) full VR, 6) partial DP, and 7) full DP. Since the registers have no information about actual work or not, full work was defined as the time gap with no registered sickness benefits. Individuals could be registered simultaneously on several overlapping sickness benefits, and combinations of partial benefits could occur in the registers. Based on a predefined ranking, individuals registered with overlaps were considered to belong to one specific benefit, full or partial. The decided benefit was defined based on the highest ranked benefit, from full DP, partial DP, full VR, full MR, full SL, partial SL and partial MR, or no registered benefit (recorded as “working”).

### 3.1.3 Statistical methods

For all three samples the descriptive analyses were performed using SPSS statistics for Windows, versions 11 and 12.1 in the first paper, SPSS statistics for Windows version 21 in the second paper, and PASW statistics for Windows version 18 in the third paper. To assess the relationships between the independent and dependent variables in the three samples different statistical methodology and software was chosen: The Statistical Package SPSS versions 11 and 12.1 were applied in the first paper, the Mplus program package version 7.00 was applied in the second paper, while the Stata version 12 was applied in the third paper.

#### 3.1.3.1 *Paper 1*

Logistic regression models were used to evaluate if level of education, subjective health complaints, fear avoidance beliefs, and coping predicted RTW 3 and 12 months after work rehabilitation. The independent variables were; education, the five subscales of the SHC Inventory, fear avoidance beliefs for physical activity and for work, and five measures of coping (instrumental mastery-oriented coping and emotion-focused coping from the UCL, general self-efficacy, the coping query, and hopelessness). All these scales were dichotomized by the median into high and low score. Initially the logistic regression analyses were adjusted for gender and age. Thereafter adjustments for gender, age, and statistically significant factors in the initial step were done. Based on the logistic regression analysis, fear avoidance beliefs for work were identified as a main predictor for non-working at 3 and 12 months. Thereafter hierarchical multiple regressions was performed to determine which set of variables explained the variance in the main predictor for RTW, fear-avoidance beliefs for work. Gender, age, and education were entered in the first step, the five subscales of subjective health complaints were entered in the second step, while the eight subscales of illness perceptions were entered in the third step.

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### 3.1.3.2 *Paper 2*

Structural equation modeling (SEM) was used to test a hypothesized mediation model of the relationships between independent variables and the outcome; days on sickness benefits after work rehabilitation. SEM is most often a confirmatory technique used to determine if a model fits the data in accordance with prior research and empirical data [280]. SEM allows for estimation of both direct and indirect effects on the output variable via one or several hypothesized mediators. It is a multivariate technique with specialized versions of other analysis methods. SEM combine path analysis, confirmatory factor analysis (CFA), covariance and correlation models, and structural regression models, the latter being the synthesis of path and measurement models [280].

In this paper, a structural measurement model was estimated, building on a mixture of clinical experience, previous research, main results from Paper 1, a biopsychosocial model, and the CATS. We hypothesized that fear avoidance beliefs for work would be an important mediator between several of the independent variables in the model and days on sickness benefits after work rehabilitation. The independent variables, musculoskeletal and pseudoneurological health complaints, education, and days on previous sickness benefits were treated as observed variables. Fear avoidance beliefs for work and the three subscales of functional ability; coping/interaction ability, lifting/carrying ability and moving ability were treated as latent variables in the model. “Latent variables in SEM generally correspond to hypothetical constructs or factors, which are explanatory variables presumed to reflect a continuum that is not directly observable” [280, p.9].

The Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) were used to assess model fit as recommended by Brown [281]. A CFI between 0.90-0.95 indicates a fair model fit, with values above 0.95 to be a good fit. For the RMSEA less than 0.08 indicates a fair model fit, while values below 0.05 define a good fit [281].

The hypothesized SEM model was tested by the use of a two-step modeling approach [280]. In the first step, we tested the adequacy of the measurement models by the inspection of modification indices [282]. In the next step, the adequacy of the full structural regression model was tested, and the significance of indirect effects was tested by the use of the Mplus Sobel (delta) method [283]. Thereafter, multiple group analyses [282, 284] were used to test whether the model was invariant across gender. Direct and indirect effects were estimated. Standardized estimates and p-values were reported.

### *3.1.3.3 Paper 3*

Prognostic factors for the probability of being on, and the intensity of transitions between, seven different states of work and sickness benefits were analyzed. Age was included in the analyses as a continuous variable divided with five so that the reported coefficient indicates the effects for a 5 year increase in age. The other independent variables were categorized ahead of the analysis: Gender; male and female. Diagnoses; musculoskeletal, mental, and other diagnoses. Occupation; blue-collar, white-collar, health and social workers, education and childcare workers, and service sector workers. Length of sick leave before work rehabilitation; 0-4 months, 5-8 months, 9-12 months, and > 12 months. For these variables, the first category was used as the reference category, to which the other categories were compared.

The analyses in paper 3 were based on two different regression models approaches. The first model measured the probability of being in any of the seven outcomes during follow-up, for each of the independent variables. The regression was performed using generalized models with a complementary log–log link function, and modelled using the observed indicator for each outcome in the follow-up. The results from these analyses were presented as hazard rate ratios (HRR). The second model measured risk factors of the intensity of transitions between any of the seven outcomes during the follow-up. Transition intensities are given as the shift between any of the seven outcomes during follow-up. Each shift represents hence an event in

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these analyses. These regressions were performed using extended proportional hazards models (Cox-models) for repeated observation, and the results from these analyses were presented as HRR. Accordingly, three outcome variables were presented in paper 3. The analyses show the probability of being *on* each of the seven outcomes (being working or on different sickness benefits) and the transition intensity *from* and *to* work and the different benefits, from any of the other states during the follow-up.

First, unadjusted analyses were performed (not presented in the paper). Thereafter, adjusted analyses were done to test how the independent variables influenced the probabilities and transition intensities adjusted for all the other independent variables.

### **3.1.4 Ethics**

The ethical principles in the Declaration of Helsinki [285] were applied in this thesis. The principles were met by giving information about study aims and procedures, and by the assurance that withdrawal was possible at any time. Thus, the consent to participate in the studies was informed.

Data used in Paper 1 was obtained as a user survey at the work rehabilitation clinic in 2002 and was part of a master thesis in health science. At 12 months follow-up, a written consent was obtained from the participants. In this, consent to collect information from the patient journal about medical diagnosis, occupation, and length of sick leave before participating in the work rehabilitation program was obtained. The Norwegian Social Science Data services approved the project in 2003 (NSD, ID 10203).

Data used in Paper 2 was obtained from eight different work rehabilitation clinics. The written consent included permission to combine data from questionnaires and official register data on sickness benefits. The Norwegian Social Science Data Services (NSD, ID 16139) and The Medical Ethics Committee, region west in Norway (REK-vest ID 026.07) approved the study. NAV approved an exception from

the confidentiality agreement in October 2007, and follow-up data on sickness benefits from official registers was obtained in July 2012.

The data used in Paper 3 was obtained from patient journals and official registers 4-5 years after the patient had participated in the work rehabilitation program during 2001. During the work rehabilitation program, the participants gave written consent to obtain information from patient journals and information from official registers on sickness benefits after the program. The Medical Ethics Committee, region south in Norway approved the study in 2004 (REK-south ID S-04210). The Norwegian Data Inspectorate gave the work rehabilitation clinic license to handle personal data in this project in 2005 (NDI, ID 204/1803-7).

Copies of the consent statement and the approvals from REK, NSD, the Norwegian Data Inspectorate, and NAV are included in the Appendix.

## **4 Summary of results**

The main objective of this thesis was to investigate individual prognostic factors for RTW after inpatient work rehabilitation, for individuals on long-term sick leave with common musculoskeletal and mental health complaints. In the following, a summary of the most important findings related to the three overarching hypotheses and the research questions are presented. Further details of the results can be found in the respective papers.

### **4.1 Paper 1**

The findings in Paper 1 confirm that among long-term sick-listed work rehabilitation participants, cognitions, in terms of fear avoidance beliefs for work were more important than health complaints in predicting non-working during follow-up. The results also show that participants in work rehabilitation have a broad spectrum of different health complaints and have more than one diagnosis, indicating high levels

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of co-morbidity. Furthermore, high levels of fear avoidance beliefs for work were associated with the severity of musculoskeletal and pseudoneurological health complaints, low level of education, and maladaptive illness perceptions concerning the components of perceived duration, consequences, and personal control of the illness.

In conclusion, the results demonstrate complex mechanisms and interrelationships between prognostic factors for RTW among long-term sick-listed work rehabilitation participants. The intervening mechanisms between fear avoidance beliefs and subsequent avoidance behavior, in terms of avoiding the workplace when sick, are still poorly understood and will be investigated further in paper 2.

## 4.2 Paper 2

Results from the mediation analysis used in Paper 2 confirm that fear avoidance beliefs for work were a strong mediator between poor physical function and low education, and days on sickness benefits during follow-up after work rehabilitation. Furthermore, poor physical function, in terms of lifting/carrying ability and moving ability, mediated the relationship between musculoskeletal complaints and fear avoidance beliefs for work. Thus, musculoskeletal complaints had only an indirect effect on continued sick leave during follow-up, whereas for the pseudoneurological health complaints it was a direct effect on continued sick leave, indicating different mechanisms for RTW for different complaints. There were however, no direct or indirect relationships between poor mental function, in terms of coping/interaction ability and days on sickness benefits after work rehabilitation. At last, length of previous sick leave had as hypothesized, a strong independent effect on continued sick leave after work rehabilitation.

In conclusion, the results indicate that receiving continued sickness benefits after work rehabilitation may be influenced by complex relationships between previous sick leave, health factors, functional ability, SES, and cognitions, in terms of fear avoidance beliefs for work. Knowledge of complex mechanisms involved in the

process of returning to work may have clinical implications, and will be investigated in paper 3.

### 4.3 Paper 3

The findings in Paper 3 confirm that the process of returning to work or of receiving sickness benefits after work rehabilitation was long lasting and complex, and differed between subgroups of rehabilitation participants based on socio-demographic characteristics. The probabilities of working and of receiving sickness benefits, and the transitions between any of these outcomes, were dependent on age, gender, diagnoses, type of work, and previous history of sick leave. Being a female, having diagnoses other than mental and musculoskeletal, having blue-collar work, and receiving long-term sick leave before entering work rehabilitation, increased the risk of not returning to work and of receiving disability pension during follow-up.

Furthermore, regression models based on transition intensities detected differences in the risk factors for entering and leaving a given state. For example among women, the lower probability of being at work during follow-up than men, could be explained by a lower probability of transitions to work, and not by a higher probability of leaving work.

In conclusion, the use of novel statistical methods in this study gives new insight into factors predicting probabilities and transition intensities of working and of receiving different sickness benefits during follow-up after participating in a work rehabilitation program.

## 5 Discussion

The current thesis is one of the first to investigate prognostic factors for RTW after comprehensive, inpatient work rehabilitation, in a Norwegian context. The prognostic value of individual factors related to age, gender, SES, health complaints, diagnosis, functional ability, cognitions, and previous sick leave was investigated in three



different papers. An overarching goal was to explore how the prognostic factors were interrelated and how they affected the complex process of returning to work after long-term sick leave and work rehabilitation. To achieve this goal, three specific research questions, with secondary follow-up questions, were studied across three papers.

## 5.1 Novel contributions

The thesis contributes with two overarching main findings.

1) New insight is achieved about the complex mechanisms and interrelationships between prognostic factors for RTW after long-term sick leave and work rehabilitation. Cognitions, in terms of fear avoidance beliefs for work, were the most important predictor for non-working and continued sick leave during follow-up, between 3 months and 3 years (Paper 1 and Paper 2). High levels of fear avoidance beliefs for work were explained by musculoskeletal and pseudoneurological health complaints, illness perceptions, and level of education (Paper 1). Moreover, fear avoidance beliefs for work mediated the effect of physical function and education on continued sick leave after work rehabilitation. An indirect effect was found for musculoskeletal complaints on continued sick leave, through physical function and fear avoidance beliefs for work (Paper 2).

2) The results provide a more in-depth understanding of the complex process of returning to work after participating in work rehabilitation. The results show how age, gender, diagnosis, occupation, and history of previous sick leave influence the probabilities of working or being on sickness benefits during follow-up, and how the transitions between working and sickness benefits are influenced by these prognostic factors (Paper 3).

The following discussion is organized around these two overarching findings and the three research questions.

## 5.2 Complex mechanisms and interrelationships between prognostic factors for RTW

### 5.2.1 Health complaints and diagnosis

The results of this thesis show that individuals on long-term sick leave, participating in work rehabilitation are often registered with more than one diagnosis (Paper 1), they report co-morbid health complaints (Paper 1), and multiple pain sites (Paper 2). These findings are supported by previous studies describing high rates of co-morbidity among individuals on sick leave with common health problems, such as musculoskeletal and mental health complaints [58-60]. Musculoskeletal complaints are often found to be widespread, with pain reported in several body regions [71-73], and often co-exist with mental health problems [21, 60, 74, 75].

The predictive value of diagnosis and health complaints on work and continued sick leave during follow-up were, however, inconsistent. In the first paper, no differences were found between the sick leave diagnosis; musculoskeletal, mental, or unspecified, and non-working at 3 and 12 months follow-up. In the third paper, participants with a mental diagnosis had a higher probability of full sick leave during follow-up, compared with those having a musculoskeletal diagnosis. Conversely, participants with a mental diagnosis did less often shift to full sick leave, from any of the other states, indicating longer sick leave spells for those with a mental diagnosis compared with musculoskeletal diagnosis. This is in line with studies showing that common mental health disorders are associated with longer duration of the sick leave episodes compared to non-depressed workers, and patients with musculoskeletal and somatic illness [21, 76, 286-288].

One possible explanation of the inconsistent findings between paper 1 and paper 3 for how mental diagnosis influenced RTW, may be the use of different outcome measures of RTW, and the longer follow-up period in paper 3. Longitudinal data on sickness benefits (Paper 3) is supposed to be more valid than cross-sectional self-reports (Paper 1) [7, 205]. Furthermore, for individuals that were sick-listed with other diagnoses than musculoskeletal and mental diagnoses at baseline, there were

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higher probabilities of receiving full disability pension during follow-up (Paper 3). However, this subgroup with other diagnoses constituted only 7% of the sample and had mainly cardiac and neurological diagnoses. This finding is in accordance with the literature showing that well-defined diseases in the nervous system, respiratory system, and circulatory system were important predictors for disability pension three-years after long-term sick leave [49]. The finding is also supported by results showing that applications for disability pension are more often accepted for well-defined biomedical diagnoses compared to complex musculoskeletal diagnoses [289]. Furthermore, the results in this thesis show that pseudoneurological health complaints, such as tiredness, sadness/depression, and anxiety, predicted non-working at 3 months follow-up, but did not predict any work outcomes at 12 months follow-up. Having musculoskeletal complaints did not have any predictive value on non-working at follow-up (Paper 1). In Paper 2, the mediation model shows that musculoskeletal complaints had an indirect effect and pseudoneurological complaints had a direct effect on days on sickness benefits during the 3-year follow-up. These results indicate that self-reported mental health problems, in terms of pseudoneurological complaints, may be a better predictor of work outcomes than having a mental diagnosis. This is partly in line with the literature stating that self-reported physical and mental health may be more important for RTW, than the sick leave diagnosis in itself in individuals with chronic LBP [68], and in employees with mental health problems [69]. In this thesis, self-reported physical health problems, in terms of musculoskeletal complaints had, however, no independent or direct influence on the work outcome during follow-up (Paper 1 and Paper 2). Furthermore, being on sick leave with a musculoskeletal diagnosis did not predict work, continued sick leave, or disability pension during the 4-year follow-up after work rehabilitation (Paper 3). The lack of associations between musculoskeletal complaints/diagnoses and the subsequent work and benefit situation show that the association between health complaints [48], medical diagnoses and sick leave is complicated [64]. Medical explanatory models do not reflect why so many are on long-term sick leave and why some never return to paid work [26, 67]. Therefore, to understand the multidimensional nature of the prognosis of RTW, a biopsychosocial perspective [12,

21] was used in this thesis. In contrast to a unidimensional biomedical model of disease, the biopsychosocial perspective encompasses biological/medical, psychological, and social/environmental variables [12]. The prognostic findings of health complaints and diagnosis in this thesis are highly interrelated with function and cognitions and must be understood in a broader context. Within the ICF framework, disability and functioning are viewed as outcomes of interactions between health conditions and contextual factors, encompassing personal and environmental factors [14, 209].

One of the main assumptions in this thesis was that cognitions would be more important for RTW after work rehabilitation, than diagnosis and health complaints. It is, however, somewhat surprising that mental diagnoses and pseudoneurological health complaints predicted non-working and continued sick leave during follow-up, whereas musculoskeletal conditions did not. This may indicate differentiated predictive value and multifactorial mechanisms for the musculoskeletal and mental diagnoses or complaints. The finding of different RTW courses between diagnoses is supported by results from a 3 months follow-up of newly sick-listed individuals with either musculoskeletal or mental diagnoses [290]. RTW among those with musculoskeletal diagnoses was not associated with receiving a combined clinical and work-related interventions, but with better health, work ability and positive expectations, whereas for sick-listed with mental diagnoses, RTW was associated with receiving the combined intervention [290]. However, common for individuals with musculoskeletal and mental complaints are that they often experience reduced functional abilities [212, 274]. There is also a linear relationship between multiple pain sites and reduced physical and mental functioning, regardless of pain location [291, 292].

### **5.2.2 Functional ability**

A novel finding in this thesis is that poor physical function, namely moving ability and lifting/carrying ability mediated the relationship between musculoskeletal

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complaints and fear avoidance beliefs for work (Paper 2). Unexpectedly, no such relationship was found for mental functioning, regarding coping/interaction ability. There was neither any direct relationship between poor physical and mental functioning, measured at baseline, and days on sickness benefits during the three year follow-up. Previously, in a sample of former work rehabilitation participants, poor physical and mental functioning were strongly associated with being in the non-working group three years after a work rehabilitation program. [155]. This may indicate, that although functional ability is highly related to work participation and disability, it may not adequately predict RTW or continued sick leave during a longer follow-up period. The reason for this may be that functional ability is a relational concept, and should therefore always incorporate the situated context [14, 213], e.g. the working conditions. According to the ICF, measures of functioning may, together with assessments of health factors, provide a broader and more accurate picture of the overall health situation and of the individual's prognosis [2, 213]. A normative sample of individuals in working age reported better physical and mental functioning [212] than individuals on sick leave [274], and individuals on disability pension [144]. In the sample of disability pensioners, reports of low physical functioning increased the likelihood of not believing in RTW [144]. Functional disability among long-term sick-listed employees claiming disability pension may vary, in both severity and nature [293]. It is therefore suggested that systematic assessments of work function should be carried out to classify differences in abilities related to type of occupation with the corresponding task demands [293].

The mediation analyzes confirmed that musculoskeletal complaints affected the physical functional ability of an individual, which in turn affected level of fear avoidance beliefs for work. Fear avoidance beliefs for work are cognitions on how pain and functional limitations may be related to work resumption. In this thesis a modified version of the FABQ was used, to capture fear avoidance beliefs in a broader and more complex sample of sick-listed individuals and not only those with LBP. It seems that fear avoidance beliefs toward working with pain is independent of pain location, and the fear may be related to previous experiences and functional limitations when working with pain.

### 5.2.3 Cognitions

The primary hypothesis in this thesis was that factors related to the participants cognitions, in terms of illness perceptions, coping, and fear avoidance beliefs would be crucial for actual RTW after work rehabilitation. Fear avoidance beliefs for work was the most important prognostic factor for non-working or continued sickness benefits during follow-up (Paper 1 and Paper 2). This finding add new knowledge, since the prognostic value of fear avoidance beliefs for work, has not previously been studied in long-term sick-listed participants in work rehabilitation, with composite and co-morbid health complaints. There is however a strong association between psychological distress, such as depression and anxiety, and fear avoidance beliefs in individuals on sick leave with common neck and back pain [294, 295]. Fear avoidance beliefs are predictors for non-RTW in individuals with non-specific, sub-acute LBP [267-269], whereas for individuals with chronic LBP there are very few prognostic studies on RTW, and results are weak and inconsistent [267]. In this thesis, fear avoidance beliefs for physical activity did not predict non-working during follow-up (Paper 1). This is in line with Waddell et al. [265], unfolding a stronger association between the fear avoidance beliefs for work and work disability in individuals with chronic LBP, than for the fear avoidance beliefs for physical activity. This finding indicates that fear avoidance beliefs is task specific and a result of experiences and learning from specific situations, either in physical activities or at work. Fear avoidance beliefs for work is a complex phenomenon, and may be shaped in the interplay between internal and external stressors, such as pain and discomfort, psychosocial factors, and daily life and workplace factors [272]. In individuals on sick leave with long-lasting health complaints, the internal stressors may be related to the perception of pain, distress, and poor functional ability, and the external stressor to perceived stress and discomfort at the workplace. In CATS, individual learning mechanisms from related situations, may explain why individuals may react differently to identical stress stimuli [217]. Participants in work rehabilitation with high levels of fear avoidance beliefs toward work may have experienced that

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performing their work will increase their health complaints, resulting in poor coping in terms of negative response outcome expectancies toward work [217]. These individuals may expect more pain and discomfort if going back to work and may interpret working as a threat resulting in sustained activation and sensitization through a cognitive system of feedback loops [56]. The experience of being activated over time may be both unpleasant and uncontrollable, and the only way to escape this distress, may be to avoid the workplace [56, 296]. Fear avoidance beliefs for work are shown to be strongly associated with psychological and social work environment, in terms of perceived demands, control, and support at work, in individuals on sick leave with common neck and back pain [295]. No information about work environmental factors were used in this thesis.

Findings in this thesis showed that illness perceptions, in terms of perceived duration, consequences, and personal control of the health complaints explained high levels of fear avoidance beliefs for work (Paper 1). A maladaptive illness perception profile does typically cluster around these three components [246, 258, 259]. Illness perceptions are the individual's cognitive models of their health complaints or diagnosis [246]. Illness perceptions have been found to predict RTW among individuals with myocardial infarction [257], beside this there is little research on illness perceptions and work outcomes. However, non-working patients seem to expect longer duration, report more symptoms and emotional responses of their illness, and to perceive the consequences of their illness to be more severe [256]. While, patients that are still working in spite of illness/disease tend to have a better understanding of their illness and a stronger belief in controllability [256]. Maladaptive illness perceptions may be influenced through education, information, and cognitive interventions [246]. The link between illness perceptions and fear avoidance beliefs for work indicates a potential to intervene on both concepts. Changes in fear avoidance beliefs for work after a brief outpatient intervention for individuals with common neck and back pain were recently found to predict RTW during follow-up [297]. This indicates that fear avoidance beliefs is a changeable phenomenon, and may be targeted in tailored interventions, such as cognitive

behavioral treatment and exposure in vivo, through new and positive experiences at the workplace [264, 270, 271].

Furthermore, high fear avoidance beliefs for work were found to mediate the relationship between musculoskeletal complaints and days on sickness benefits after work rehabilitation (Paper 2). There was however only an indirect path from musculoskeletal complaints to high levels of fear avoidance beliefs for work, as this effect went through poor physical function (Paper 2). This indicates that fear is not directly influenced by the level of complaints, but by how the musculoskeletal complaint affects the individual's level of functioning. The relationship between health complaints, fear avoidance beliefs, and fear avoidance behavior, is however complicated. Demanding life events seem to influence individuals differently and there may also be individual variances in the vulnerability to stress [228, 298]. Such variances in vulnerability may be due to sensitization mechanisms and sustained activation [55, 56, 219, 221]. Sensitization is described as an increased stimulus response due to repeated stimuli [219], and may explain the mechanisms of persistent fear avoidance beliefs. When a worker is exposed to non-manageable internal and external stressors at the workplace, sustained activation may occur, due to psychobiological and cognitive sensitization mechanisms [55, 221]. Thus, the vicious circle of fear avoidance may be the result of psychological and cognitive processes in the experience and interpretation of pain and discomfort [262, 263]. In the first place, experiences of pain may prompt fear avoidance beliefs and thereafter, individuals could develop chronic musculoskeletal pain due to avoidance behavior based on their fear avoidance beliefs [260, 261]. It is however important to realize that the vicious circle of fear avoidance always will be influenced by the individual's context. A recent study which tested a mediation model of individual psychosocial factors following the onset of LBP, found that fear avoidance beliefs, together with pain and catastrophizing had only an indirect relationship with RTW during follow-up [299]. RTW confidence and RTW expectations had however a direct relationship with RTW outcomes at 3 months follow-up. In accordance with our findings, this study found only an indirect relationship between pain and fear avoidance beliefs. However, while



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our results showed a path from musculoskeletal complaints via physical function to fear avoidance beliefs, they found that pain was related to fear avoidance beliefs via pain catastrophizing [299]. The mediation model utilized in the study of Besen et al. [299] is not directly comparable with our model, as the sample was limited to LBP patients in an acute stage of the illness. However, the results indicate that mediation modeling may be a promising way to achieve detailed information about how prognostic factors for RTW after sick leave are interrelated.

High instrumental mastery-oriented coping (IMOC) was found to predict RTW at 3 months follow-up, but not after 12 months (Paper 1). Three subscales of the Utrecht coping list (UCL) constitute the IMOC scale; active problem solving, and the inverse scores of avoidance and passive expectancy, and depressive reaction pattern [229, 230]. The active problem solving subscale of IMOC may resemble the problem-focused strategies in the “Ways of coping” theory of Lazarus and Folkman [228]. The IMOC scale has previously been found to be associated with work-outcomes after work rehabilitation [155]. In a cross-sectional survey, those being in the non-working group three years after participating in inpatient work rehabilitation, reported higher instrumental mastery-oriented coping, than those in the sickness benefit group [155]. Coping is however, not a uniform concept and may be understood and measured in different ways [225]. In this thesis coping was defined as positive response outcome expectancy, according to the CATS [217]. This definition is comprehensive, because it can be transferred to all types of cognitions with elements of outcome expectancy, and it also covers poor coping in terms of hopelessness (negative expectancy) and helplessness (no expectancy) [217]. Long-term sick leave may be viewed as hopelessness in relation to how the worker cope with their illness and work situation [296]. Corresponding, workers with an active problem-solving coping style may have lower risk of future sick leave [300]. Neither of the other coping measures used in the thesis predicted any work outcomes (Paper 1). For the self-efficacy scale, lack of prediction may be due to the use of the general self-efficacy scale, since this scale has not been found to predict RTW after sick leave, although individuals on sick leave

often report low general self-efficacy [242]. A newly developed return-to-work self-efficacy scale has shown promising predictive value for RTW among workers with musculoskeletal disorders and should be tested in later studies [301].

Common for illness perceptions, fear avoidance beliefs, and coping is the element of expectancy of a given outcome, e.g. recovery of health or going to work with health complaints. It is demonstrated that recovery expectancy is related both to health outcomes [302] and to RTW [23], and that RTW-expectancy is highly related to work outcomes among individuals with LBP [23] or mental [303] and musculoskeletal diagnoses [290]. Recovery expectancies might be influenced by a number of health related and environmental factors [23]. In the current thesis, the mechanisms of recovery expectancy and RTW expectancy are explained within the CATS.

#### **5.2.4 Socioeconomic status (SES)**

Results in this thesis indicate that there is a social gradient in the prognosis for RTW after participating in work rehabilitation. The social gradient in health, and consequently in sick leave and disability, have long been recognized [49, 124-126]. SES is also an important predictor for RTW after sick leave [19, 20, 87]. However, it has to my knowledge, not been documented how SES, in terms of level of education and type of occupation, influences the prognosis of RTW after participation in inpatient work rehabilitation.

In this thesis, low level of education had an independent association with non-working at 12 months follow-up, and explained a considerable variance in levels of fear avoidance beliefs for work (Paper 1). Level of education had moreover an indirect effect on days on sickness benefits during a three-year follow-up, as the effect of education was mediated by fear avoidance beliefs for work (Paper 2). In the last paper, we had no measures of education, but found that participants working in blue-collar occupations were more likely to be non-working and receiving disability

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pension during a four-year follow-up, compared to those with white-collar occupations (Paper 3). The majority of these blue-collar workers have probably low level of education, as occupational class and type of work are highly interrelated with level of education [111, 112, 122, 123].

Both environmental and individual factors may explain why low SES predicted non-working after work rehabilitation in this thesis. Environmental factors related to the labor market may be more unfavorable for workers with low education, and level of education is often associated with strenuous physical and psychosocial work [120, 130, 304]. Working conditions may thus hinder work resumption, in particular if the work tasks are not compatible with limitations in health and functioning [305]. Sick-listed workers with low education and blue-collar occupations may also have fewer opportunities to change work tasks and workplace [306, 307]. However, work environmental factors were not analysed in this thesis. Individual factors related to previous learning and psychosocial resources may explain the negative association between low SES and work resumption after work rehabilitation. If the worker have experienced and learned that he or she is not able to influence their health or working conditions, they may establish negative expectancies about returning to work through hopelessness and helplessness. There seems to be a strong social gradient in the expectancy to cope with working life challenges [127]. Thus, participants in work rehabilitation may have different expectancies and prerequisites for returning to work. The association between level of education, working conditions, and later disability is found to be confounded by characteristics present already in childhood [305]. Individual differences in characteristics and skills manifested early in life are influenced by genetic and social background factors [305]. There may therefore be a selection already at entrance to the labor market, influencing the possibilities for work resumption after long-term sick leave at a later stage. Moreover, psychosocial resources may influence how the participant take advantage of the work rehabilitation program, e.g. when it comes to goal achievements and cognitive processes. The rehabilitation programs are goal oriented and demand that the participant is an active agent in his or her RTW-process. Therefore, due to less psychosocial resources [128, 129], one may assume that not all participants in work rehabilitation programs may

benefit equally from the content of the programs. There is a strong trend of unhealthy behavior among those with lower education, and health promotion programs seem to be more effective among higher educated individuals [308]. It is claimed, that in well developed welfare societies, so-called “intervention generated inequalities” may contribute to maintenance or increase of inequalities in health and working life [309, 121].

### **5.2.5 Length of previous sick leave**

The length of sick leave at admittance to the work rehabilitation program (mean 10.5 months), was not related to non-working after three months (Paper 1). However, those who had been on sick leave for more than 12 months at inclusion to the program, were less likely to be working 12 months after participation in the work rehabilitation program (Paper 1). As hypothesized, length of previous sick leave had a strong independent effect on days on sickness benefits during the 3-year and four months follow-up (Paper 2). In addition, length of previous sick leave was a strong prognostic factor for not returning to work, for receiving medical and vocational rehabilitation allowances, and for full disability pension during the 4-year follow-up (Paper 3).

The results in this thesis is in accordance with the literature indicating better work-outcomes after a shorter period on sick leave [4, 86], and worse work-outcomes after long-term sick leave [20, 87-93]. Prolonged sick leave may be related to the severity of the health problems, but also to contextual factors in terms of working conditions [95]. Among individuals with common mental disorders the length and severity of the health problems prior to becoming sick-listed was the strongest predictor of sick leave duration [70]. Although workers with chronic diseases had more sick leave than workers with non-chronic diseases, sick leave duration in both groups was associated with the same health and work-related problems [310]. Additional health problems such as fatigue and emotional exhaustion, and work-related problems of physical workload, hindered early RTW after sick leave in both the chronic and non-chronic

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group [310]. In a recent study, early and late RTW was not associated with any health measures among workers sick-listed with common mental disorders [149]. Early RTW was associated with lower education and late RTW with a perceived need to reduce demands at work and intentions to change job [149].

Still, little is known of the specific mechanisms behind why sick leave in itself is negatively associated with RTW, and the causal mechanisms are probably complex. In Norway, partial sick leave and contact with the workplace are important political elements to hinder the negative consequences of long sick leave spells [311]. For this reason, follow-up actions from NAV, in terms of the first dialogue meeting where the employer and employee both are present, have recently been postponed from eight to six weeks after the first sick leave spell. Among the rationales for this meeting are the need of an earlier identification of individuals at risk of long-lasting sick leave [311].

### 5.3 The complex process of RTW after participation in work rehabilitation

The current thesis demonstrate that the process of returning to work after work rehabilitation may take several years with multiple transitions in and out of work, and of receiving sickness benefits. Furthermore, the results show that the probability of working and of transitions between working and receiving sickness benefits during follow-up were dependent on age, gender, occupation, diagnosis, and history of previous sick leave (Paper 3). The results confirm that work resumption after long-term sick leave may be a long-lasting and complex process, not possible to measure as an isolated event [3, 6-9, 189]. For cost-effective analyses of RTW interventions, more than 12 months follow-up is warranted [312]. However, an important finding in this thesis was the annual increase in return to full work, from 10% at departure from the rehabilitation clinic to 51% at 4-year follow-up. This indicate that the process of returning to work may proceed long after the rehabilitation program, and call for

long-term follow-up to get an adequate picture of the RTW situation [7]. There is, however, no clear agreement about how long an optimal follow-up period should be, and this may depend on the purpose of the study [313, 314]. Access to all registered sickness benefits (sick leave benefit, medical and vocational allowances, and disability pension), and whether the registered benefit was full or partial, made it possible to capture all transitions between full and partial benefits and work during the 4-year follow-up (Paper 3). Analyzing the transition intensities in and out of work and sickness benefits gave new insight into different mechanisms for RTW across subgroups. When analyzing prognostic factors for the probabilities of being at work or on the different sickness benefits, some findings were as expected, and in accordance with the literature on sick leave, and some were not. Unexpected findings in this thesis may be due to the selected study sample of work rehabilitation participants in a Norwegian context. So far, very little research has been conducted on prognostic factors for RTW after work rehabilitation for individuals on long-term sick leave with common musculoskeletal and mental health complaints.

The association between higher age and a higher probability of receiving full and partial disability pension was in accordance with the literature [91, 96], but the expected association between lower age and RTW was not found. Participants with lower age had, however, higher probabilities of being on vocational rehabilitation allowance. Vocational rehabilitation allowance was at the time of the survey granted for individuals exceeding 12 months on sick leave, in need of e.g. active vocational guiding, work training, or professional re-education. Vocational rehabilitation allowance was in particular targeted at younger people with health problems and functional limitation at risk of falling out of working life. The lack of association between higher age and full sick leave during follow-up was contrary to studies showing a strong relationship [38]. Higher age was, however, associated with higher probabilities of being on partial sick leave. This is in accordance with results in a NAV report from 2013, and may be explained by more use of shorter sick leave spells on full sick leave among younger people [190].

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Women's higher probability of receiving full and partial disability pension is supported by previous findings [102-104]. This result may also explain the lower probability of working among women during follow-up. There was, however, no association between gender and the probabilities of receiving sick leave, indicating homogeneity in the group of men and women participating in work rehabilitation.

The higher probability of receiving full disability pension during follow-up for blue-collar workers, compared to health and social workers, and education and childcare workers, is in accordance with the literature [125]. Accordingly, there was also a lower probability of being at work for those with blue-collar work compared to all other occupations. As mentioned under 5.2.4, this may be due to less job mobility and less opportunities for work adjustment for these occupations [131, 307].

The finding of longer sick leave spells for participants with mental diagnoses compared to those with musculoskeletal diagnoses was expected and in accordance with the literature [21, 286-288]. It was however unexpected that those with other diagnoses than mental and musculoskeletal diagnoses should have higher probability of receiving full disability pension during follow-up. This subgroup with other diagnoses constituted only 7% of the participants, and had well-defined biomedical diagnoses, mostly related to neurology and heart diseases. As mentioned, such well-defined diagnoses have been found to predict later disability pension [49], and are less often rejected when applying for disability pension, compared to musculoskeletal diagnoses [289]. However, sick-listed individuals with these diagnoses are not a defined target group of comprehensive inpatient work rehabilitation in Norway. Unfortunately, we have no information about co-morbidity or other confounding circumstances that could explain the higher probabilities of disability pension in this subgroup.

Length of previous sick leave was as expected a strong prognostic factor for non-working and for full disability pension during follow-up. Participants with the longest sick leave length before the rehabilitation program had a lower probability of being on full sick leave, and for transitions from and to full sick leave, and for receiving

medical and vocational rehabilitation allowances during follow-up. This is expected since the recipient after one year on sick leave benefit will be transferred to a rehabilitation allowance (now: WAA), if he or she is not able to return to full work.

Although the different sickness benefits studied in this thesis are distinctively Norwegian, the results may have transfer value to other countries, at least to the sick leave systems and regulations in the Nordic countries. As an example, similar analysis have been conducted in a Danish context, finding slightly different transitional patterns for men and women regarding working and being sick-listed, with less working and more sick listing among women [315]. However, this study did also include other social transfer payments, and the findings are therefore not comparable to our data.

## 5.4 Methodological considerations

In this thesis, three different prognostic models were used to investigate the probabilities of RTW related to individual characteristics of sick-listed work rehabilitation participants. As recommended in prognostic research [316], a prospective cohort study design was chosen to assess the relative importance of the selected independent variables on the different RTW outcomes. A prognostic model should normally include multiple variables since the course of an illness [316], and of RTW, depend on several factors [317]. This is contrary to etiological research, where the aim is to find out whether an outcome is attributed to a particular risk factor, with adjustments for other causal factors [316]. In prognostic research, the aim is to use multiple variables to predict a future outcome as accurately as possible [316].

### 5.4.1 Strengths and limitations

Among the strengths of the current thesis are the well-defined study population, the few dropouts, the large sample sizes, the use of validated questionnaires and official register data, and the long periods of follow-up.



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The study population constituted three different samples of participants in work rehabilitation. The high response rate reduces the probability of selection bias. The participants are however not representative for sick-listed individuals in general, but may be considered representative for individuals on sick leave referred to work rehabilitation in Norway. Two of the samples comprised participants from the largest work rehabilitation clinic in Norway (Paper 1 and Paper 3), whereas one sample was a multicenter study including participants from the eight largest rehabilitation clinics in Norway (Paper 2). In paper 3, access to data from patient journals and register data, made it possible to track the total sample of rehabilitation participants during the complete follow-up period, without any attrition. Further, there was a high response rate on the self-reported data at baseline in paper 1 (79%) and in paper 2 (89%), and the non-participants in paper 1, did not differ from the participants regarding age, gender, diagnosis, or length of previous sick leave. In sum, the thesis included 1874 participants, with a majority from the multicenter study, paper 2 (n=1155), and from paper 3 (n=584).

A limitation in paper 1 is, however, the restriction of data on RTW and sickness benefits from self-reports at the two time-points during follow-up, with a decline in response rates at 3 months (84%) and 12 months (70%). Loss to follow-up can create attrition bias [301], which may influence the external validity of the results. Non-respondents may differ from respondents both on prognostic factors and on RTW outcome. Examples from corresponding studies show that non-respondents were more often younger males with better mental health [301], and respondents had more often white-collar occupations [318]. Conducting an attrition analysis for the prognostic factors in paper 1, could have given information about differences in score between respondents and non-respondents on the prognostic variables at baseline. The RTW rate may also differ between the respondents and those lost to follow-up at 3 and 12 months in paper 1. It is however, suggested that the associations between the predicting factors for RTW between respondents and non-respondents will not be influenced by attritions [319].

The use of register data in paper 2 and paper 3 was a strength, because it gave access to complete data with all registered sickness benefits during the total period of follow-up. This type of longitudinal data is preferable in research on sick-listed individuals with common musculoskeletal and mental complaints, because it may capture the dynamic pattern of these illnesses and sick leave [320]. Workers with long lasting health problems are often at risk of recurrent sick leave [198], and longitudinal data with a long follow-up period is necessary when assessing recurrence of sick leave and sustainability in RTW [194, 321, 322]. In agreement with this, the long follow-up periods of 12 months (paper 1), 3 years and 4 months (Paper 2), and 4 years (Paper 3), were chosen.

A shortcoming is that the included variables were limited to individual characteristics related to sociodemography, SES, health, function, and cognitions. Contextual factors e.g. related to work environment may also influence the prognosis of RTW after long-term sick leave [15, 208, 317]. It may therefore be a limitation that physical and psychosocial factors related to the work environment were not included in the analyses. Nevertheless, individual factors such as cognitions may be susceptible to modification during work rehabilitation, and knowledge of individual predictors for RTW may therefore have transfer value to rehabilitation practice.

Another aspect in prognostic models is that all potential prognostic factors that may affect the outcome should be included. Such considerations should be done to avoid omitted variable bias, which may induce so-called underfitting of the results, and poor transportability to other populations [323]. When selecting the variables to a prediction model, predictors already reported as prognostic should be used [324]. For participants in work rehabilitation, who are sick-listed with composite health complaints, we still do not know all possible factors that might predict RTW.

Therefore, when selecting the predicting variables in this thesis, judgements were done based on existing empirical data on prognosis for RTW after sick leave, besides experience from clinical practice. It is however, not possible to know whether a prognostic model include all important variables [325]. When using complex prognostic models, there are also a risk of including too many variables, leading to

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overoptimistic prediction of the outcome [325, 326]. This, so-called overfitting of results may in particular be a problem when the sample size is small, and may lead to poor external validity [316]. In a multivariable prognostic model, it is difficult to estimate the required sample size [316]. Thus, before application of a prognostic model, the results should be validated on a new sample of similar patients [327].

The aim of this thesis was not to explore if the work rehabilitation program in itself was effective for RTW, therefore no conclusions can be drawn on any effects. There is still a lack of evidence of the effect on RTW after inpatient work rehabilitation in Norway, and it is not known which components in the program that may be most beneficial for RTW during follow-up.

#### **5.4.2 Generalizability**

When assessing prognostic models it is essential to consider whether the results derived from the analysis can be generalized to other, but similar groups of patients [325]. In this thesis, it is considered that the use of three similar and probably, representative samples of participants from inpatient work rehabilitation may indicate high generalizability of the results to other samples of participants in work rehabilitation. High generalizability indicate good external validity, meaning that the prognostic models will be valid also in other samples of sick listed individuals [326]. At least, the prognostic factors that are common between the samples, such as SES, length of previous sick leave, and fear avoidance beliefs for work, are likely to predict RTW in similar samples. However, the only way to determine the generalizability of our results is by validating the prognostic models [323, 327]. Unfortunately, validation in terms of statistical tests is outside the scope of this thesis.

High generalizability in this thesis may in particular be shown in the results from the prognostic model of the multicenter study (paper 2) since this sample is judged more representative than the other two. Multicenter studies have the advantage of larger sample size and improved generalizability of the results [328]. Although the eight different work rehabilitation clinics have the same target group and aim, local

differences may occur, indicating a more heterogeneous study population. This may be an advantage, since the more diverse the primary location for the prognostic model has been, and found to be accurate, the more likely it is that the model will generalize to a new location [323]. A prognostic model is found to be accurate when it matches the observed outcome. Testing of accuracy, in terms of analyses of calibration and discrimination, was however outside the frame of this thesis. Overall, the predicting variables in this thesis are supposed to work satisfactorily in a similar population of participants in work rehabilitation, indicating high reproducibility. It will be more problematic to transfer the prognostic model to a broader population of individuals on sick leave without further external validation. Generalizability, in terms of transportability of a prognostic model to a broader sample of individuals, will however often be of greater clinical value [323, 326]. Most often generalization of study result can be made only at a group level, and caution should be taken to transfer the result directly to an individual level.

In conclusion, the performance of the prognostic models used in this thesis should be evaluated, as a minimum in terms of a clinical validation before the results can be used in practice [325]. Generalization and external validity is thus crucial for clinical implications.

## 5.5 Implications

Results from this thesis may have several implications for stakeholders working with individuals at risk of long-term sick leave and disability. In the future, knowledge of prognostic factors for RTW after work rehabilitation may be used in systematic screening of sick-listed individuals to tailor follow-up actions aiming at RTW. However, such multivariable screening tools should be tested systematically for sensitivity, specificity, and predictive values [329]. Furthermore, predictive and clinical scores for good and poor prognosis of RTW should be defined, and used in clinical decision making [267]. Specifically, knowledge of prognostic factors for

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RTW after sick leave and work rehabilitation could be used; 1) to select the right candidates for work rehabilitation, 2) to decide and target the content of the work rehabilitation program, and 3) to guide follow-up actions aiming at RTW after the program.

1) When selecting sick-listed candidates to work rehabilitation, stakeholders involved in the referral process, such as the physician and NAV, may focus too much on the diagnostic criteria [330]. Among sick-listed with no clear-cut disease, more focus on, and knowledge about the sick-listed individual's own cognitions about health and illness, functional ability, and expectancies toward work, may add prognostic information relevant for selection into work rehabilitation [330]. Negative RTW-expectancy is highly related to maladaptive illness perceptions [331], and is one of the most important predictors of RTW, for sick-listed individuals with musculoskeletal complaints [332, 333], various health conditions [334], as well as common mental disorders [303]. These factors should be considered together with information about previous sick leave duration and number of episodes, level of education, and occupation in terms of type of work. Besides, the screening should have a biopsychosocial approach with more emphasize on contextual factors in accordance with the ICF [209]. More in depth information about contextual factors, such as work environment and family-life are in addition to individual factors vital for the RTW prognosis [14, 209]. This type of systematic screening of multivariable prognostic factors may be a complex process and could be conducted by a local, specialized interdisciplinary team.

Previously, a screening instrument of psychological and motivational factors was found useful to differentiate between three different prognostic groups of RTW among sick-listed individuals with musculoskeletal complaints, and the instrument was deemed sufficient to randomly allocate the right treatment for the right group [24]. Sick-listed classified with a poor prognosis showed better results after extensive treatment, where sick-listed with a medium prognosis had best effect of a light treatment, and those classified with good prognosis had no effect of extensive treatment compared to the other treatments [24]. This study showed that it is possible

to identify sick-listed individuals with different prognosis for RTW by a short screening instrument. Although some similarities, the results from Haldorsen et al. [24] have no direct implication for the results of this thesis, due to different study population and clinical settings. However, it would be of great value if we in the same way, could discriminate between sick-listed that are most likely to benefit from comprehensive work rehabilitation, those that are in no need for such extensive rehabilitation programs, and finally those individuals that are unlikely to RTW. The latter group could be spared for any further treatment or rehabilitation actions where the main goal is RTW.

2) Results from this thesis may have clinical implications for the content of the work rehabilitation program. The interdisciplinary rehabilitation team should more systematically use information about the individuals' cognitions and expectancies, when tailoring the rehabilitation [335, 336]. Work-focused cognitive approaches, either individually or group based, may target maladaptive illness perceptions such as expected duration of the complaints, consequences for work and family-life, as well as personal control of the health complaints [337]. Emphasize should also be on long-term sick leave, low education, and type of work since these factors may give poorer prognosis for RTW. Results from this thesis indicate that the participants self-perceived level of physical functioning should be investigated, alongside with fear avoidance beliefs and work ability. Individuals on sick leave and disability pension report lower functional ability than working populations [144, 155, 212]. Information about physical function could give direction for activities and exercises offered during work rehabilitation. In some cases, visiting the workplace to gain information about specific aspects that may hinder or facilitate RTW may be useful [185, 199]. In Norway, work rehabilitation programs already include many of the components mentioned above, through physical activities and cognitive behavioral approaches [177, 180, 184]. However, results from this thesis indicate that the focus should be even more structured, tailored, and directed toward obstacles of work resumption.

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3) Knowledge of prognostic factors may also have implications for professionals and stakeholders outside the rehabilitation setting. Follow-up after work rehabilitation programmes are important for successful RTW [186-188]. Especially sick-listed workers with poor prognosis for RTW may need closer and more tailored follow-up toward the workplace. For successful tailoring of follow-up actions knowledge from the work rehabilitation clinic needs to be transferred to stakeholders at the workplace, in the health service, and to NAV. This knowledge about facilitating or hindering factors may have important implications for the sick-listed individual, for the health professionals' clinical decisions, and for other stakeholders' views and decisions. In addition, coordinating stakeholders and getting them to communicate better, are crucial for work resumption after work rehabilitation [2, 184].

## 5.6 Directions for future research

Result from this thesis may have several implications for future research. Important implications involve further development of prognostic models for RTW, validation, usability, and implementation of clinical relevant factors.

There is still a need for more knowledge of prognostic factors for RTW after sick leave and work rehabilitation for individuals with common mental and musculoskeletal health complaints, and co-morbid conditions. Results from the three papers show that the process of returning to work is complex, and may depend on several interrelated prognostic factors. However, only individual factors were included in this work, and we still do not know how these factors may intervene with contextual factors for this target group [12, 243]. Therefore, the prognostic models presented in this thesis should be expanded to include work environmental factors. More knowledge is needed on how the workplace can be better integrated into the rehabilitation process [1, 290]. The possibility of modified work and job accommodations are among work-related predictors of RTW, and thus potential variables in future prognostic models [12]. Furthermore, future research on

prognostic models should have a biopsychosocial approach, to capture the complex mechanisms of the RTW prognosis [12, 21].

Before expanding the prognostic models, the results should ideally be validated in a new and similar sample of sick-listed participants in work rehabilitation. Thereafter, the next step would be to perform corresponding analyses in a broader sample of individuals on sick leave. It is unfortunate that newly collected data from prediction research are often used to develop new prognostic models rather than validation of existing models [327]. However, within this field of work rehabilitation there seem to be a need for developing models that are more comprehensive before starting the process of validation. This model could preferably be tested in a representative multicentre sample, and if possible simultaneously among sick-listed individuals with usual treatment and follow-up within the primary health service.

The usability of a prognostic model requires reproducible measurements, both of the predictors and outcome variables [327]. The prognostic variables could easily be assessed by standardized and validated questionnaires, however the outcome variables of RTW may be more difficult to standardize, in particular if the source is from self-reports. The usability and feasibility of questionnaires may be better if they contain fewer items. Reme et al. [338, 339], have shown promising results using one or two single-items to screen for depression and anxiety. These results suggest that comprehensive questionnaires may be simplified, and future research should therefore focus more on extracting existing knowledge from fewer questions. It would also be beneficial for comparison between studies and nations if outcomes of RTW were standardized, and defined more precise [82, 83]. Developing national and international standards for reports of RTW are therefore warranted.

The implementation of validated results from prognostic models of RTW may be demanding and time consuming and require political initiatives with necessary economically and human resources. It is however, a huge potential and need for more systematically use of existing knowledge of prognostic factors for RTW. It may be a challenge to implement knowledge of prognostic models for RTW because multiple



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stakeholders often are involved in the follow-up of individuals on sick leave. The general practitioner, the workplace, NAV, and work rehabilitation clinics are among stakeholders with different roles and responsibilities at different stages in the sick-listed individual's process back to work. Future research should quantify whether use of a validated prognostic model for RTW actually improves decision making when allocating sick-listed individuals to work rehabilitation and other actions aiming at RTW. Changes in practice over time can limit the implications of prognostic models, and they should therefore be replicated [327]. There is also a need for more research on the effects of RTW after inpatient work rehabilitation in Norway. Knowledge from prognostic models should be incorporated in the design of randomized controlled trials.

## 5.7 Summary and conclusions

In this thesis, individual prognostic factors for RTW after long-term sick leave and work rehabilitation were examined in three papers. As hypothesized, the participants' cognitions and socioeconomic status, in terms of low education and blue-collar occupations, were important predictors for non-working during follow-up. In addition, the results confirmed that the process of returning to work can be long and complex, with multiple transitions in and out of work and of receiving sickness benefits, depending of socio-demographic characteristics.

A main finding was that individuals' cognitions, in terms of fear avoidance beliefs for work predicted non-working and continued sick leave during follow-up. High levels of fear avoidance beliefs for work were associated with the severity of the musculoskeletal and pseudoneurological health complaints, low level of education, and maladaptive illness perceptions. Furthermore, fear avoidance beliefs for work were an important mediator between physical function and level of education, and continued sick leave during follow-up. Musculoskeletal complaints had an indirect effect on continued sick leave, as this effect went through physical function and fear avoidance beliefs for work.

In conclusion, results from this thesis show that the process of returning to work after work rehabilitation may be long and complex, and depends on the interplay between multifaceted prognostic factors. Knowledge of factors that hinder or facilitate the process of returning to work may have implications for selection criteria into work rehabilitation, for tailoring of actions during a work rehabilitation program, and may guide follow-up actions aiming at RTW in collaboration with stakeholders outside the work rehabilitation clinic.

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ORIGINAL REPORT

PROGNOSTIC FACTORS ASSOCIATED WITH RETURN TO WORK  
FOLLOWING MULTIDISCIPLINARY VOCATIONAL REHABILITATION\*

Irene Øyeflaten, Cand. san.<sup>1</sup>, Mari Hysing, PsyD<sup>2,3</sup> and Hege R. Eriksen, PhD<sup>4,5</sup>

From the <sup>1</sup>Rauland Vocational Rehabilitation Centre, Rauland, <sup>2</sup>Department of Physical Medicine and Rehabilitation, Haukeland University Hospital, <sup>3</sup>Department of Biological and Medical Psychology, <sup>4</sup>Department of Education and Health Promotion and <sup>5</sup>Unifob Health, University of Bergen, Bergen, Norway

**Objectives:** The number of people in Western countries on long-term sick-leave and disability pension due to musculoskeletal complaints and psychological health problems is increasing. The main objective of this study was to examine whether fear-avoidance beliefs, illness perceptions, subjective health complaints, and coping are prognostic factors for return to work after multidisciplinary vocational rehabilitation, and to assess the relative importance and inter-relationship of these factors.

**Methods:** A prospective cohort study with a 1-year follow-up period was performed. A total of 135 individuals on long-term sick-leave (87 women, mean age 45 years) participated in a 4-week inpatient multidisciplinary vocational rehabilitation programme. The participants had been out of work for an average of 10.5 months.

**Results:** Fear-avoidance beliefs about work was the most important risk factor for not returning to work, both at 3 months (odds ratio (OR) 3.8; confidence interval (CI) 1.30–11.32) and 1 year (OR 9.5; CI 2.40–37.53) after the intervention. Forty-eight percent of the variance in fear-avoidance beliefs was explained by subjective health complaints, illness perceptions and education. Coping explained only 1% of the variance.

**Conclusion:** These findings indicate that interventions for these patients should target fear of returning to work and illness perceptions about subjective health complaints.

**Key words:** multidisciplinary vocational rehabilitation, return to work, subjective health complaints, illness perceptions, fear-avoidance, coping, expectancy.

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Correspondence address: Irene Øyeflaten, Attføringscenteret i Rauland, NO-3864 Rauland, Norway. E-mail: irene.oyeflaten@air.no

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INTRODUCTION

The main objective of this study was to examine whether fear-avoidance beliefs, illness perceptions, subjective health

complaints, and coping were prognostic factors for return to work (RTW) after multidisciplinary vocational rehabilitation, and to assess the relative importance and inter-relationship of these factors.

Despite the improvement in objective measures in health, long-term sickness compensation and disability pension in Western countries has increased substantially (1, 2). Diagnoses related to musculoskeletal and psychiatric complaints are among the most common causes of sickness absence and long-term incapacity to work (2, 3). Most of the increased trend is in non-specific conditions, largely subjective complaints, often with little objective pathology or impairment (2). In particular, for the musculoskeletal complaints, up to 85% of cases are non-specific (4). For these conditions there is a high rate of co-morbidity with other subjective health complaints (5), and the degree of co-morbidity influences the prognosis and degree of disability (6). The intensity of complaints forms a continuum from normal complaints to conditions that require medical care and are incompatible with participation in social and working life (7). RTW following long-term sick-leave is influenced by a mixture of medical, psychological and social factors (8). To be able better to target the interventions, knowledge of predictive factors is required.

The impairment from severe cases of subjective health complaints, including RTW, is related to the perception, attribution and expectancies of the individual. Expectations of treatment outcome and RTW, are in part determined by earlier experience and learning. The ability to handle demands and challenges is, according to the Cognitive Activation Theory of Stress (CATS; 9), dependent on acquired expectancies of the situation and on the resources available to the individual. In CATS, coping is defined as positive response outcome expectancies, i.e. the individual expects to be able to handle a difficult and challenging situation. Positive expectancies and good health (9, 10) may be enhanced through multidisciplinary interventions (11), and may influence RTW (12). Expecting to RTW is an important prognostic factor (13, 14) and individuals with no, or negative response outcome expectancies, may not believe in RTW (9).

Illness perceptions may be related to both stimulus expectancy and response outcome expectancy (9), and are the patient's cognitive and emotional models of health and disease (15). Illness perceptions include the complaints associated with

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the illness, personal ideas about aetiology, perceived duration of the illness, expected effects of outcome, and expectations of cure control or recovering from the illness (16). Illness perceptions are related to RTW regardless of the severity of the illness, in patients with myocardial infarction (17) as well as in chronic fatigue syndrome (18). Our hypothesis is that illness perception is an important factor for RTW following multidisciplinary vocational rehabilitation.

Patients on long-term sick-leave related to subjective health complaints have often established a belief that pain is a sign of damage or harm to the body, and that activities that might cause pain should be avoided (19), i.e. establish a negative response outcome expectancy regarding work or activities (9). The fear-avoidance model is based on cognitive-behavioural theory explaining why some acute low back pain sufferers develop a chronic pain problem (20). Pain-related fear has been shown to be more disabling than the pain itself (21, 22), and is an important factor in explaining the transition from acute low back pain to chronic conditions (23). An understanding of the development of chronic health problems is crucial for both prevention and better management of pain conditions (24). Fear-avoidance beliefs are associated with prolonged disability and work absence in patients with low back pain (12, 25), and are related to level of disability among people with chronic pain (19). There is, therefore, reason to assume that interventions based on reducing fear-avoidance-based behaviours may be a successful intervention (20, 26).

Expectancies of outcome, coping, illness perceptions and fear-avoidance have been shown to be important predictors for RTW for patient groups with specific diagnoses (12–14). However, it is not established whether these factors predict RTW for individuals who have been sick-listed for a long time for complex non-specific health conditions (24, 27).

The aims of this study were: (i) to identify the prognostic value of subjective health complaints, fear-avoidance beliefs, illness perceptions and coping for RTW after a 4-week vocational rehabilitation programme for individuals on long-term sickness leave; and (ii) to explore which variables could explain significant variance in the main predictor.

## METHODS

### Design

This study was a prospective cohort study with a 12-month follow-up period, examining possible predictive factors on RTW measured 3 and 12 months after a multidisciplinary vocational rehabilitation programme.

### Participants

A total of 135 individuals, 87 women (64%) and 48 men (36%) participated in the study (mean age 45 years; standard deviation (SD) 8.4; age range 24–61 years). They were recruited from a sample of 172 consecutive long-term sick-listed individuals, participating in a 4-week inpatient multidisciplinary vocational rehabilitation programme during the autumn of 2002. Patients were admitted to the rehabilitation centre based on referrals from their general practitioners (GP), National Health Insurance offices or labour market agencies. They were recruited from the whole country, both urban and rural areas. The patients did not pay any charge to attend the programme. Inclusion

criteria at the rehabilitation centre were: being motivated to participate in the programme and having an intentional goal and plan to RTW. In addition, other relevant medical examinations and treatments should have been tried before admittance to the programme. Exclusion criteria were: serious psychiatric disorders or undecided applications for disability pension or insurance claims.

All participants answered a comprehensive set of questionnaires (pre-test) before they entered the rehabilitation programme. The same sets of questionnaires were distributed to the participants 4 weeks (post-test; response rate 90% ( $n=122$ )) and (by post) 12 months (follow-up test; response rate 70% ( $n=95$ )) after completing the rehabilitation programme. Three and 12 months after completing the rehabilitation programme data and sickness leave were collected from questionnaires (by post) (response rate at 3 months: 84% ( $n=113$ ) and after 12 months; 70% ( $n=95$ )) (Fig. 1).

### Multidisciplinary vocational rehabilitation programme

The study was performed at a national vocational rehabilitation centre offering a 4-week inpatient multidisciplinary rehabilitation programme, with 6 1-hour long sessions 5 days per week. The aim of the multidisciplinary rehabilitation programme was to help individuals on long-term sick-leave with complex, non-specific subjective health complaints, mainly related to musculoskeletal and psychological diagnoses, to improve their level of functioning, improve their work ability, and to increase the likelihood of RTW. The multidisciplinary rehabilitation programme included a combination of individual and group-based interventions with physical activity, education and cognitive behavioural modification. Self-confidence, coping and learning were important objectives for all activities offered. The multidisciplinary rehabilitation team consisted of physicians, nurses, physiotherapists, vocational social workers and sport educators.

### Instruments and outcome measures

The comprehensive questionnaire comprised 8 standardized instruments, demographic variables, level of education, self-ratings of health and fitness, physical activity and exercise, sleep, smoking, and alcohol consumption. Medical diagnosis, length of sickness leave, occupation, and work-related conditions at baseline were collected from patient journals. RTW and sickness leave were measured by self-report in a questionnaire administered 3 and 12 months after the intervention.

RTW was defined as return to work-related activity (see Table II). Return to ordinary work, return with adjusted work tasks, new work tasks/same employer, new employer and “work related re-employment” (paid by the public health insurance or labour-agency) were included in work-related activity. Not returned to work was defined as not in work at the moment (due to sickness compensation, unemployment, student or other reasons) and “active sick-leave”/vocational training.

*Subjective Health Complaints (SHC) Inventory* (28) consists of 29 questions regarding common somatic and psychological complaints over the last 30 days, rated on a 4-point scale. The items are scored on 5 sub-scales: SHC musculoskeletal complaints (8 items), SHC pseudoneurological complaints (7 items: fatigue, anxiety, sleep-problems, sadness/depression, dizziness, hot flushes, extra heart-beats), gastrointestinal complaints (7 items), SHC allergy (5 items) and SHC influenza (2 items).

*Revised Illness Perceptions Questionnaire (IPQ-R)* (16, 29) is based on the 5 components of illness representations in Leventhal’s self-regulatory model. The questionnaire is a method for assessing cognitive representations of illness and contains 9 scales or components (identity, timeline acute/chronic, timeline cyclical, consequences, personal control, cure control, illness coherence, emotional representations and cause).

*Fear-Avoidance Beliefs Questionnaire (FABQ)* (21) was created to measure pain-related fear and fear-avoidance behaviour. The questionnaire consists of 11 statements rated on a 7-point scale. The test comprises 2 sub-scales: fear-avoidance beliefs for physical activity and fear-avoidance beliefs for work.

*Coping* was measured with 5 different standardized instruments, as follows:

*Perceived Self-Efficacy Scale (GPSES)* (30) consists of 10 questions rated on a 4-point scale. The questionnaire was created to assess a general sense of perceived self-efficacy (coping expectancy) with the aim of predicting coping with daily hassles as well as adaptation after all kinds of stressful life events.

*Utrecht Coping List (UCL)* (10, 31) consists of 47 statements about how one would cope with problems. Each statement is rated on a 4-point scale. The test yields 2 major factors based on 7 subscales: instrumental mastery-oriented coping and emotion-focused coping.

*Coping* (32) was created to assess coping expectancy and how the individual considers their own abilities and beliefs in the future. The schema consists of 7 statements rated on a 4-point scale.

*Hopelessness* (33) measures negative expectancies about oneself and the future and consists of 2 items rated on a 5-point scale.

*The Ladder of Life* (34) consists of 10 "steps" indicating the best and worst possible quality of life. The individual rates on which of the 10 steps he/she consider him/herself to have been one year ago, where he/she is just now and where he/she expects to be one year from now.

**Statistics**

SPSS 11.0 and 12.1 for Windows was used for the statistical analyses. Descriptive data was determined for baseline characteristics and RTW. The  $\chi^2$  test was used to explore gender differences. Logistic regression was used to evaluate prognostic factors for RTW. Continuous data used in the regression model were dichotomized by the median into high and low score. Hierarchical multiple regression was performed to determine which set of variables explained the main predictor for RTW (fear-avoidance beliefs).

**RESULTS**

Out of 172 invited participants, 135 (78.5%) individuals returned the questionnaires at baseline. The 37 non-participants (Fig. 1) did not differ from the participants regarding gender ( $p=0.64$ ;  $\chi^2$ ), medical diagnosis ( $p=0.24$ ;  $\chi^2$ ), age ( $p=0.498$ ;  $t$ -test), or sick-leave period ( $p=0.405$ ;  $t$ -test).

*Work status and diagnosis at baseline*

All the participants were on sickness leave, with a mean duration of sick-leave of 10.5 months, (SD=2.8) and a range of 0–48 months, before inclusion in the study. About one-third

(34%) ( $n=46$ ) of the participants had been sick-listed more than one year. Sick-leave length distribution was skewed to the left. All participants were diagnosed by their GP according to the International Classification of Primary Care (ICPC) diagnostic system when they were granted their initial sickness certificate. According to the ICPC diagnoses 59 participants (43.7%) were sick-listed for a diagnosis related to musculoskeletal complaints, 44 (31.9%) for psychiatric diagnoses, and 31 (23%) had no specific diagnosis. In Norway the ICPC is the only diagnostic system used within general practice and primary care. More than 50% of the participants were registered with more than one medical diagnosis (ICPC) at baseline, and about half of these participants had more than one diagnosis in 2 different diagnostic groups, i.e. one musculoskeletal diagnosis and one psychiatric diagnosis.

*Occupational and education status at baseline*

Occupational status was distributed equally between the participants: 18% were blue-collar workers ( $n=24$ ), 22% were white-collar workers ( $n=29$ ), 16% worked in school or kindergarten ( $n=22$ ), 26% worked in the healthcare sector ( $n=35$ ) and 16% worked in the service field ( $n=21$ ). Sixty-five percent were full-time workers ( $n=88$ ), 25% worked part-time ( $n=34$ ) and 8% were unemployed ( $n=11$ ). The educational level was, on average, 13.5 years (SD 3.3) with a range of 8–22 years.

*Co-morbidity*

The participants reported, on average, 12 subjective health complaints (SD 4.6) during the last 30 days, with a range of 1–23 complaints (29 possible complaints) (Fig. 2). Fatigue was the most frequently reported complaint, and was reported by 84% of participants, followed by neck pain, headache, sleep problems, and sadness/depression (Table I). Seventy-six percent of participants reported complaints from 2 or several organ systems, i.e. musculoskeletal, pseudoneurological and gastrointestinal complaints.

*Return to work*

After 3 months 60% of the participants had returned to work, and at 12-months follow-up 70% had returned to work (Table II). Type of diagnosis at baseline (musculoskeletal, psychiatric

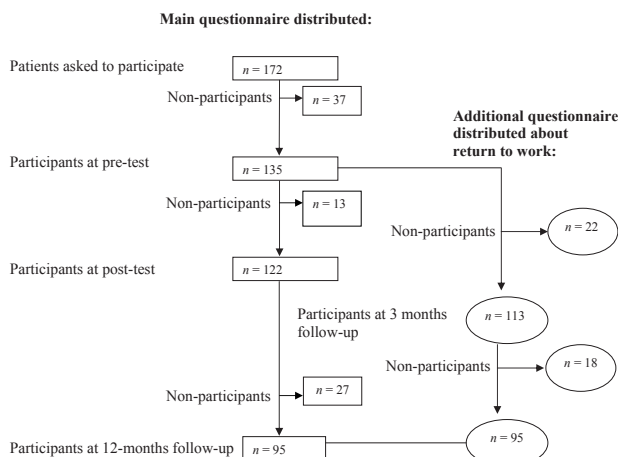


Fig. 1. Study flow-chart.

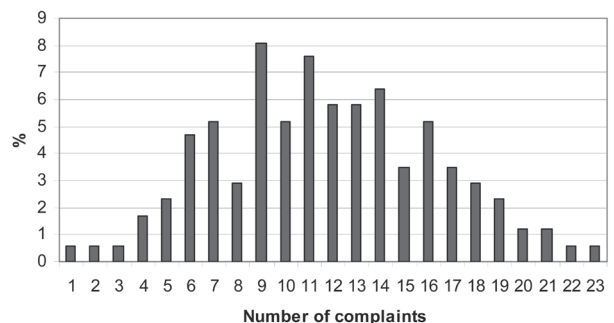


Fig. 2. Percentage distribution of the number of complaints within subjective health complaints.

Table I. Ranked distribution of the 14 most-reported subjective health complaints. Number and percentage. Separate scores for men and women.  $\chi^2$  is calculated for gender differences

Complaint	All	Men	Women	p-value*
	n=135 n (%)	n=48 n (%)	n=87 n (%)	
Fatigue	113 (83.7)	37 (77.1)	76 (87.4)	0.192
Neck pain	110 (81.5)	35 (75.0)	74 (85.1)	0.326
Headache	102 (75.6)	35 (72.9)	67 (77.0)	0.815
Sleep problems	97 (71.9)	31 (64.6)	66 (75.9)	0.232
Sadness/depression	95 (70.4)	26 (54.2)	69 (79.3)	<b>0.007</b>
Low back pain	93 (68.9)	31 (64.6)	62 (71.3)	0.358
Shoulder pain	91 (67.4)	28 (58.3)	63 (72.4)	0.185
Arm pain	77 (57.0)	22 (45.8)	55 (63.2)	0.070
Upper back pain	70 (51.9)	17 (35.4)	53 (60.9)	<b>0.016</b>
Dizziness	58 (43.0)	17 (35.4)	41 (47.1)	0.257
Diarrhoea	58 (43.0)	19 (39.6)	39 (44.8)	0.643
Leg pain during physical activity	54 (40.0)	13 (27.1)	41 (47.1)	0.055
Anxiety	52 (38.5)	13 (27.1)	39 (44.8)	0.051
Gas discomfort	51 (37.8)	15 (31.3)	36 (41.1)	0.034

\*Level of significance based on  $\chi^2$  test.  $p < 0.05$  shown in bold.

or unspecified diagnosis) did not influence RTW after 3 months ( $p = 0.24$ ;  $\chi^2$ ) or after 12 months ( $p = 0.25$ ;  $\chi^2$ ). The length of sick-leave at baseline did not affect RTW at 3 months ( $p = 0.25$ ;  $\chi^2$ ), but those with more than 12 months sick-leave at baseline were less likely to RTW 12 months after the intervention ( $p = 0.007$ ;  $\chi^2$ ).

*Prognostic factors for RTW at 3 months follow-up*

There was an increased risk for not RTW with high score on SHC pseudoneurology, SHC allergy and fear-avoidance beliefs (Table III). Instrumental mastery-oriented coping had a protective effect; the chances of RTW were 5 times higher with high scores on instrumental mastery-oriented coping than with low coping. After adjusting for all factors significant in the first part of the logistic regression analysis, high scores on

Table II. Return to work and sickness absence after 3 months (n = 113) and at 12 months (n = 95) follow-up

	3 months follow-up n (%)	12 months follow-up n (%)
<i>Total return to work-related activity</i>	68 (60.2)	66 (69.5)
Return to ordinary work	44 (38.9)	43 (45.3)
Return with adjusted work tasks	4 (3.5)	4 (4.2)
New work tasks/same employer	5 (4.4)	4 (4.2)
New employer	2 (1.8)	5 (5.3)
“Work-related re-employment”	13 (11.5)	10 (10.5)
<i>Total not return to work-related activity</i>	45 (39.8)	29 (30.5)
“Active sick-leave”/vocational-training	19 (16.8)	8 (8.4)
Not in work at the moment (sickness compensation or without work)	26 (23.0)	21 (22.1)

SHC pseudoneurology, fear-avoidance beliefs for work, and low score on instrumental mastery-oriented coping showed 3 times higher risk for not returning to work.

*Prognostic factors for RTW at 12 months follow-up*

After one year there was an increased risk for not RTW with short education ( $\leq 12$  years) and high score in fear-avoidance beliefs for work (Table IV). Instrumental mastery-oriented coping no longer had any protective effect, but had changed to be a risk factor for not RTW. After adjusting for all factors significant in the first part of the logistic regression analysis, there was still a high risk of not RTW with high scores on fear-avoidance beliefs for work and instrumental mastery-oriented coping. Short education was no longer a risk factor. The large confidence intervals indicate uncertainty concerning the relative risks on fear-avoidance beliefs and instrumental mastery-oriented coping.

*What explains fear-avoidance beliefs for work?*

Together with education, both subjective health complaints and illness perceptions contributed to explaining fear-avoidance beliefs for work (Table V). In a fully adjusted model, a total of

Table III. Odds ratios (OR) (95% confidence interval) for no return to work after 3 months

	OR adjusted for gender and age		OR adjusted for gender, age and significant factors†	
	n=113	p-value	n=98	p-value*
Education	0.9 (0.42–1.99)	0.83		
SHC musculoskeletal	1.2 (0.54–2.71)	0.70		
SHC pseudoneurology	<b>3.5 (1.51–8.02)</b>	<b>0.004</b>	<b>3.3 (1.14–9.60)</b>	<b>0.03</b>
SHC gastrointestinal	1.9 (0.83–4.18)	0.14		
SHC allergy	<b>2.6 (1.12–5.93)</b>	<b>0.03</b>	2.8 (0.98–8.22)	0.053
SHC influenza	1.3 (0.57–2.82)	0.61		
Fear-avoidance beliefs for activity	1.8 (0.80–4.17)	0.16		
Fear-avoidance beliefs for work	<b>2.3 (1.00–5.49)</b>	<b>0.05</b>	<b>3.8 (1.30–11.32)</b>	<b>0.02</b>
“Coping”	1.4 (0.63–3.25)	0.41		
Hopelessness	1.8 (0.79–4.18)	0.21		
Instrumental coping	<b>0.2 (0.08–0.51)</b>	<b>0.001</b>	<b>0.3 (0.10–0.74)</b>	<b>0.01</b>
Emotion-focused coping	1.2 (0.54–2.71)	0.64		
Self-efficacy	0.8 (0.33–1.73)	0.51		

\*Level of significance based on logistic regression analysis.  $p < 0.05$  in bold.

†Adjustment was made for all factors in the model significant in the first part of the analysis.

SHC: subjective health complaints.

Table IV. Odds ratios (OR) (95% confidence interval (95% CI)) for no return to work after 12 months

	OR adjusted for gender and age		OR adjusted for gender, age and significant factors†	
	n=113	p-value	n=98	p-value*
Education	<b>0.2 (0.09–0.64)</b>	<b>0.005</b>	0.4 (0.12–1.12)	0.07
SHC musculoskeletal	1.8 (0.71–4.54)	0.21		
SHC pseudoneurology	0.7 (0.31–1.91)	0.53		
SHC gastrointestinal	1.5 (0.61–3.61)	0.40		
SHC allergy	0.9 (0.40–2.20)	0.80		
SHC influenza	1.2 (0.51–2.98)	0.67		
Fear-avoidance beliefs for activity	1.6 (0.65–4.21)	0.31		
Fear-avoidance beliefs for work	<b>6.9 (2.30–20.91)</b>	<b>0.001</b>	<b>9.5 (2.40–37.53)</b>	0.001
“Coping”	0.9 (0.35–2.30)	0.83		
Hopelessness	1.2 (0.51–3.04)	0.71		
Instrumental coping	<b>3.1 (1.20–8.24)</b>	<b>0.02</b>	<b>5.9 (1.63–21.41)</b>	0.007
Emotion-focused coping	0.6 (0.31–1.60)	0.33		
Self-efficacy	2.1 (0.85–5.24)	0.11		

\*Level of significance based on logistic regression analysis.  $p < 0.05$  in bold.

†Adjustment was made for all factors in the model significant in the first part of the analysis.

SHC: subjective health complaints.

48% of the variance for fear-avoidance for work was explained by these variables. Gender, age, and education explained 18% of the variance. Subjective health complaints explained 19% of the variance, while illness perceptions explained 18%. The coping variables self-efficacy, emotion-focused coping, instrumental mastery-oriented coping, and hopelessness explained only 1% of the variance in fear-avoidance beliefs for work (adjusted  $R^2$  0.556, significant change 0.781).

## DISCUSSION

Fear-avoidance beliefs for work were the main prognostic factor for RTW, both 3 and 12 months after the intervention. Subjective health complaints and low coping were significant risk factors for sick-leave at 3-months follow-up.

At 3-months follow-up, an adjusted model showed 3 times higher risk for not RTW for high scores on subjective health

Table V. Hierarchical multiple regression analysis of subjective health complaints and illness perception with fear-avoidance beliefs for work as dependent variable ( $n = 135$ )

	Step 1		Step 2		Step 3	
	$\beta$ Beta	Significant $p$ -value	$\beta$ Beta	Significant $p$ -value	$\beta$ Beta	Significant $p$ -value
1. Gender	-0.078	0.354	-0.111	0.166	-0.029	0.703
2. Age	-0.198	0.019	-0.154	0.043	-0.139	0.051
3. Education	-0.365	0.000	-0.286	0.000	-0.183	0.015
4. SHC musculoskeletal*			0.482	0.000	0.397	0.000
5. SHC pseudoneurology*			-0.198	0.033	-0.258	0.008
6. SHC gastrointestinal*			-0.061	0.455	0.014	0.859
7. SHC allergy*			-0.035	0.707	-0.055	0.507
8. SHC influenza*			-0.034	0.667	-0.038	0.593
9. Identity†					-0.122	0.232
10. Timeline acute/chronic†					0.200	0.031
11. Timeline cyclical†					-0.033	0.643
12. Consequences†					0.284	0.001
13. Personal control†					-0.226	0.006
14. Cure control†					0.109	0.262
15. Illness coherence†					0.134	0.082
16. Emotional representations†					0.077	0.350
$R^2$	0.177		0.369		0.545	
Adjusted $R^2$	0.156		0.325		0.477	
$R^2$ change	0.177		0.192		0.176	
Significant change (F)	$p < 0.001$		$p < 0.001$		$p < 0.001$	

\*High score is many reported subjective health complaints.

†High score is many symptoms associated with the complaint, perceptions of long duration, perceptions of cyclical/episodic duration, beliefs of illness severity and consequences, beliefs of personal control, beliefs of treatment control, good illness coherence and many emotional representations.

SHC: subjective health complaints.



complaints (SHC pseudoneurology), fear-avoidance beliefs for work, and low coping. At 12-months follow-up, the adjusted model showed 9 times higher risk for not RTW with high scores on fear-avoidance beliefs for work. Subjective health complaints did not predict RTW after 12 months. Coping shifted from being a protective factor 3 months after the intervention, to a strong risk factor for not RTW after 12 months. Instrumental mastery-oriented coping may be used as a measure of a general positive response outcome expectancy (9, 10), i.e. a belief that "my strategies will yield a good result". The goal of the rehabilitation programme was RTW.

The participants may therefore have believed that RTW was a good solution to their health and work situation at 3-months follow-up. At 12-months follow-up some participants may have experienced that the daily hassles and demands at home and work were an obstacle to RTW. When RTW is the goal, but is not reached, a coping individual has, according to the cognitive activation theory of stress (9, 10), 2 options; one is to try harder to reach the goal the other is to change the goal. The coping participant who has not returned to work 12 months after the intervention may now consider further sick-leave to be a positive solution to health problems and difficult work situations. The patient is coping, but at a high cost. We know that patients have strong influence on whether their physician grants them a sick-leave certificate and that the decision hinges on factors such as the patients needs, expectations and demands (35). This shift in coping as a predictor may have consequences for the way we treat and follow-up patients after rehabilitation.

Fear-avoidance beliefs for work explained RTW in this study. The result is in accordance with previous findings on the development of chronic conditions and the level of functional ability among patients with low back pain (21). Fear-avoidance itself was explained by a combination of subjective health complaints, illness perceptions and education (48% of the variance). This agrees with findings that pain, illness perceptions, expectancy, and pain-related fear are strongly inter-related in patients with back pain and have a predictive value for future pain and disability (13). Other studies have also identified low education as an independent predictor of long-term absence (36) and disability (37). High levels of education may be associated with the resources and motivation to do something with one's own health and work situation, and may be related to the general socioeconomic gradients for health (38). This group may also be characterized by mobility and good employment opportunities. Coping, the expectancy to be able to handle challenging situations, explained only 1% of the variance in fear-avoidance beliefs. This is surprising, since expectations of outcome are essential within coping and stress theory (9), and in psychosocial theories where expectations are significant (13, 14). It appears that, in our data where all the patients have participated in a rehabilitation programme, illness perceptions, education, and the level of subjective health complaints are the main links between fear-avoidance beliefs and RTW.

After 3 months, 60% of participants had returned to work, and at 12-months follow-up 70% had returned. This appears

to be a very good result, but the lack of any control group in this study does not allow any conclusions to be drawn about the effect of the intervention.

There are several possible shortcomings to this study. Self-rating of both the dependent and independent variables may inflate the risk estimates. Rather large confidence intervals for significant predictive variables may be explained by a large range between the lowest and highest score and may limit the strength of the conclusion. Possible inter-correlations between the standardized instruments may also bias the results. On the other hand, inter-correlations between the instruments may be a strength, since it is obvious that no single item alone predicts or explains RTW in sick-listed individuals with complex conditions. The response rate tends to decrease in long-term follow-up studies, as is the case here.

This study confirms that long-term sick-listed individuals are a complex patient group reporting a broad spectrum of different health complaints, and a high level of co-morbidity. High levels of co-morbidity are also found in long-term patients with low back pain (5) and patients with "functional" gastrointestinal problems (39, 40). There is, therefore, reason to question whether a single medical diagnosis reflects the complex situation for these long-term sick-listed individuals. In our study the diagnosis did not influence RTW. The important factors appear to be complex and non-specific subjective health complaints, and this terminology may therefore be better than "unspecific medical diagnosis".

In conclusion, it is likely that, to be successful, interventions for long-term sick-listed individuals with complex health conditions should be directed at fear-avoidance beliefs, since this was the main prognostic factor for not RTW. Our findings also indicate that interventions should target illness perceptions about subjective health complaints. Directing rehabilitation programmes to overcome biopsychosocial obstacles to RTW may be fundamental to better clinical and occupational management and minimizing incapacity (3). There is a need for studies that further examine these complex issues in rehabilitation and clinical practice.

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RESEARCH ARTICLE

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# Subjective health complaints, functional ability, fear avoidance beliefs, and days on sickness benefits after work rehabilitation – a mediation model

Irene Øyeflaten<sup>1,2\*</sup>, Jon Opsahl<sup>2</sup>, Hege R. Eriksen<sup>2,3</sup>, Tore Norendal Braathen<sup>1,4</sup>, Stein Atle Lie<sup>5</sup>, Søren Brage<sup>6</sup>, Camilla M. Ihlebæk<sup>7</sup> and Kyrre Breivik<sup>2</sup>

## Abstract

**Background:** Long-term sick leave and withdrawal from working life is a concern in western countries. In Norway, comprehensive inpatient work rehabilitation may be offered to sick listed individuals at risk of long-term absence from work. Knowledge about prognostic factors for work outcomes after long-term sick leave and work rehabilitation is still limited. The aim of this study was to test a mediation model for various hypothesized biopsychosocial predictors of continued sick leave after inpatient work rehabilitation.

**Methods:** One thousand one hundred fifty-five participants on long-term sick leave from eight different work rehabilitation clinics answered comprehensive questionnaires at arrival to the clinic, and were followed with official register data on sickness benefits for 3 years. Structural equation models were conducted, with days on sickness benefits after work rehabilitation as the outcome.

**Results:** Fear avoidance beliefs for work mediated the relation between both musculoskeletal complaints and education on days on sickness benefits after work rehabilitation. The relation between musculoskeletal complaints and fear avoidance beliefs for work was furthermore fully mediated by poor physical function. Previous sick leave had a strong independent effect on continued sick leave after work rehabilitation. Fear avoidance beliefs for work did not mediate the small effect of pseudoneurological complaints on continued sick leave. Poor coping/interaction ability was neither related to continued sick leave nor fear avoidance beliefs for work.

**Conclusions:** The mediation model was partly supported by the data, and provides some possible new insight into how fear avoidance beliefs for work and functional ability may intervene with subjective health complaints and days on sickness benefits after work rehabilitation.

**Keywords:** Sickness absence, Sick leave, Functional ability, Subjective health complaints, Musculoskeletal diseases, Mental disorders, Fear avoidance beliefs, Rehabilitation, Prognostic factors, Return to work

\* Correspondence: irene.oyeflaten@air.no

<sup>1</sup>National Centre for Occupational Rehabilitation, Haddlandsvegen 20, NO-3864 Rauland, Norway

<sup>2</sup>Uni Research Health, Bergen, Norway

Full list of author information is available at the end of the article



## Background

The prevalence of long-term sick leave and disability pension is undesirably high in many industrialized countries [1]. To address some of these challenges, the Norwegian health service offers comprehensive inpatient work rehabilitation (WR) to individuals on long-term sick leave. The goal of WR is to assist individuals back to work through comprehensive programs where physical activity, cognitive behavioral modification, and cooperation with involved stakeholders are important elements. This is done within the frame of an interdisciplinary biopsychosocial rehabilitation model [2–4].

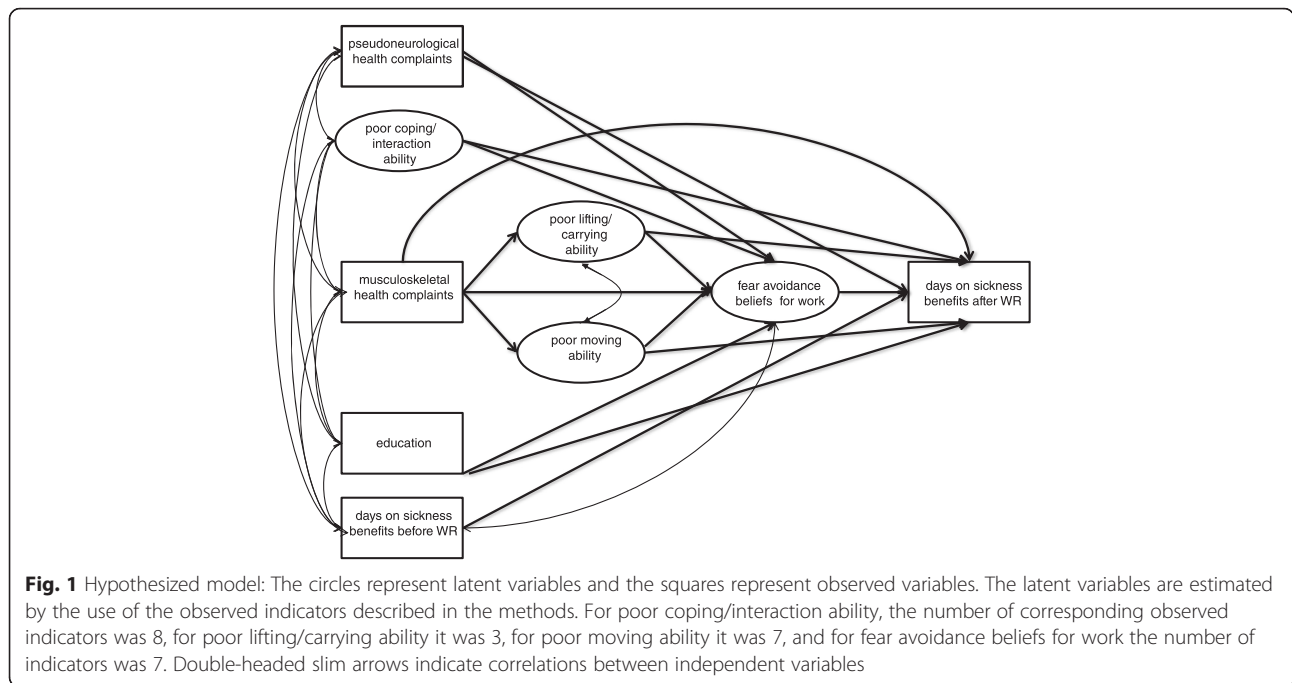
There are large individual differences in the process of returning to work (RTW) after long-term sick leave [5–7]. Previous research suggests that this process may be influenced by multifaceted biopsychosocial factors [8, 9]. In Norway, the most common diagnoses related to long-term sick leave and disability pension are musculoskeletal complaints and mild or moderate mental health problems [10]. These are typically non-specific complaints, often with few biomedical findings and with a high rate of co-morbidity with other subjective health complaints [11–14]. The majority of sick leave episodes related to musculoskeletal and mental complaints are based on the patients' subjective reports of pain and discomfort [15, 16]. Subjective health complaints have been suggested as a neutral term for these complaints [11, 17]. Common mental disorders, such as anxiety and depression, predict longer duration and higher recurrence of sick leave [18]. Multiple pain sites [19], higher levels of pain and discomfort, and more severe conditions have a negative effect on RTW and work disability [20, 21]. In addition to health complaints, a range of other factors has been found to predict non-RTW and disability after long-term sick leave. These factors include functional ability [22], beliefs and expectations about recovery and RTW [23], length of previous sick leave [7, 9, 14, 24], socioeconomic status [7, 8, 14, 25], and physical and psychosocial work factors [8, 20, 25]. With the exception of these findings, knowledge about predictive factors for continued sick leave after WR is limited, and there has recently been made a call for more refined research exploring indirect relationships between various psychosocial predictors of RTW [26].

Fear avoidance beliefs are found to be a strong predictor for non-RTW among individuals with non-specific low back pain (LBP) [27–29]. However, relatively few studies have examined the predictive value solely of fear avoidance beliefs for work (FABW) on RTW. Due to the high rates of co-morbidity with other musculoskeletal and mental health complaints, it is reasonable to assume that the cognitive and behavioral predictors for RTW in individuals with LBP are applicable to other musculoskeletal conditions and to common mental

health complaints [29]. We have earlier, in a similar Norwegian sample, shown that FABW were the strongest predictor for non-RTW at 3 and 12 months follow-up of WR participants [14]. The assessment of fear avoidance beliefs was originally based on a biopsychosocial model [30]. Fear avoidance beliefs are mediators between pain and avoidance behavior, such as sick leave and withdrawal from working life [31, 32]. Pain and avoidance behavior is determined by psychological processes in experience and interpretation of pain and discomfort [33, 34], and comprises sensory as well as cognitive, affective, behavioral, and social aspects [30, 35]. The meaning of pain to the individual depends on how the pain stimulus is evaluated, the expected outcome, based on previous experiences, and whether the individual expects to cope with the pain or not [36]. The Cognitive activation theory of stress (CATS) postulates that learned stimulus and response outcome expectancies determine psychobiological responses [36]. Individuals expecting to cope with a specific situation have established positive response outcome expectancy, while individuals who do not expect to cope may have negative response outcome expectancies (hopelessness) or no response outcome expectancies (helplessness) [36]. In the current study we propose and test five paths, and hypothesize that FABW will mediate the effects of subjective health complaints (musculoskeletal and pseudoneurological complaints), functional ability (poor coping/interaction ability, poor lifting/carrying ability and poor moving ability), and education on days on sickness benefits after WR (Fig. 1). We also hypothesized that high levels of earlier sick leave will lead to high levels after the intervention.

### Path 1

The path from musculoskeletal complaints via FABW to days on sickness benefits after WR (Fig. 1) is supported by previous research [27–29]. We hypothesize that the relation between musculoskeletal complaints and FABW can be explained by lowered physical function (moving ability and lifting/carrying ability) (Fig. 1). Some studies have found a negative relationship between musculoskeletal complaints and work-related functional abilities [37, 38], e.g. individuals on sick leave with musculoskeletal diagnoses report loss of physical function [37, 39]. However, how health complaints affect function in daily life and work depend on both individual and contextual factors [2, 40]. If an employee experiences pain and functional problems at the workplace while performing specific work tasks, he or she may avoid these tasks or avoid going to work at all. Avoiding the work tasks or the workplace can in certain cases be protective, and the employee learns that avoidance behavior is beneficial [32, 41]. Associative learning mechanisms can cause persistent workplace avoidance for a long time, even when



there is no longer any risk of harm [41]. High levels of FABW may therefore lead to sustained avoidance behavior, and may be dysfunctional over time. We propose that the path from poor physical function to FABW goes from negative experiences to learned workplace avoidance, which in turn lead to negative response outcome expectancies towards going back to work.

**Path 2 and 3**

The path from pseudoneurological complaints (i.e. tiredness, sadness/depression, anxiety) to FABW (Fig. 1) has previously been supported [14, 42, 43]. There is a strong association between psychological distress, such as depression and anxiety, and FABW, in individuals on sick leave with neck and back pain [42, 43]. Among WR participants, high level of pseudoneurological complaints explained a significant part of the variance in FABW [14]. Individuals on sick leave with common mental health disorders will typically report poor mental functioning often related to coping and interaction ability [37, 38]. Poor physical and mental functioning has been shown to be strongly associated with not returning to work 3 years after WR [44]. In the paths from pseudoneurological complaints and poor coping/interaction ability to continued sick leave, previously established negative response outcome expectancies may act as mediators in terms of FABW. They mediate between the stimulus, such as perceived psychosocial stress at the workplace, and the avoidance behavior e.g. not going to work [45].

**Path 4**

We hypothesize that FABW will mediate, at least, some of the effect of level of education on non-RTW after WR. FABW are negatively correlated with education [46]. Education is often used as a proxy for socioeconomic status [47, 48], and is highly interrelated with occupational class and type of work [49, 50]. The level of education is strongly related to long-term sick leave [51] and non-RTW after WR [9, 14]. Individuals with lower education more often have physically demanding work with less control and decision latitude [48, 51]. Lower education is also associated with less psychosocial resources [52, 53], skills, and qualifications [54]. A discrepancy between work demands and available resources may lead to an enhanced stress response and to a feeling of helplessness and hopelessness, with biological and behavioral consequences [52, 53]. Loss of capacity to cope at work is therefore believed to trigger more fear and work avoidance behavior among individuals with low education.

**Path 5**

Previous sick leave is a strong predictor of long-term sick leave and disability pension [7, 9, 14, 24]. One might hypothesize that FABW will mediate the effect of previous sick leave on RTW. However, there are to our knowledge, no current studies supporting a possible indirect effect of previous sick leave via FABW. Therefore, previous sick leave is included as an independent variable in the model, hypothesized to have a direct effect on days on sick leave during follow-up (Fig. 1).

The aim of the present paper was to test a mediation model for continued sick leave where we hypothesized that FABW would be an important mediator between known biopsychosocial predictors and the number of days on sickness benefits after WR. The model was tested using structural equation modeling (SEM) [55].

**Methods**

**Participants**

This was a prospective cohort study with 1155 participants (69 % women) from eight different inpatient WR clinics in Norway (Study flowchart, Fig. 2). The participants were recruited between April 2007 and Mars 2009. Baseline characteristics are shown in Table 1.

**Procedure**

At arrival to the WR clinic, all patients were gathered to an information meeting. Oral and written information was given according to the Declaration of Helsinki, with information about study aims and procedures, and assurance that withdrawal was possible at any time without any consequences for the treatment. All participants who returned a written informed consent and who answered a comprehensive questionnaire were included in the study. There were no further exclusion criteria. The participants were followed with register data for 3 years and 4 months (1217 days). The follow-up data on sickness benefits were obtained from official registers from The Norwegian Labour and Welfare Administration (NAV) in July 2012. The study fulfilled the principles in the Declaration of Helsinki, and was approved by the Medical Ethics Committee; Region West in Norway (REK-vest ID 3.2007.178) and the Norwegian social science data services (NSD, ID 16139).

**Work rehabilitation**

All the participants completed inpatient WR programs administrated within the specialized health care in Norway. Patients were admitted to WR mainly based on referrals from their general practitioners. Target groups

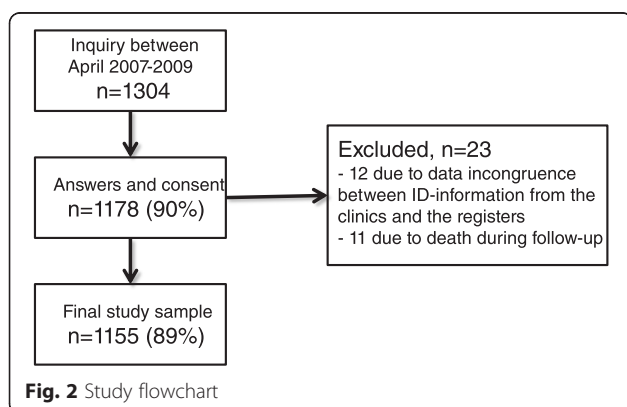
of the rehabilitation programs were individuals on long-term sick leave, typically with diagnoses related to musculoskeletal and/or mental health complaints. The goal of the WR programs was to improve the level of functioning, enhance work ability, and increase the likelihood of RTW. The content of the WR programs were similar, but the length of the programs varied from 3 to 6 weeks with a mean length of 31 days (SD = 11). The programs were run by interdisciplinary rehabilitation teams, constituted by at least four of the following professions; physicians, work consultants, nurses, physiotherapists, sport pedagogues, and occupational therapists. The content of the programs included a combination of individual and group based interventions with physical activity, education, cognitive behavioral modification, and cooperation with relevant stakeholders. One clinic offered work training in different manual workshops, amounting to one third of the rehabilitation program. At the end of the WR program, a follow-up plan was developed together with the participant, with RTW as the main goal. This plan could include future participation from several stakeholders outside the WR setting, e.g. different health care providers, the workplace, or the local social insurance office.

**The Norwegian sickness insurance system**

An employee is entitled to sickness benefits (sick leave benefit, work assessment allowance, or disability benefit) from NAV if incapable of working due to disease or injury. From the first day of reporting sick and up to 1 year, an employee is entitled to a sick leave benefit equal to 100 % of their regular salary in compensation from the first day of reported sick. The sick leave benefit can be partial and graded from 20 to 99 %. If the employee does not return to work after 1 year, the employee may receive a work assessment allowance (WAA), which has an upper limit of 4 years. A WAA is granted for individuals going through medical treatment or rehabilitation, or individuals that might benefit from vocational rehabilitation actions to RTW. If the employee does not return to work after fulfilled WAA, a disability pension (DP) may be granted to individuals with permanent incapacity for work, defined as having work ability reduced by at least 50 %. As a main rule, WAA and DP constitute 66 % of the salary the last year as an employee.

**Measures and instruments**

All the predictor variables; education, days on previous sickness benefits, health complaints, functional ability, and fear avoidance beliefs for work, were measured at baseline. Days on sickness benefits before and after WR were obtained from official registers from NAV, and were adjusted for receiving partial benefits. Partial benefits were adjusted so that 50 % sick leave was registered



**Table 1** Baseline characteristics, means and standard deviation (SD). Women and men reported separately

	(n = 1155) [missing %]	Mean (SD) women (n = 806)	Men (n = 349)	p-value <sup>#</sup>
Age	46 (9.1) [0 %]	47 (8.9)	45 (9.4)	0.002*
Education	13 (2.9) [7.5 %]	13 (2.9)	12 (2.8)	<0.001**
Days on sickness benefits before WR	297 (189) [0 %]	292 (184)	307 (201)	0.234
Days on sickness benefits after WR	595 (424) [0 %]	590 (422)	607 (428)	0.536
Musculoskeletal complaints	9.5 (5.1) [1.3 %]	10.0 (5.0)	8.3 (4.6)	<0.001**
Pseudoneurological complaints	6.2 (3.9) [1.3 %]	6.60 (3.8)	5.3 (3.9)	<0.001**
Fear avoidance beliefs for work	23.1 (11.4) [7.8 %]	21.9 (11.5)	26.1 (10.8)	<0.001**
Moving ability	1.5 (0.5) [0.2 %]	1.5 (0.5)	1.7 (0.5)	<0.001**
Lifting/carrying ability	1.6 (0.6) [0.4]	1.6 (0.6)	1.6 (0.6)	0.392
Coping/interaction ability	1.7 (0.5) [0.8 %]	1.7 (0.5)	1.6 (0.5)	0.055

<sup>#</sup>Independent samples T-tests, \*\* $p < 0.001$ , \* $p < 0.01$

as half a working day. Overlap between start and end date for the registered sickness benefits could occur in the registers when the person moved from one type of benefit to another. To avoid double counting, we let the new benefit replace the old.

#### Outcome measure

Continued sick leave was measured as the total number of days on registered sickness benefits during the follow-up period of 3 years and 4 months.

#### Predictor variables

- Education was measured by a single question about total completed years of schooling/studies, counted from the first year of primary/elementary school.
- Previous sick leave was measured as the total days on registered sickness benefits during the last 2 years before entry to the WR program, prior to entering the study.

#### The subjective health complaints (SHC) inventory [11]

Two subscales from the SHC-Inventory measured musculoskeletal and pseudoneurological complaints. These two scales were utilized as they represent the most common complaints among musculoskeletal and mental complaints, causing sick leave [16]. Intensity of each complaint is scored on a four-point scale from 0–3, where 0 is no complaints and three is severe complaints. Predictive validity of the subscales has previously been reported [11, 56].

- 1) “*Musculoskeletal complaints*”, 8 items, (shoulder pain, neck pain, upper back pain, arm pain, headache, low back pain, leg pain during physical activity, migraine).
- 2) “*Pseudoneurological complaints*”, 7 items, (tiredness, anxiety, sleep problems, sadness/depression, dizziness, heat flushes, extra heartbeats).

#### The Norwegian Function Assessment Scale (NFAS) [37, 38]

Physical and mental function during the last week were measured with the NFAS, rated on a four-point scale from 1–4, where one is no functional limitations and four is cannot perform [37, 38]. The original scale consists of 39 items and seven domains, and has been shown to be a valid instrument for evaluation of work-related function in a previous Norwegian study [37]. Three new subscales derived from the NFAS were used, measuring physical function and coping/interaction ability. The new scale consists of 18 items and three factors (see statistical methods).

- 1) “*Moving ability*”, 7 items,  $\alpha = 0.83$  (standing, walking more than a km on flat ground, walking on different surfaces, putting on your shoes and socks, dressing and undressing, cleaning your house, sitting on a kitchen chair).
- 2) “*Lifting/carrying ability*”, 3 items,  $\alpha = 0.75$  (carrying shopping bags in your hands, carrying a little sack/backpack on your shoulders or back, pushing and pulling with your arms).
- 3) “*Coping/interaction ability*”, 8 items,  $\alpha = 0.79$  (staying alert and being able to concentrate, working in groups, guiding others in their activities, managing everyday responsibility, managing everyday stress and strains, managing to take criticism, managing to control your anger and aggression, remembering things).

#### The Fear Avoidance Beliefs Questionnaire (FABQ) [30]

FABW were measured using the FABQ-Work subscale from the FABQ. Each item is rated on a seven-point Likert scale ranging from 0–6, where 0 is completely disagree and 6 is completely agree. Good reliability and construct validity have been reported [30, 57].

“*Fear avoidance beliefs for work*”, 7 items,  $\alpha = 0.87$  (My pain was caused by my work or by an accident at work.

My work aggravated my pain. My work is too heavy for me. My work makes or would make my pain worse. My work might harm me. I should not do my normal work with my present pain. I do not think I will be back to my normal work within 3 months).

The questionnaire was slightly modified to concern individuals with pain in general, and not only back pain. Introductorily one question was added, asking whether the respondents were bothered with pain or not, and it was followed by a multiple response question on pain location (back, shoulder/arm, neck, leg/feet, head, chest or other).

### Statistical methods

Baseline characteristics were examined using SPSS statistics version 21 for Windows. Differences in socio demographic and questionnaire data between genders were examined by Chi square tests ( $\chi^2$ ) in non-parametric data, and independent samples t-tests in parametric data.

### Data handling

Performing a confirmatory factor analysis (CFA) of the original scale of NFAS [37, 38] did not confirm the original factor structure of seven domains. Therefore an exploratory factor analysis (EFA) was performed, using the robust-weighted least square estimator (WLSMV) and geomin oblique rotation. The EFA was conducted in Mplus, allowing for categorical items. The EFA revealed the presence of three factors. Twenty-one items were removed from the three factors to create meaningful entities and to avoid cross loadings. The subsequent EFA on the remaining 18 items supported the structure of the same three factors. Chronbach's alpha ( $\alpha$ ) was used to determine the internal consistency of the three subscales based on the derived factors: 1) "Moving ability", 7 items,  $\alpha = 0.83$ . 2) "Lifting/carrying ability", 3 items,  $\alpha = 0.75$ . 3) "Coping/interaction ability", 8 items,  $\alpha = 0.79$ .

### Structural equation modeling

The hypothesized model was tested using structural equation modeling (SEM) [55]. SEM is a multivariate technique, which combines path analysis and measurement (factor) models [55]. SEM may combine observed and latent variables, and is a confirmatory technique where SEM is used to determine if the a priori model is supported by the data [55]. The SEM analyses were performed with Mplus version 7.00 program package [58] using the robust-weighted least square estimator (WLSMV). The WLSMV estimator was used because all of the indicators of the latent variables were treated as ordinal. WLSMV uses polychoric correlations for estimation, seems relatively robust to violations of normality [59, 60], and provides consistent estimates when missing

data are random with respect to the covariates in the model [61]. The Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) were used to assess model fit as recommended by Brown [60]. A CFI between 0.90 and 0.95 indicates a fair model fit, with values above 0.95 to be a good fit, and a RMSEA less than 0.08 indicates a fair model fit, with values below 0.05 to be a good fit, between the measurement model and the observed data [60].

The structural measurement model was estimated with number of days on sickness benefits after WR as an observed dependent variable. Education and number of previous days on sickness benefits were treated as observed variables as they were both based on a single item. Musculoskeletal complaints and pseudoneurological complaints were also treated as observed variables, because their associated items were considered as formative/causal indicators and not as reflective of a common factor [55]. FABW and the three subscales of functional ability; coping/interaction ability, lifting/carrying ability, and moving ability, were treated as latent variables in the model as their associated items were assumed to be caused by underlying common factors [55].

The hypothesized SEM model (Fig. 1) was tested by the use of a two-step modeling approach [55]. In the first step, we tested the adequacy of the measurement models. The hypothesized three-factor model derived from the NFAS (moving ability, lifting/carrying ability, and coping/interaction ability) and the hypothesized unidimensional FABW model were tested separately. To identify sources of misfit in potentially inadequately fitting measurement models, modification indices were inspected [62]. In the second step the adequacy of the full structural regression model was tested, and the significance of indirect effects was tested by the use of the Sobel (delta) method [58].

Multiple group analyses [62, 63] were used to test whether the model was invariant across gender. When testing whether the measurement model was invariant across gender, each latent construct was tested separately. In these analyses a top down strategy was applied [58] where the fit of a model of which the loadings and thresholds were held equal between genders was compared to a model of which the same parameters (except for the identification item) were free to vary. The model was assumed non-invariant if the change in chi square was significant (tested by DIFFTEST in Mplus) and the decrease in CFI was less than 0.002 [55, 64]. Only the DIFFTEST procedure was used to test whether the paths and correlations in the structural model were invariant across gender. In the final multiple group analysis the paths that were significantly different between men and women were estimated freely, while the non-significant paths were set equal between men and women. Direct



and indirect effects were estimated as indicated in Fig. 3. Standardized estimates and p-values were reported.

**Results**

All participants were either on partial or fulltime sickness benefits when they were admitted to the WR program. Mean time on sickness benefits during the last 2 years before admittance to the WR program, were 10 months (SD = 6.7). Baseline characteristics are shown in Table 1.

**Descriptive statistics**

During the follow-up period, the participants received sickness benefits for an average of 595 (SD = 424) days. There were no significant gender differences in days on sickness benefits before or after the WR program (Table 1). Significant gender differences were found for age, education, SHC, FABW, and functional ability. Men were significantly younger, reported fewer years of education, less severe SHC, higher levels of FABW, and poorer moving ability. Women reported poorer coping/interaction ability (Table 1). On the modified version of the FABQ, 95 % of the women and 91 % of the men reported having pain, and a majority reported several pain sites. In terms of pain location, a statistically significant higher proportion of the women reported pain in shoulder/arm, neck, head, and other pain sites (Chi-square test, all  $p < 0.001$ ).

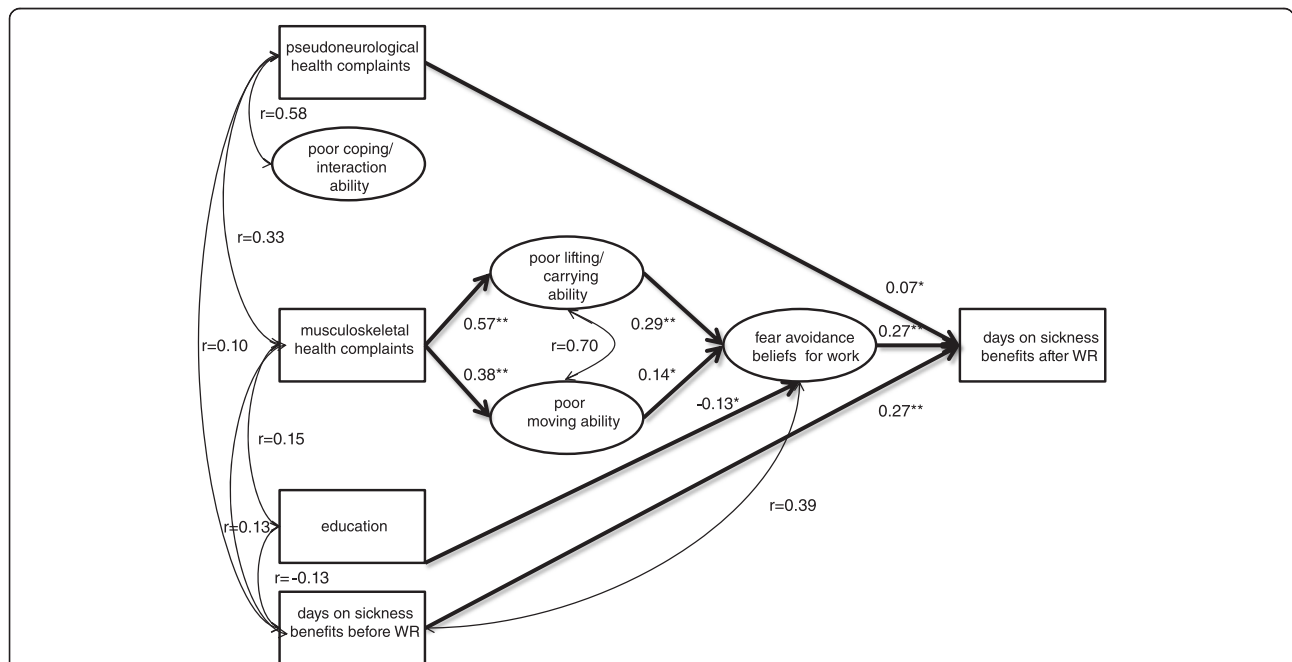
**Correlations**

Correlations based on the sum scores of the different scales are shown in Table 2. The correlations between the observed variables were of small to moderate magnitude and most were as expected by our model. Days on sickness benefits after WR were significantly correlated with all the included variables in the expected direction (range  $r = -0.12-0.39$ ). The correlation between days on sickness benefits after WR was most pronounced with FABW ( $r = 0.38$ ) and previous days on sickness benefits ( $r = 0.39$ ). Given the prominent place of FABW in our model, it was not surprising that it was significantly correlated with most of the other variables. It was surprising, however, that FABW was neither significantly correlated with pseudoneurological complaints ( $r = 0.04$ ,  $p > 0.05$ ) nor with coping/interaction ability ( $r = 0.02$ ,  $p > 0.05$ ).

**SEM analyses**

**Gender differences**

Preliminary multigroup analyses on all the included models showed some gender differences in the structural parameters. When testing for measurement invariance across gender for each latent construct separately, the analyses revealed strong measurement invariance for coping/interaction ability and lifting/carrying ability, and partial measurement invariance for FABW and moving ability. More specifically, given equal trait levels of FABW across gender, men had a higher score on the



**Fig. 3** Parameter estimates for the final model. The circles represent latent variables. The squares represent observed variables. Double-headed slim arrows indicate correlations between independent variables. Non-significant paths/correlations are not shown. Model fit: ( $\chi^2 [370] = 1409,335$ ,  $p < 0.001$ , CFI = 0.957, RMSEA = 0.049 (90 % CI: 0.046–0.052)  $^{**}p < 0.001$ ,  $^*p < 0.05$

**Table 2** Correlations between days on sickness benefits before WR, education, subjective health complaints, functional ability, fear avoidance beliefs for work and days on sickness benefits after WR

	1	2	3	4	5	6	7	8
1 Days on sickness benefits before WR	-							
2 Education	-0.13**							
3 Musculoskeletal complaints	0.13**	-0.15**						
4 Pseudoneurological complaints	0.10**	0.13**	0.33**					
5 Moving ability	0.19**	-0.25**	0.41**	0.03				
6 Coping/interaction ability	0.10*	0.12**	0.13**	0.58**	0.04			
7 Lifting/carrying ability	0.22**	-0.24**	0.57**	0.15**	0.70**	0.15**		
8 Fear avoidance beliefs for work	0.33**	-0.25**	0.29**	0.03	0.40**	0.02	0.45**	
9 Days on sickness benefits after WR	0.39**	-0.12**	0.15**	0.13**	0.22**	0.13**	0.23**	0.38**

\*\* $p < 0.001$ , \* $p < 0.01$

following items: “My pain was caused by my work or by an accident at work”, “My work might harm me”, and “I should not do my normal work with my present pain”. Women were more likely to report that they had more problems “cleaning your house” than men with an equal level of moving ability. Multigroup analyses on the full structural model furthermore revealed that education was significantly correlated only with pseudoneurological complaints ( $r = 0.31$  vs.  $r = 0.03$ ) and coping/interaction ( $r = 0.26$  vs.  $r = 0.05$ ) amongst men. Most importantly however, no significant differences were found between genders on the structural paths in the full model. Men and women were therefore treated as one group in the following analyses and results presented.

**Step 1: CFA measurement models**

Neither the hypothesized three-factor model derived from the NFAS ( $\chi^2 [132] = 1232.962$ ,  $p < 0.001$ , CFI = 0.926, RMSEA = 0.085, 90 % CI for RMSEA = 0.081–0.089) nor the hypothesized unidimensional FABW model ( $\chi^2 [14] = 260.797$ ,  $p < 0.001$ , CFI = 0.978, RMSEA = 0.128, 90 % CI for RMSEA = 0.115–0.142) had an adequate fit to the data. For functional ability, the three-factor solution had an acceptable fit ( $\chi^2 [130] = 755.998$ ,  $p < 0.001$ , CFI = 0.958, RMSEA = 0.065, 90 % CI for RMSEA = 0.060–0.069) when allowing local dependencies (correlated error terms) between the items “putting on your shoes and socks” and “dressing and undressing” ( $r = 0.74$ ), and between the items “walking more than a km on flat ground” and “walking on different surfaces” ( $r = 0.67$ ). Both of these local dependencies were located on the moving factor. For FABW, the model fit indices for a one-factor solution was acceptable ( $\chi^2 [11] = 62.381$ ,  $p < 0.001$ , CFI = 0.995, RMSEA = 0.066, 90 % CI for RMSEA = 0.051–0.082), after allowing local dependencies between: “I do not think I will be back to my normal work within 3 months” and “I should not do my normal work with my present pain” ( $r = 0.30$ ), “My work

makes or would make my pain worse” and “My work aggravated my pain” ( $r = 0.42$ ), and “My work aggravated my pain” and “My pain was caused by my work or by an accident at work” ( $r = 0.30$ ). Even if the hypothesized measurement models had to be modified somewhat, it can be argued that the results supported the construct validity of the latent constructs as all the items had rather high loadings on their respective latent variables (standardized loadings for moving ability ranged between 0.66 and 0.81; FABW ranged between 0.54 and 0.88) which supports that these constructs are essentially unidimensional despite some local dependencies.

**Step 2: The full structural model**

The full structural model had a good fit to the data ( $\chi^2 [370] = 1409.335$ ,  $p < 0.001$ , CFI = 0.957, RMSEA = 0.049, 90 % CI for RMSEA = 0.046–0.052). The analyses supported the hypothesized important role of both FABW (Standardized Beta = 0.27,  $p < 0.001$ ) and days on sickness benefits before WR (Standardized Beta = 0.27,  $p < 0.001$ ) in predicting days on sickness benefits after WR (Fig. 3). Also as hypothesized, FABW mediated the paths between both education (Standardized Beta for indirect effect = -0.034,  $p < 0.01$ ) and musculoskeletal complaints on days on sickness benefits after WR. As predicted the latter mediation effect went via two different routes. One of the indirect effects went from musculoskeletal complaints to days on sickness benefits after WR via lifting/carrying ability (Standardized Beta for indirect effect = 0.045,  $p < 0.001$ ). The other indirect effect went via moving ability (Standardized Beta for indirect effect = 0.015,  $p < 0.05$ ) prior to going via FABW (Fig. 3). The indirect effects from both poor lifting/carrying ability (Standardized Beta for indirect effect = 0.08,  $p < 0.001$ ) and poor moving ability (Standardized Beta for indirect effect = 0.039,  $p < 0.05$ ) via FABW were significant. Poor coping/interaction ability did not have a direct or an indirect effect on days on sickness benefits after WR.

Pseudoneurological complaints had only a very weak direct effect (Standardized Beta = 0.07,  $p < 0.05$ ) on days on sickness benefits after WR.

## Discussion

The results partly supported our main hypothesis, which stated that FABW are an important mediator between the predictors; health complaints, functional ability, and socioeconomic status, and the outcome; continued sickness benefits 3 years after WR. FABW seem to mediate the effect of physical function and level of education on days on sickness benefits after WR. Also, as hypothesized, musculoskeletal complaints had an indirect effect on continued sick leave via physical function and via FABW. The present analyses did not support the hypothesis that pseudoneurological complaints or poor coping/interaction ability lead to continued sick leave after WR via FABW. Whereas pseudoneurological complaints only had a small direct effect on days on sickness benefits after WR, poor coping/interaction ability did not predict either FABW or days on sickness benefits after WR. There were no gender differences in the mediation model, indicating that the factors involved in the process of RTW after long-term sick leave and WR may be equal for men and women.

A key message from this study is that FABW are a mediator between various predictors and continued sickness benefits after WR in individuals with long-lasting musculoskeletal complaints and multiple pain sites. Most of the studies showing that cognitions and beliefs predict work outcomes have been on individuals with LBP [29], but results are weak and inconsistent for fear avoidance beliefs predicting RTW in samples of individuals with chronic LBP [27]. Our results are in line with previous findings showing that FABW was a main predictor of non-RTW at 3 and 12 months follow-ups after WR [14].

This study adds to the literature by showing direct and indirect relationships between various predictors and FABW and continued sick leave after WR, in a predefined mediation model. FABW is a complex phenomenon, shaped in the interplay between internal and external stressors, from competing personal goals, psychosocial factors, and daily life and workplace factors [32]. In individuals on sick leave with long-lasting health complaints, the internal stressors may be related to the perception of pain, distress and functional ability, and the external stressors to perceived stress and discomfort at the workplace. Fear avoidance beliefs are linked to avoidance behavior, and may act as a mediator between the internal and external stressors and avoiding the workplace [45]. Stimulus expectancies and learned positive or negative response outcome expectancies as described in the CATS determine psychobiological responses [55]. High levels of

FABW and subsequent avoidance behavior can be explained as negative response outcome expectancies towards RTW, e.g. poor coping.

Our results revealed no direct path from musculoskeletal complaints to days on sickness benefits after WR. This finding supports the understanding that biomedical factors do not directly influence RTW after long-term sick leave, but rather work indirectly through other factors such as functional ability and beliefs [3, 29, 65]. Likewise, we believe that the strong indirect effects found for musculoskeletal complaints via physical function and further via FABW to continued sick leave after WR, support the use of a biopsychosocial approach when predicting RTW after long-term sick leave and rehabilitation efforts [3, 4, 65]. The paths from musculoskeletal complaints to poor physical function as measured by moving ability and lifting/carrying ability, were strong, and in line with previous research [37–39]. Functional limitations may be superior to pain for predicting disability outcomes and RTW [66].

The results supported our hypothesis of a path from level of education via FABW to continued sickness benefits after WR. Individuals with low education have more often manual and physically demanding work with less control and decision latitude [48, 49]. This may lead to high levels of negative workplace exposures [49] and FABW. Individuals with low level of education may also have less psychosocial resources to deal with the work demands [52, 53]. Consequently, there may be a discrepancy between demands and available resources, which in turn may cause high activation, negative outcome expectancies, and prolonged workplace avoidance in terms of prolonged sick leave.

Another main finding was that length of previous sick leave at admittance to the WR program had a direct effect on days on sickness benefits after WR. There are strong indicators for negative and independent relationships between length of previous sick leave and the probabilities for returning to work [7, 9, 14, 24]. However, one might also assume an indirect effect of previous sick leave via FABW. This issue should be addressed in future research.

For pseudoneurological complaints, the results did not support the hypothesis of FABW being a mediator of continued sick leave after WR. This result is purely a consequence of the very small correlations between FABW and pseudoneurological complaints in our data. However, this finding is surprising, since previous results in a similar study population of long-term sick-listed WR participants, found pseudoneurological complaints to explain a significant part of the variance in FABW [14]. Similarly, in individuals on sick leave due to neck and back pain, there were a strong relationship between psychological distress, such as depression and anxiety

and FABW [42, 43]. A possible explanation of the lack of association between pseudoneurological complaints and FABW in this study may be that the current study population, from eight different WR clinics, is more heterogeneous than the previous study population of WR participants [14]. This may imply a higher variance in reports on the musculoskeletal and pseudoneurological variables, and less overlap between these complaints. An argument against this explanation is however, that pseudoneurological complaints in the current study had a direct predictive effect on continued sick leave after WR, in line with findings in the previous study where pseudoneurological complaints predicted work outcomes 3 months after participating in WR [14]. When the fear avoidance beliefs questionnaire was developed, it was strongly emphasized that there was an affective dimension, in the form of anxiety, high somatic awareness, and depressive symptoms, between maladaptive beliefs and developing chronic pain [30]. The associations and mechanisms between common mental complaints, FABW, and RTW seem still poorly understood in sick-listed WR participants with long-lasting composite health complaints.

Furthermore, the results did not support our hypothesis of an effect of coping/interacting ability on continued sick leave benefits after WR, neither directly nor indirectly via FABW. This lack of association is also reflected by the very small correlation with FABW in this data set. In a previous study, we found that individuals on sickness benefits 3 years after WR reported poorer physical and mental functional ability than those who had returned to work [44]. Functional ability is dependent on the situation, as the capacity of an individual always will be restricted or facilitated in interacting with contextual factors, like the work environment [40]. We did however not include any work-related variables in the current SEM model. More research investigating direct and indirect relationships between individual psychosocial factors and environmental workplace factors is needed to understand more of what facilitates and hinders RTW in individuals on sick leave [3, 26].

The large and representative study sample of WR participants from eight different rehabilitation clinics in Norway is a strength in the present study. A multicenter sample may give a more heterogeneous study population. Heterogeneity may give high generalizability when the prognostic model matches the observed outcome [67]. Access to complete official register data and the long follow-up period of sickness benefits strengthen the interpretation of the results. A limitation may however be that all variables except the outcome measure were collected at entry to the WR program. This clearly limits causal interpretations between the constructs. Longitudinal studies focusing on change in the constructs included in the model have been recommended [26], and

should be a priority in later studies. A limitation may also be that the WR program could influence some of the included independent variables, related to health, functioning, and FABW, and they may change during follow-up. This potential bias will however be equal for all the participants. In this paper, we choose to include the independent factors measured at baseline, because we were interested in the prediction effect and not the changes over time. Future studies might explore if any changes in these variables during or after the rehabilitation will be stronger predictors for RTW after WR.

In our final model, poor coping/interaction ability was not a significant predictor for continued days on sickness benefit. This may be due to its high correlation with pseudoneurological complaints. A potential interesting hypothesis for future research is that pseudoneurological complaints may mediate the relation between poor coping/interaction ability and continued days on sickness benefit. Although the data partly supported the hypothesized mediation model, the estimates for the single pathways were not very strong. It is therefore important to identify other predictors and pathways intervening with education, health complaints, functional ability, and fear avoidance beliefs for work. Research should in particular address how individual factors intervene with contextual factors, e.g. at the workplace. In addition, using measures on work exposure or work environmental factors in our model could have given a stronger design, making it possible to adjust for possible contextual confounders. Despite these limitations, the results from this study may have implications for the process of referral to WR programs and for determining the content of the programs. Our results suggest that clinicians and stakeholders should have an increased focus on individuals with high levels of FABW and poor physical function among those reporting musculoskeletal complaints, and on the severity of complaints among those reporting pseudoneurological complaints. For individuals at risk, increased attention should be on the workplace, in particular on work tasks and the organization of work, for instance via improved learning climate and learning opportunities [52].

## Conclusions

The hypothesized model was partly supported by the data. The results show that FABW may mediate the effect of musculoskeletal complaints via physical function, and the effect of education on continued sickness benefits 3 years after participating in a WR program. These findings may give direction for future research assessing prognostic factors for RTW outcomes after long-term sick leave in individuals with long-lasting health complaints.

## Abbreviations

CATS: the cognitive activation theory of stress; CFA: confirmatory factor analysis; CFI: the comparative fit index; CI: confidence interval; DP: disability pension; EFA: exploratory factor analysis; FABQ: the fear avoidance beliefs questionnaire; FABW: fear avoidance beliefs for work; LBP: low back pain; NAV: The Norwegian Labour and Welfare Administration; NFAS: The Norwegian function assessment scale; NSD: The Norwegian social science data services; REK: Region Medical Ethics Committee; RMSEA: the root mean square error of approximation; RTW: return to work; SD: standard deviation; SEM: structural equation modeling; SHC: subjective health complaints; WAA: work assessment allowance; WLSMV: the robust-weighted least square estimator; WR: work rehabilitation.

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## Availability of data and materials

Data will not be shared as it contains data from the Norwegian Labour and Welfare Administration which we by law are not allowed to share.

## Authors' contributions

IØ was involved in the planning and design of the study, performed the statistical analysis, and drafted the manuscript. JO was involved in the design of the study, contributed substantially in the statistical analysis, in the interpretation of the results, and helped draft the manuscript. HRE was involved in the planning of the study, in the interpretation of the results and in the writing process. TNB was involved in the planning of the study, in the interpretation of the results and in the writing process. SAL was involved in the planning of the study and in the interpretation of the results. SB was involved in the planning of the study and in the writing process. CI was involved in the planning of the study and in the writing process. KB gave important advice in the statistical analysis, in interpretation of the results, and contributed continuously in the writing process. All authors read and approved the final manuscript.

## Competing interests

The authors of this manuscript claim to have no conflicts of interest including any financial, personal or other relationships with other people or organizations that could inappropriately influence this work.

## Consent for publication

Not applicable.

## Ethics approval and consent to participate

The study fulfilled the principles in the Declaration of Helsinki, and was approved by the Medical Ethics Committee; Region West in Norway (REK-vest ID 3.2007.178) and the Norwegian social science data services (NSD, ID 16139).

## Author details

<sup>1</sup>National Centre for Occupational Rehabilitation, Haddlandsvegen 20, NO-3864 Rauland, Norway. <sup>2</sup>Uni Research Health, Bergen, Norway. <sup>3</sup>Department of Sport and Physical Activity, Bergen University College, Bergen, Norway. <sup>4</sup>Faculty of Health and Social Studies, Telemark University College, Porsgrunn, Norway. <sup>5</sup>Department of Clinical Dentistry, University of Bergen, Bergen, Norway. <sup>6</sup>The Directorate of Labour and Welfare, Oslo, Norway. <sup>7</sup>Section of Public Health Science, ILP, Norwegian University of Life Sciences, Ås, Norway.

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# Prognostic Factors for Return to Work, Sickness Benefits, and Transitions Between These States: A 4-year Follow-up After Work-Related Rehabilitation

Irene Øyeflaten · Stein Atle Lie · Camilla M. Ihlebæk · Hege R. Eriksen

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**Abstract** *Purpose* The aim of this study was to examine if age, gender, medical diagnosis, occupation, and previous sick leave predicted different probabilities for being at work and for registered sickness benefits, and differences in the transitions between any of these states, for individuals that had participated in an interdisciplinary work-related rehabilitation program. *Methods* 584 individuals on long-term sickness benefits (mean 9.3 months, SD = 3.4) were followed with official register data over a 4-year period after a rehabilitation program. 66 % were female, and mean age was 44 years (SD = 9.3). The majority had a mental (47 %) or a musculoskeletal (46 %) diagnosis. 7 % had other diagnoses. Proportional hazards regression models were used to analyze prognostic factors for the probability of being on, and the intensity of transitions between, any of the following seven states during follow-up; working, partial sick leave, full sick leave, medical rehabilitation, vocational rehabilitation, partial disability pension (DP), and full DP. *Results* In a fully adjusted model; women, those with diagnoses other than mental and musculoskeletal, blue-collar workers, and those with

previous long-term sick leave, had a lower probability for being at work and a higher probability for full DP during follow-up. DP was also associated with high age. Mental diagnoses gave higher probability for being on full sick leave, but not for transitions to full sick leave. Regression models based on transition intensities showed that risk factors for entering a given state (work or receiving sickness benefits) were slightly different from risk factors for leaving the same state. *Conclusions* The probabilities for working and for receiving sickness benefits and DP were dependent on gender, diagnoses, type of work and previous history of sick leave, as expected. The use of novel statistical methods to analyze factors predicting transition intensities have improved our understanding of how the processes to and from work, and to and from sickness benefits may differ between groups. Further research is required to understand more about differences in prognosis for return to work after intensive work-related rehabilitation efforts.

**Keywords** Sick leave · Disability leave · Return to work · Rehabilitation—Vocational · Risk factors

I. Øyeflaten (✉)

The National Centre for Occupational Rehabilitation,  
Haddlandsvegen 20, 3864 Rauland, Norway  
e-mail: irene.oyeflaten@air.no

I. Øyeflaten · H. R. Eriksen

Department of Health Promotion and Development,  
University of Bergen, Bergen, Norway

S. A. Lie · H. R. Eriksen

Uni Health, Uni Research, Bergen, Norway

C. M. Ihlebæk

The Section for Public Health Science, ILP, University of Life Sciences, Aas, Norway

## Introduction

Several specialized occupational and vocational rehabilitation programs are offered to individuals on long-term sickness benefits. Knowledge about prognostic factors for work resumption after rehabilitation is still limited, and we do not know which patients will benefit most from comprehensive work-related rehabilitation efforts [1]. Additionally, there is a lack of agreement regarding when and how work resumption should be measured [2, 3], and little is known about the long-term work outcomes after

work-related rehabilitation [4, 5]. The present study was a 4-year follow-up of employees on long-term sickness benefits who had participated in an inpatient interdisciplinary work-related rehabilitation program in Norway.

Medical diagnoses related to musculoskeletal complaints and mild or moderate mental health problems are the most frequent diagnoses for long-term sick leave and disability pension (DP) in Norway [6–8], and in other industrialized countries [9, 10]. This is a heterogeneous group of patients, often with no or few objective medical explanations and with a high rate of co-morbidity with other health complaints [11–15]. They are also the main target for work-related rehabilitation.

Socio-demographic factors, work-related factors and factors related to the medical condition are the three dominating types of prognostic factors for long-term sickness benefits and return to work (RTW). Norwegian women have a higher rate of sick leave and DP than men, and still little is known on this gender divide [16, 17]. Female gender [1, 4, 18] and higher age [1, 19, 20] predict lack of RTW. Length of sick leave before rehabilitation [1] and sick leave in itself, are considered to be important risk factors for delayed RTW [19], and for future DP [21]. Both psychosocial and physical work factors predict long-term sick leave [22]. Unskilled [5, 23] and manual work, lack of job control, interpersonal relations and emotional demands are among these work factors, but differ between gender, age and socio-economic position [22]. There are some inconsistencies in how the diagnosis affects the prognosis for RTW and DP after sickness absence, and diverse diagnoses seem to affect men's and women's prognosis in different ways [8, 24]. In a 1-year follow-up after work-related rehabilitation, we did not find any associations between the sick leave diagnoses (musculoskeletal, mental or unspecified diagnosis) and RTW [13]. Work ability and impairment from medical diagnoses will in general be related to the perception, attribution and expectations of the individual, and are in part determined by earlier experience and learning [25]. The degree of co-morbidity may also influence the prognosis for recovery after sickness absence, and it is a risk factor for long-term incapacity for work [26].

RTW is a complex process [27], where the individual over time may have multiple and recurrent transitions between RTW and various sickness benefits [3, 28]. Recently, more emphasis has been given to the individuals mobility between different social security benefits during follow up, and how this may affect work resumption [21]. However we do not know if the variation in mobility between different benefits and work is related to specific socio-demographic factors [21], and especially gender differences in such transitions is of interest [16, 29].

The Norwegian sickness compensation system represents a generous welfare model intended to secure the income of individuals with temporary or permanent reduced function due to a disease. If you have been in paid work the last 4 weeks before the sickness incident you are entitled to sickness benefits from The Labour and Welfare Administration. An employee cannot be discharged due to sick leave; these legislations are especially strict during the first 12 months. To be entitled sickness compensation the incapacity for work must be caused by reduced functional ability due to a disease or an injury. In Norway, the general practitioner issue about 79 % of all long-term sick leaves [30], and a medical diagnosis is required on the sickness certificate. The international classification of primary care (ICPC) is the main diagnostic system used within general practice and primary care, and within The Labour and Welfare Administration. The employee receives 100 % compensation during the first year. After up to 1 year on sick leave benefit, the sick listed may be entitled a work assessment allowance. If medical or vocational rehabilitation efforts have no intended effect, the individual may be granted a DP, however partial sickness benefits are actively recommended by the authorities.

Previously, in a 4-year follow-up of patients on long-term sick leave, we used multi-state models, synthesizing the transition intensities between the different categories for sickness benefits and RTW a patient could be in after work-related rehabilitation [28]. We found an increased probability for being at work, a decreased probability for being on sick leave, and an increased probability for DP. The participants had an average of 4 transitions between work and different benefits during follow-up. The aim of the current follow-up study is to further explore the probability for work resumption and for being in, and having transitions between, work and different benefits during a 4-year follow up after participation in a work-related rehabilitation program. Age, gender, diagnosis, occupation and length of sick leave before rehabilitation, are used as predictors.

## Methods

We conducted a longitudinal cohort study of individuals on long-term sick leave, who had participated in a comprehensive, interdisciplinary work-related rehabilitation program. During 2001, 615 individuals completed the rehabilitation program. At the end of the program all these patients were invited to participate in the study. 586 individuals gave informed consent to obtain data from the patient journals and registers. Socio-demographic data at baseline was obtained from patient journals and follow-up data from official registers of The Labour and Welfare



Administration in Norway. Data were missing for 2 individuals, thus 584 individuals were included. Each of these individuals was followed with register data on sickness benefits for 4 years after the stay at the rehabilitation clinic. The study was approved by the Medical Ethics Committee; Region South in Norway. All principles in the Helsinki declaration were followed.

### Participants

584 individuals, 383 (66 %) women, mean age 44 years, (SD = 9.3), who had been on different long-term sickness benefits, mean length 9.3 months, [(SD = 3.4), range 0–61 months], mainly due to musculoskeletal (46 %) and mental (47 %) diagnoses before participating in the rehabilitation program, participated in the study. 7 % had other diagnoses, with diagnoses related to neurological and heart diseases as the most common (Table 1).

The patients ended their stay at the rehabilitation clinic between January 14, and December 23, 2001. The

continuous register data was obtained for all participants from departure until December 30, 2005. During the 4-year follow-up period 6 participants died, 2 received early retirement pension, and 2 participants had passed the age of 67 years and received ordinary retirement pension, at which time these observations were censored.

### Work-Related Rehabilitation

All the participants completed a 4-week inpatient rehabilitation program. The goal of the rehabilitation program was to improve level of functioning, enhance work ability, and to increase the chances of RTW. Physicians, nurses, vocational social workers, physiotherapists, and sport pedagogues constituted interdisciplinary rehabilitation teams. The content of the program was mostly the same for all the participants, and included a combination of individual and group based interventions with physical activity, education, and cognitive behavioral modification. Increased self-confidence, coping, and learning were

**Table 1** Description of the study population on the categories utilized for the independent variables in the regression analysis, (n = 584)

	n	%
Gender		
Male	201	34
Female	383	66
Diagnoses; codes from the ICPC-2 <sup>#</sup>		
Musculoskeletal diagnoses	<b>271</b>	<b>46</b>
Back pain with or without radiating pain (L02, L03, L84, L86)	152	
Neck/shoulder/arm pain (L08, L12, L83, L92, L93)	43	
Musculoskeletal pain in general (L18, L29, L81, L82, L99)	55	
Other (L11, L15, L20, L76, L88, L90, L91, L94, L97)	21	
Mental diagnoses	<b>275</b>	<b>47</b>
Anxiety (P01, P74)	15	
Depression (P03, P76)	130	
Neurasthenia (P78)	119	
Other (P02, P06, P24, P28, P29, P79, P86)	11	
Other diagnoses	<b>38</b>	<b>7</b>
Heart disease (K02, K73, K74, K75, K76, K78, K81, K87, K92, K94)	13	
Neurology (N17, N29, N71, N79, N81, N89, N94, N99)	11	
Other (A04, A87, D75, H86, R95, S91, T73, T82, T90)	14	
Occupation	<b>n = 579*</b>	
Blue-collar	167	29
White-collar	136	23
Health and social workers	120	21
Education and child care	91	16
Service sector	65	11
Sick leave length before work-related rehabilitation		
0–4 months	82	14
5–8 months	195	33
9–12 months	160	28
>12 months	147	25

\* Information on occupation missing on 5 individuals

<sup>#</sup> ICPC codes up to 29 indicate symptoms/complaints; codes from 70 to 99 indicate a verified disease/disorder

important objectives for all the activities. At the end of the rehabilitation program a treatment plan with RTW as the main goal, was developed together with the patient. This plan could include future participation from several stakeholders outside the rehabilitation setting, e.g. different health providers, the work place or the local health insurance office.

In Norway, inpatient rehabilitation programs are offered to individuals on long-term sick leave at risk of permanent disability. Before admittance to such programs other relevant medical examinations and treatments should have been tried in the occupational or primary health care. The specific rehabilitation program in this study was carried out at a national occupational rehabilitation clinic. Patients from the whole country could be admitted to this clinic based on referrals from their general practitioners, occupational health service or the social security offices. The program is part of the healthcare system in Norway, and was therefore offered free of charge.

To be admitted to the rehabilitation clinic the individual had to be motivated to participate in the program, and having an intentional goal and plan to resume work. Exclusion criteria were serious psychiatric disorders, undecided applications for DP, or insurance claims.

## Measures

### *Independent Variables*

Information about age, gender, diagnosis (The international classification of primary care, ICPC; <http://www.who.int/en/> or [www.kith.no](http://www.kith.no)), occupation, and length of sick leave before rehabilitation were obtained from patient journals at the rehabilitation clinic. Age was used as a continuous variable divided with 5 so that the reported coefficient accounts for a 5 year increase in age. The other variables were categorized before the analysis, with the first category being used as reference in the analyses (Table 1).

### *Dependent Variables*

Information about different sickness benefits was achieved from official registers and constituted 7 different variables: (1) full work, i.e. no registered benefits, (2) partial sick leave or partial medical rehabilitation allowance, (3) full sick leave, (4) medical rehabilitation allowance, (5) vocational rehabilitation allowance, (6) partial disability pension and (7) full disability pension.

The sick leave benefit constitutes 100 % of the wage loss, from the first day of reported sickness up to 1 year. The employer pays the first 16 days of a sick leave period, thereafter The Labour and Welfare Administration covers the disbursement. Sick leave days paid by the employer

were not included in these analyses. If the employee has not returned to work after 1 year, he or she may receive a rehabilitation allowance, which constitutes approximately 66 % of the salary. To be eligible for medical rehabilitation allowance, there must be a certain probability to recover after medical treatment. Vocational rehabilitation allowance is granted for individuals that may benefit from vocational guidance to RTW, e.g. work training or professional re-education. From 2010 medical and vocational rehabilitation allowances have been combined and are labelled work assessment allowance. After proper rehabilitation efforts have been undertaken, the individual may be entitled DP if the work ability is reduced with at least 50 %, and caused by reduced functional ability due to a disease or an injury. In the Norwegian welfare system it is possible to work part-time and at the same time receive sickness compensation. Partial sick leave includes sickness benefits from 20 to 90 %, whereas for partial rehabilitation allowance and DP it is a 50 % lower limit. The sickness compensation legislations in Norway have been slightly changed after the time period for this study (2001–2005), but this is mostly on actions/measures and administrations, thus the claimant's economic rights are principally the same.

## Statistical Methods

The official registers included separate data files on sick leave, medical rehabilitation allowance, vocational rehabilitation allowance and DP, and included information on partial benefits from 20 to 100 %. For each individual, start and end date on each benefit were registered. Being at work was defined as the time gap with no sickness benefits, since the registers do not contain exact information on whether a person is actually working or not. The disbursements to individuals on sickness benefits are however based on these registers, and are therefore judged to be complete and valid. The register files were merged together to form one complete event history file, thereafter it was combined with the socio-demographic information from the patient journals. Overlaps in the start and end date could occur for some registered benefits in the merged file due to administrative reasons, errors, or that individuals were receiving several different graded benefits. The file was therefore modified in accordance with a predefined ranking of the different benefits, (for details, see Oyeflaten et al. [28]). When combinations of partial benefits occurred in the registers we included only data from one of the benefits in the analysis at the same time; i.e. each individual could hence only be present in one state at one specific time. This was done in accordance with the predefined ranking, where DP had a higher rank than the rehabilitation allowances, and where sick leave had the lowest rank; e.g. an individual

registered on partial DP and at the same time on partial sick leave, was defined as belonging to the partial DP group.

The analyses were based on two distinct different models. Regression models for the probabilities to be in either of the states were modeled using the observed indicator for each state for each third month in the follow-up. These models were performed using generalized models with a complementary log–log link function. The results from these analyses are presented as hazard rate ratios (HRR). During follow-up a specific individual could shift between work and different benefits several times. Each shift represents an event. Repeated events or observations may be synthesized as transition intensities. In this article we analyzed risk factors for the transition intensities using extended proportional hazards models (Cox-models) for repeated observation, presented as HRR. Thus three outcome variables are presented; the probability for being on each of the 7 states (being working or on different sickness benefits), and the transition intensity from and to work and the different benefits, during follow up. The probability for working or receiving one of the different benefits is a synthesis of all the transition intensities to and from all states in the model during the follow up.

Unadjusted analyses were first carried out to explore how the independent variables (age, gender, diagnosis, occupation and length of sick leave before rehabilitation) predicted (1) leaving (transition from), (2) entering (transition to) and (3) being on each of the 7 states, i.e. the dependent variables (full work, partial sick leave, full sick leave, medical rehabilitation allowance, vocational rehabilitation allowance, partial disability pension and full disability pension). Results from the unadjusted analyses are not reported. Finally, adjusted analyses were done to study how the independent variables influenced the probabilities and transition intensities adjusted for all the other independent variables.

Genders differences on the independent variables were analyzed with Pearson Chi square tests and *t* tests. The descriptive analyses were performed using the statistical packages PASW, version 18 (SPSS Inc. Released 2009, PASW Statistics for Windows, Version 18.0, SPSS Inc., Chicago). The regression analyses were done in Stata, version 12 (StataCorp. 2011, Stata Statistical Software: Release 12, StataCorp LP, College Station, TX). All *p* values <.05 were considered statistically significant.

## Results

Men were significantly younger [ $\bar{x}$  43 (SD = 10)] than women [ $\bar{x}$  45 (SD = 9)], ( $p = .016$ ). Men had more frequently a musculoskeletal diagnosis (58 %) than women (41 %) and more often “another diagnosis” (10 %) than women (4 %), and women had more often a mental

diagnosis (55 %) than men (32 %) ( $p < .001$ ). There were significant differences in occupations between men and women ( $p < .001$ ); men had more often blue-collar work (51 %) than women (16 %), women had more often health and social work (27 %) than men (8 %), and women had more often work within education and child care (19 %) than men (9 %). For white-collar work there were no gender differences. No gender differences were found for length of sick leave before participation in the rehabilitation program ( $p = .604$ ).

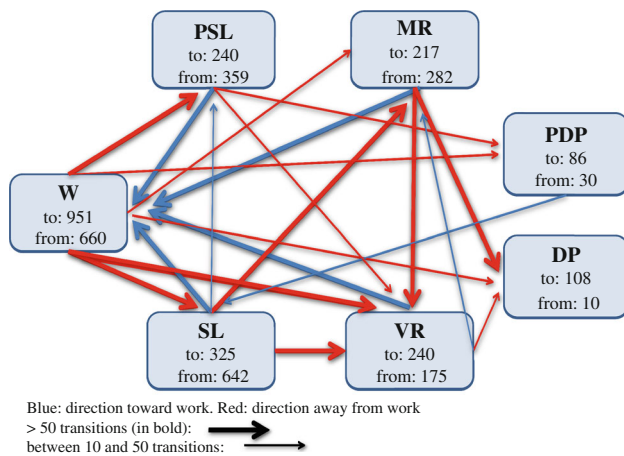
During follow-up there was an annual increase in participants who returned to full work, from 10 % at departure from the clinic ( $n = 59$ ) to 51 % after 4 years ( $n = 291$ ). (For details see Oyeflaten et al. [28]). For partial sick leave there was an annual decrease from 20 % at departure ( $n = 114$ ) to 3 % after 4 years ( $n = 17$ ). The same tendency were found for full sick leave: 52 % received full sick leave at departure, after 1 year the numbers were 4 %, after 2 years it had increased to 8 % but after 4 years it was down to 3 % again. For both medical rehabilitation (MR) and vocational rehabilitation (VR) allowances there was a different pattern with relative small numbers the first year (MR: 11 %,  $n = 64$ , VR: 5 %,  $n = 31$ ) and a peak between 2 and 3 years (around 20 % for both allowances), then after 4 years 2 % received medical rehabilitation and 15 % ( $n = 80$ ) received vocational rehabilitation allowance. For partial DP there was an annual decrease from 2 % at departure to 11 % after 4 years, and for full DP the numbers increased from 0.5 % at departure to 16 % at 4 year follow-up.

During the 4-year follow up there was a total of 2,165 transitions between work and the different sickness benefits (Fig. 1). During the total follow-up there was an average of 3.7 transitions between the different benefits and working. Median number of transitions was 3, ranging from zero to 18 transitions. (For more details see Oyeflaten et al. [28]).

## Probabilities of States and of Transition Intensities

### Work

The probabilities for being at work during the 4-year follow-up were lower for women (HRR = 0.70, 95 % CI 0.58–0.86) than for men, and for those with “other diagnosis” (HRR = 0.62, 95 % CI 0.39–1.00) compared with musculoskeletal diagnosis (Table 2). Blue-collar workers had lower probability for being at work, compared with all other occupations; white-collar (HRR = 1.69, 95 % CI 1.29–2.22), education and child care (HRR = 1.84, 95 % CI 1.35–2.51), health and social workers (HRR = 1.63, 95 % CI 1.21–2.19), and service workers (HRR = 1.56, 95 % CI 1.11–2.18). Those with the shortest sick leave length before rehabilitation (0–4 months) showed the highest probability for being at work during follow-up, and



**Fig. 1** Model showing numbers and directions of transitions (above 10) to and from work and the different benefits during the 4-year follow-up. (W work, PSL partial sick leave, 100 % SL sick leave, MR medical rehabilitation, VR vocational rehabilitation, PDP partial disability pension, 100 % DP disability pension).  $n = 584$

the probability decreased with the increase in sick leave length; 5–8 months (HRR = 0.70, 95 % CI 0.56–0.89), and more than 12 months (HRR = 0.52, 95 % CI 0.39–0.70). Men, individuals working within education and child care, and those with the shortest sick leave before rehabilitation shifted more often back to work than women, blue collar workers and those with long-term sick leave, respectively (Table 2). A short sick leave length was the only predictor of transition from work.

#### Partial Sick Leave

The probability for being on partial sick leave during the 4-year follow-up increased with higher age (HRR = 1.09, 95 % CI 1.01–1.18) (Table 3). High age also indicated an increased intensity for transition both from (HRR = 1.12, 95 % CI 1.04–1.21) and to (HRR = 1.12, 95 % CI 1.03–1.21) partial sick leave during the follow-up. Those with the shortest sick leave length before rehabilitation (0–4 months) shifted more often from and to partial sick leave than those with longer sick leave. Those with the longest sick leave (>12 months) were least likely to shift to partial sick leave (HRR = 0.41, 95 % CI 0.25–0.70). However, sick leave length before rehabilitation did not give a higher probability for being on partial sick leave during follow up.

#### 100 % Sick Leave

The probability for being on full sick leave during the 4-year follow-up were higher for those with a mental diagnosis (HRR = 1.29, 95 % CI 1.07–1.56), compared with musculoskeletal diagnosis (Table 4). However, those with a mental diagnosis shifted less often to full sick leave

(HRR = 0.72, 95 % CI 0.52–1.01) compared to those with musculoskeletal diagnosis. Blue-collar workers had higher risk for being on full sick leave than those with white-collar occupations (HRR = 0.73, 95 % CI 0.57–0.94), and health and social workers (HRR = 0.79, 95 % CI 0.62–1.00). Those with the shortest sick leave length before rehabilitation (0–4 months) had the highest risk for being on full sick leave during follow-up, and the risk for being on full sick leave decreased with the increase in sick leave length; 9–12 months (HRR = 0.56, 95 % CI 0.45–0.71), and more than 12 months (HRR = 0.16, 95 % CI 0.10–0.27). This was also the case for transition from and to full sick leave during follow-up; those with sick leave length between 0 and 4 months had a higher intensity than those on sick leave for more than 12 months.

#### Medical Rehabilitation Allowance

The probability for being on medical rehabilitation during the 4-year follow-up was higher for blue-collar workers than for education and child care workers (HRR = 0.57, 95 % CI 0.35–0.93), (Table 5). This was also the case for transition from and to medical rehabilitation. Sick leave length gave the highest probability for being on medical rehabilitation, and increased with duration; sick leave more than 12 months (HRR = 4.42, 95 % CI 2.60–7.54), but also for transition from and to medical rehabilitation.

#### Vocational Rehabilitation Allowance

The probability for being on vocational rehabilitation during the 4-year follow-up decreased with higher age (HRR = 0.76, 95 % CI 0.70–0.83) (Table 6). This was also the case for transitions from (HRR = 0.84, 95 % CI 0.81–0.91) and to (HRR = 0.84, 95 % CI 0.81–0.91) vocational rehabilitation. Blue-collar workers had a higher risk for being on vocational rehabilitation than white-collar workers (HRR = 0.58, 95 % CI 0.35–0.94). Also, blue-collar workers had a higher intensity to shift from and to vocational rehabilitation than all other occupations. Sick leave length gave the highest probability for being on vocational rehabilitation, and increased with duration; sick leave more than 12 months (HRR = 3.27, 95 % CI 1.79–6.00), but also for transition from and to medical rehabilitation.

#### Partial Disability Pension

The probability for being on partial DP during the 4-year follow-up increased with higher age (HRR = 1.49, 95 % CI 1.30–1.70) (Table 7). Women had a higher probability (HRR = 1.81, 95 % CI 1.00–3.26) to be on partial DP than men. Sick leave length before rehabilitation did not give increased risk for partial DP.

**Table 2** The intensity of transitions from and to 100 % work (W); Cox proportional hazards regression of relative risk (HRR), and the probability for being working (HRR) during a 4-year follow-up after work-related rehabilitation, (n = 584)

	From W HRR (CI 95 %)	To W HRR (CI 95 %)	In W HRR (CI 95 %)
Age	0.98 (0.94–1.03)	0.97 (0.92–1.03)	0.96 (0.91–1.01)
Gender			
Men	1	1	1
Female	0.97 (0.81–1.16)	<b>0.73 (0.57–0.94)*</b>	<b>0.70 (0.58–0.86)**</b>
Diagnoses			
Musculoskeletal	1	1	1
Mental	0.91 (0.75–1.09)	0.94 (0.74–1.19)	0.90 (0.74–1.10)
Other	0.68 (0.45–1.02)	0.63 (0.38–1.05)	<b>0.62 (0.39–1.00)*</b>
Occupation			
Blue-collar	1	1	1
White-collar	0.94 (0.75–1.18)	1.19 (0.89–1.62)	<b>1.69 (1.29–2.22)**</b>
Health and social workers	1.06 (0.83–1.37)	1.35 (0.98–1.86)	<b>1.63 (1.21–2.19)**</b>
Education and child care	1.07 (0.82–1.39)	<b>1.51 (1.04–2.18)*</b>	<b>1.84 (1.35–2.51)**</b>
Service sector	0.75 (0.54–1.03)	0.96 (0.64–1.45)	<b>1.56 (1.11–2.18)*</b>
Sick leave length			
0–4 months	1	1	1
5–8 months	<b>0.77 (0.62–0.95)*</b>	<b>0.68 (0.51–0.91)*</b>	<b>0.70 (0.56–0.89)*</b>
9–12 months	0.91 (0.74–1.12)	0.78 (0.59–1.04)	<b>0.71 (0.55–0.91)*</b>
>12 months	<b>0.70 (0.54–0.91)*</b>	<b>0.53 (0.38–0.73)**</b>	<b>0.52 (0.39–0.70)**</b>

Fully adjusted analysis for age, gender, diagnoses, occupation, and sick leave length before work-related rehabilitation.  
\*  $p < .05$ , \*\*  $p < .005$   
Bold values are statistical significant

**Table 3** The intensity of transitions from and to partial sick leave (PSL); Cox proportional hazards regression of relative risk (HRR), and the probability for being on PSL (HRR) during a 4-year follow-up after work-related rehabilitation, (n = 584)

	From PSL HRR (CI 95 %)	To PSL HRR (CI 95 %)	On PSL HRR (CI 95 %)
Age	<b>1.12 (1.04–1.21)*</b>	<b>1.12 (1.03–1.21)*</b>	<b>1.09 (1.01–1.18)*</b>
Gender			
Men	1	1	1
Female	1.08 (0.8–1.50)	1.35 (0.92–1.96)	1.06 (0.74–1.51)
Diagnoses			
Musculoskeletal	1	1	1
Mental	0.93 (0.71–1.23)	0.96 (0.71–1.34)	0.91 (0.66–1.24)
Other	0.72 (0.61–1.42)	0.81 (0.40–1.60)	0.55 (0.24–1.29)
Occupation			
Blue-collar	1	1	1
White-collar	1.22 (0.82–1.83)	1.05 (0.64–1.70)	1.54 (0.97–2.44)
Health and social workers	1.30 (0.85–1.96)	1.23 (0.80–1.96)	1.56 (0.94–2.59)
Education and child care	1.42 (0.91–2.24)	1.23 (0.73–2.11)	1.63 (0.98–2.72)
Service sector	1.24 (0.74–2.06)	1.21 (0.71–2.12)	1.02 (0.57–1.85)
Sick leave length			
0–4 months	1	1	1
5–8 months	<b>0.61 (0.41–0.84)*</b>	<b>0.52 (0.34–0.80)*</b>	0.79 (0.55–1.16)
9–12 months	<b>0.63 (0.46–0.90)*</b>	<b>0.65 (0.45–0.95)*</b>	1.08 (0.75–1.57)
>12 months	<b>0.55 (0.41–0.82)*</b>	<b>0.41 (0.25–0.70)**</b>	1.28 (0.84–1.94)

Fully adjusted analysis for age, gender, diagnoses, occupation, and sick leave length before work-related rehabilitation.\*  $p < .05$ , \*\*  $p < .005$   
Bold values are statistical significant

Full Disability Pension

The probability for being on full DP during the 4-year follow-up increased with higher age (HRR = 1.51, 95 % CI 1.32–1.74) (Table 8). This was also the case for

transition from (HRR = 1.50, 95 % CI 1.30–1.70) and to (HRR = 1.51, 95 % CI 1.31–1.73) full DP. Women had a higher probability (HRR = 2.08, 95 % CI 1.23–3.49) to be on full DP than men. This was also the case for transition from (HRR = 1.90, 95 % CI 1.04–3.50) and to

**Table 4** The intensity of transitions from and to 100 % sick leave (SL); Cox proportional hazards regression of relative risk (HRR), and the probability for being on 100 % SL (HRR) during a 4-year follow-up after work-related rehabilitation, (n = 584)

	From 100 % SL HRR (CI 95 %)	To 100 % SL HRR (CI 95 %)	On 100 % SL HRR (CI 95 %)
Age	0.99 (0.94–1.05)	0.99 (0.91–1.10)	1.00 (0.96–1.05)
Gender			
Men	1	1	1
Female	0.93 (0.75–1.16)	0.95 (0.71–1.32)	0.98 (0.81–1.18)
Diagnosis			
Musculoskeletal	1	1	1
Mental	0.86 (0.71–1.10)	<b>0.72 (0.51–1.00)*</b>	<b>1.29 (1.07–1.56)*</b>
Other	0.98 (0.63–1.51)	0.90 (0.51–1.75)	1.23 (0.89–1.69)
Occupation			
Blue-collar	1	1	1
White-collar	0.84 (0.63–1.12)	0.80 (0.53–1.22)	<b>0.73 (0.57–0.94)*</b>
Health and social workers	0.93 (0.70–1.23)	0.97 (0.63–1.50)	<b>0.79 (0.62–1.00)*</b>
Education and child care	0.97 (0.71–1.33)	0.97 (0.63–1.50)	0.90 (0.70–1.16)
Service sector	<b>0.74 (0.55–0.99)*</b>	0.62 (0.36–1.11)	0.78 (0.59–1.03)
Sick leave length			
0–4 months	1	1	1
5–8 months	1.03 (0.81–1.31)	0.82 (0.55–1.23)	1.02 (0.83–1.26)
9–12 months	1.20 (0.91–1.50)	1.01 (0.70–1.50)	<b>0.56 (0.45–0.71)**</b>
>12 months	<b>0.70 (0.24–0.61)**</b>	<b>0.60 (0.35–0.99)*</b>	<b>0.16 (0.10–0.27)**</b>

Fully adjusted analysis for age, gender, diagnoses, occupation, and sick leave length before work-related rehabilitation.

\*  $p < .05$ , \*\*  $p < .005$

Bold values are statistical significant

**Table 5** The intensity of transitions from and to medical rehabilitation (MR); Cox proportional hazards regression of relative risk (HRR), and the probability for being on MR (HRR) during a 4-year follow-up after work-related rehabilitation, (n = 584)

	From MR HRR (CI 95 %)	To MR HRR (CI 95 %)	On MR HRR (CI 95 %)
Age	<b>0.93 (0.87–0.98)*</b>	0.93 (0.91–1.01)	0.99 (0.92–1.08)
Gender			
Men	1	1	1
Female	1.10 (0.81–1.43)	1.02 (0.72–1.43)	1.37 (0.97–1.93)
Diagnoses			
Musculoskeletal	1	1	1
Mental	1.15 (0.88–1.50)	1.20 (0.86–1.66)	1.12 (0.81–1.53)
Other	1.20 (0.71–1.98)	1.22 (0.65–2.31)	1.04 (0.55–1.96)
Occupation			
Blue-collar	1	1	1
White-collar	0.85 (0.61–1.21)	0.82 (0.54–1.26)	0.85 (0.57–1.26)
Health and social workers	0.87 (0.60–1.30)	0.93 (0.60–1.51)	0.69 (0.45–1.08)
Education and child care	<b>0.60 (0.40–0.92)*</b>	<b>0.60 (0.36–0.98)*</b>	<b>0.57 (0.35–0.93)*</b>
Service sector	0.75 (0.52–1.10)	0.81 (0.50–1.32)	0.86 (0.54–1.37)
Sick leave length			
0–4 months	1	1	1
5–8 months	<b>1.66 (1.11–2.60)*</b>	<b>1.81 (1.20–2.82)*</b>	<b>2.42 (1.44–4.09)**</b>
9–12 months	<b>1.94 (1.30–2.97)**</b>	<b>2.10 (1.31–3.25)**</b>	<b>3.51 (2.09–5.90)**</b>
>12 months	<b>2.06 (1.33–3.21)**</b>	1.04 (0.61–1.83)	<b>4.42 (2.60–7.54)**</b>

Fully adjusted analysis for age, gender, diagnoses, occupation, and sick leave length before work-related rehabilitation.

\*  $p < .05$ , \*\*  $p < .005$

Bold values are statistical significant

(HRR = 1.84, 95 % CI 1.04–3.25) full DP. Those with other diagnosis (HRR = 4.78, 95 % CI 2.40–9.54) had higher probability for being on full DP compared with musculoskeletal diagnosis. This was also the case for

transition from (HRR = 2.25, 95 % CI 1.24–4.11) and to (HRR = 2.97, 95 % CI 1.51–5.91) full DP. Blue-collar workers had higher risk for being on full DP than education and child care workers, (HRR = 0.28, 95 % CI 0.13–0.59)

**Table 6** The intensity of transitions from and to vocational rehabilitation (VR); Cox proportional hazards regression of relative risk (HRR), and the probability for being on VR (HRR) during a 4-year follow-up after work-related rehabilitation, (n = 584)

	From VR HRR (CI 95 %)	To VR HRR (CI 95 %)	On VR HRR (CI 95 %)
Age	<b>0.84 (0.81–0.91)**</b>	<b>0.84 (0.81–0.91)**</b>	<b>0.76 (0.70–0.83)**</b>
Gender			
Men	1	1	1
Female	1.05 (0.80–1.41)	1.13 (0.83–1.55)	1.09 (0.77–1.54)
Diagnoses			
Musculoskeletal	1	1	1
Mental	1.10 (0.81–1.43)	0.97 (0.71–1.33)	0.95 (0.67–1.36)
Other	0.72 (0.41–1.40)	0.70 (0.35–1.32)	0.84 (0.43–1.66)
Occupation			
Blue-collar	1	1	1
White-collar	<b>0.45 (0.30–0.71)**</b>	<b>0.43 (0.29–0.64)**</b>	<b>0.58 (0.35–0.94)*</b>
Health and social workers	<b>0.60 (0.41–0.85)*</b>	<b>0.50 (0.31–0.71)**</b>	0.77 (0.48–1.22)
Education and child care	<b>0.53 (0.34–0.84)*</b>	<b>0.51 (0.29–0.74)**</b>	0.63 (0.36–1.10)
Service sector	<b>0.70 (0.45–1.01)*</b>	0.67 (0.44–1.03)	0.82 (0.51–1.34)
Sick leave length			
0–4 months	1	1	1
5–8 months	<b>2.31 (1.43–3.73)**</b>	<b>2.33 (1.51–3.62)**</b>	<b>2.21 (1.24–3.96)*</b>
9–12 months	<b>1.98 (1.21–3.24)*</b>	<b>2.06 (1.31–3.31)**</b>	<b>2.20 (1.19–4.06)*</b>
>12 months	<b>2.61 (1.60–4.30)**</b>	<b>1.75 (1.07–2.91)*</b>	<b>3.27 (1.79–6.00)**</b>

Fully adjusted analysis for age, gender, diagnoses, occupation, and sick leave length before work-related rehabilitation.  
\*  $p < .05$ , \*\*  $p < .005$   
Bold values are statistical significant

and health and social workers (HRR = 0.42, 95 % CI 0.21–0.84). Sick leave length before rehabilitation gave higher probability for being on DP; sick leave more than 12 months (HRR = 3.13, 95 % CI 1.51–6.46), but also for transition from and to DP.

All the analyses were also done stratified for gender. There were some minor non-significant differences; the effects for occupations and diagnoses differed slightly between men and women. Except for that, the stratified risk estimates followed, in general, the same pattern as in the total sample. The results from the stratified analyses are therefore not reported in any further detail.

**Discussion**

**Main Results**

The risk for not returning to work and for receiving DP during the 4-year follow-up were associated with blue-collar work, being female, long-term sick leave length before referral to the rehabilitation clinic, and diagnoses other than mental and musculoskeletal. Receiving partial and full DP was also associated with higher age, and those with higher age were more often on partial sick leave. Young age was strongly associated with being on vocational rehabilitation allowance. Moreover, individuals with a mental diagnosis had a higher probability for being on full sick leave, but not for transitions to full sick leave. For

women, the lower probability for being at work than men, was due to a lower probability for transitions to work, whereas they had not at higher probability for leaving work than men.

**Interpretation of the Prognostic Factors**

As expected, older individuals had a higher probability for DP, both full and partial. They also had a higher probability for partial sick leave. There is a well-known, and strong relationship between age and DP [29, 31]. However, we found no associations between age and full sick leave. This is contrary to others who have found that age is a strong predictor for sick leave [32]. Although many studies describe age as a significant risk factor, both for sick leave and DP, research on potential causal mechanisms are lacking [32]. Among the proposed explanations is increased morbidity due to age, exclusion of elderly from the labour market, or a more lenient granting of DP with increasing age [29]. Another explanation for the association between age and DP, may be changes in the age structure in industrial countries [10], however, these changes explain only 5 % of the increase in DP [32]. In this study, we did not find any association between young age and RTW after the rehabilitation program, but it was a higher probability for being on vocational rehabilitation allowance for those with younger age. In a Swedish study, RTW after vocational rehabilitation was found to be higher for the younger age groups, particular for those below 40 years [1]. However, vocational rehabilitation

**Table 7** The intensity of transitions from and to partial disability pension (PDP); Cox proportional hazards regression of relative risk (HRR), and the probability for being on PDP (HRR) during a 4-year follow-up after work-related rehabilitation, (n = 584)

	From PDP HRR (CI 95 %)	To PDP HRR (CI 95 %)	On PDP HRR (CI 95 %)
Age	<b>1.40 (1.22–1.61)**</b>	<b>1.41 (1.23–1.62)**</b>	<b>1.49 (1.30–1.70)**</b>
Gender			
Men	1	1	1
Female	<b>1.66 (1.01–2.75)*</b>	1.45 (0.91–2.40)	<b>1.81 (1.00–3.26)*</b>
Diagnoses			
Musculoskeletal	1	1	1
Mental	0.70 (0.44–1.11)	0.75 (0.46–1.24)	0.82 (0.45–1.49)
Other	1.21 (0.62–2.34)	1.30 (0.60–2.71)	1.50 (0.72–3.10)
Occupation			
Blue-collar	1	1	1
White-collar	0.61 (0.34–1.10)	<b>0.52 (0.30–0.99)*</b>	0.53 (0.26–1.22)
Health and social workers	0.76 (0.40–1.42)	0.91 (0.50–1.71)	0.72 (0.35–1.48)
Education and child care	0.80 (0.41–1.51)	0.64 (0.31–1.32)	0.53 (0.23–1.22)
Service sector	0.71 (0.34–1.33)	0.81 (0.40–1.71)	0.75 (0.33–1.70)
Sick leave length			
0–4 months	1	1	1
5–8 months	0.85 (0.51–1.51)	0.63 (0.31–1.25)	0.52 (0.26–1.05)
9–12 months	1.27 (0.76–2.13)	1.41 (0.76–2.60)	1.06 (0.55–2.03)
>12 months	1.25 (0.71–2.20)	1.20 (0.60–2.31)	1.18 (0.59–2.36)

Fully adjusted analysis for age, gender, diagnoses, occupation, and sick leave length before work-related rehabilitation.

\*  $p < .05$ , \*\*  $p < .005$

Bold values are statistical significant

**Table 8** The intensity of transitions from and to 100 % disability pension (DP); Cox proportional hazards regression of relative risk (HRR), and the probability for being on DP (HRR) during a 4-year follow-up after work-related rehabilitation, (n = 584)

	From DP HRR (CI 95 %)	To DP HRR (CI 95 %)	On DP HRR (CI 95 %)
Age	<b>1.50 (1.30–1.70)**</b>	<b>1.51 (1.31–1.73)**</b>	<b>1.51 (1.32–1.74)**</b>
Gender			
Men	1	1	1
Female	<b>1.90 (1.04–3.50)*</b>	<b>1.84 (1.04–3.25)*</b>	<b>2.08 (1.23–3.49)*</b>
Diagnoses			
Musculoskeletal	1	1	1
Mental	0.75 (0.50–1.20)	1.06 (0.65–1.71)	1.12 (0.69–1.81)
Other	<b>2.25 (1.24–4.11)*</b>	<b>2.97 (1.51–5.91)**</b>	<b>4.78 (2.40–9.54)**</b>
Occupation			
Blue-collar	1	1	1
White-collar	0.80 (0.42–1.50)	0.81 (0.44–1.50)	0.68 (0.39–1.17)
Health and social workers	<b>0.41 (0.21–0.80)*</b>	<b>0.41 (0.20–0.90)*</b>	<b>0.42 (0.21–0.84)*</b>
Education and child care	0.64 (0.32–1.30)	<b>0.51 (0.24–0.98)*</b>	<b>0.28 (0.13–0.59)**</b>
Service sector	0.71 (0.34–1.44)	1.13 (0.61–2.14)	0.79 (0.42–1.48)
Sick leave length			
0–4 months	1	1	1
5–8 months	<b>2.41 (1.25–4.56)*</b>	1.92 (0.97–3.80)	1.92 (0.97–3.80)
9–12 months	1.63 (0.81–3.34)	1.74 (0.85–3.54)	1.27 (0.62–2.60)
>12 months	<b>2.61 (1.32–5.10)**</b>	<b>2.61 (1.26–5.41)*</b>	<b>3.13 (1.51–6.46)**</b>

Fully adjusted analysis for age, gender, diagnoses, occupation, and sick leave length before work-related rehabilitation.

\*  $p < .05$ , \*\*  $p < .005$

Bold values are statistical significant

allowance in Norway may differ from vocational rehabilitation Sweden.

As expected, women had higher probability for receiving both partial and full DP, and a lower probability for working during follow-up. No gender differences were found for sick

leave or for the other benefits. In Norway, and in most countries with high work participation among women, there is a higher rate of sick leave and DP among women [4, 16, 17]. Numerous theories and hypothesis have been suggested to identify the reason for this gender divide [17]. Hypothesis



related to work exposure, gender specific vulnerability, health factors, socio-economic factors and the “double burden” are among the hypotheses that have been proposed [16]. Theories on gender specific patterns in the process towards DP have been suggested. However, a Norwegian study did not reveal any higher risk for women than men, in the transitions from long-term sick leave to DP [16]. For transitions between work, sickness absence, unemployment and DP, only minor gender differences are reported [33]. In the Oslo Health study, the higher rates of DP among women were attributable to self-reported health, level of mental distress, working conditions, and income [34]. This is in contrast to the population-based study in Hordaland (HUSK), where self-perceived health, work factors and family situation did not explain women’s higher likelihood of DP [17]. Thus, results seem to differ between populations and studies and there is still no consensus in how to understand the gender divide in sick leave and DP. Studies on prognostic factors for RTW after diverse work-related rehabilitation interventions, show contradictory results between genders, some with better outcomes for men [1, 35], some with better outcomes for women [23], and some with no gender differences in outcome [5, 13].

Those with a mental diagnosis at the departure from the rehabilitation clinic had a higher probability for full sick leave during follow up, compared to those with musculoskeletal diagnoses. However, the intensity for transitions to full sick leave was higher for those with musculoskeletal diagnoses. This indicates that those with mental diagnoses had longer sick leave spells than the musculoskeletal group. This is in line with studies showing longer duration of sick leave for common mental disorders [36] and longer time to RTW after onset of sick leave for this patient group [37]. We also found a strong probability for full DP among those sick listed with other diagnoses than mental and musculoskeletal. This is not in accordance with previous results from a similar population of rehabilitation patients where medical diagnosis did not predict RTW [13]. According to the literature, sickness absence is due to multifactorial causes and does not depend solely on the disease [38], hence the diagnosis per se may not reflect why so many are on long-term sick leave and why some never return to paid work. Although a medical diagnosis is essential on the sick leave certificate and a premise for receiving sickness benefits and DP, the validity of this diagnosis have been questioned, especially for more complex cases of patients with subjective health complaints [39–41]. Despite this challenge, ICPC is considered a valid diagnostic system. A possible interpretation of the strong risk estimates for DP in our study found for those with other diagnoses, may be the well-defined medical characteristics of this group, as diagnoses related to neurology and heart diseases were the most common. Our findings are

supported by a recent article, which explored how the medical condition influenced acceptance or rejection of the DP application [42]. Applications with well-defined medical conditions were less often rejected than complex musculoskeletal disorders [42]. Also a register based study of long-term sick listed individuals found well-defined diseases in the nervous system, respiratory system, and circulatory system, beside mental diagnosis, to be predictors of DP in a three-year follow-up [8].

As expected, blue-collar work was a main prognostic factor for not returning to work and for receiving DP. This group is represented by manual skilled and unskilled work, and the workers have often low education and high physical workload. Unfortunately we have no information about level of education in this sample. It is yet reason to believe that our findings support the social gradient in receiving DP, which may be due to an education-based selection into the work force [43]. This is in accordance with the HUSK-study, where it was a higher risk of DP among skilled and unskilled manual workers, also after adjusting for health and other work-related factors [44]. However, this is in contrast with results after a rehabilitation program for individuals on long-term sick leave, where women working in blue-collar and service/care occupations had higher RTW at 3-years follow-up, than men [23]. Also, limited evidence has been found for an effect of physically stressful work and long-term sickness absence and DP [32]. There is limited evidence about why and how the social gradient in blue-collar occupations may affect future DP, and results seem to differ between studies and populations.

Our finding, that long sick leave length before referral to the rehabilitation clinic was a strong risk factor for not returning to work, for receiving medical and vocational rehabilitation allowances, and for DP during follow-up is in accordance with the literature [1, 5, 19, 21]. The probability for transition both from and to work during follow-up was highest for those with the shortest sick leave spells, indicating that short sick leave spells may be a risk for new sick leave spells. Those with the longest sick leave length before the rehabilitation program had a lower probability for transitions from and to full sick leave, and for being on full sick leave during the follow-up. This may be understood as an effect of the “system rules”, since it is not possible to be on sick leave benefits for more than 1 year. After 1 year the sick leave recipient will be transferred to a rehabilitation allowance, and the income decreases from 100 % compensation to 66 %.

#### Partial Sick Leave and Partial Disability Pension

Partial sick leave was associated with higher age and with shorter sick leave length before rehabilitation. The probability for transitions to partial sick leave decreased with length of the sick leave. This indicates that partial sick

leave is used in combination with shorter sick leave spells. For partial DP there was an association with higher age. In addition, women had higher probability for receiving partial DP, but also for transitions from partial DP, indicating that partial DP may be a transitory benefit. The detected association between partial benefits, higher age, and being a female, is in accordance with the results from a Swedish study [45]. When sick leave and DP is combined with part time work, it may be beneficial, because work is considered to be generally good for the individual's health and well-being [46]. Partial sick leave has been put forward as a treatment method for full recovery to the workforce [45].

### Clinical Implications

The study population was a selective sample of individuals who had participated in a comprehensive work-related rehabilitation program after long-lasting sick leave. They were all at a later stage of the process of sickness absence and probably had complex problems with health, low work ability and maybe a weak connection to the work place. Therefore, our findings may not be generalized to sick-listed individuals in general. Nevertheless, it is important to achieve more insight in the processes leading to RTW or to DP for this selective sample of patients.

This study was not designed to test the effect of the intervention or to conclude which patients should be selected into such programs. Still, we believe that knowledge on prognostic factors and vulnerable groups may be essential for the referrals to comprehensive rehabilitation programs, for the planning of individual treatment during the rehabilitation program and for better tailoring and coordinating of follow-up interventions after such programs. Our findings that those with a mental diagnosis had a higher probability for being on full sick leave, but not for entering sick leave, suggest that special attention should be on RTW difficulties. Likewise, the higher risk of DP for those with other and more specific diagnoses may indicate that special attention should be on factors preventing DP. The findings should be of both national and international interest for the rehabilitation teams and the stakeholders, such as the general practitioners, the occupational physicians, or the social security officers, to better judge the risk factors for not returning to work, and to implement relevant interventions. It cannot be concluded that the rehabilitation program offered did fit less with the needs of blue collar workers, women, older participants, and those with other diseases than mental or musculoskeletal diseases. As stated in the introduction, RTW after long-term sick leave may be a complex process [27], and there may be interaction effects between different prognostic factors for RTW and sickness benefits. In addition to factors on socio-demography, work and health, also personal factors related to

earlier experiences and expectations may influence the prognosis for recovery and RTW [25].

### Strengths and Limitations

To our knowledge this is the first study to explore prognostic factors for transitions between work and all possible sickness benefits during a long follow-up period after a work-related rehabilitation program. The probability for any event during follow-up is a synthesis of all transitions in and out of this event, and thus we captured the whole RTW process in the prognostic models. Access to register data and socio-demographic data from the patient journals made it possible to track the total cohort of rehabilitation patients during the whole follow-up period without any drop-outs or missing data.

The study would have benefited even more if the patient journals had information about education, since the education divide may be an explanation why those with manual work have higher risk of DP [43, 44]. Workplace context may also differ between different occupations and may as such be an important barrier or a facilitator for work resumption [27]. However this study only includes information about occupation; no information on work-related factors such as psychosocial factors, work tasks, or work environment was included. Access to secondary diagnosis could also have strengthened the analysis, since it is recognized that many of the rehabilitation patients have comorbid conditions, which is an independent risk factor for long-term incapacity for work [26]. It is also a limitation that the official registers utilized in this study did not give access to unemployment benefits. However, the number of people on unemployment benefits in Norway is very low, and this was also outside the scope of this study. Additionally the register data contains little information on whether a person is actually working or not. We defined work to be the time gap between dates of different sickness benefits in the register files. Based on our analysis, we believe this to be a correct and valid interpretation [28].

### Conclusions

Among subgroups of long-term sick-listed rehabilitation patients, there were differences in the probabilities for RTW, sickness benefits and DP after participating in a work-related rehabilitation program. Blue-collar workers, women, those with previous long-term sick leave, and those with diagnoses other than mental and musculoskeletal, had a lower probability for being at work and a higher probability for full DP during follow-up. Mental diagnoses gave higher probability for being on full sick leave, but not for transitions to sick leave. The current study adds to the

literature by new insight into prognostic factors for transitions to and from work and sickness benefits, and how this differ between groups. However, there are still unexplained differences in the long-term RTW prognosis between men and women, occupations, medical diagnoses and different age groups. Possible interaction effects between these predictors should be investigated further, especially on how these findings are influenced by personal factors and a social gradient in health and working life. Further research is required to understand more about why there are differences in the transitions to and from work and different sickness benefits after intensive work-related rehabilitation efforts, between long-term sick listed men and women, different occupations and diagnoses.

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**Conflict of interest** The authors of this manuscript claim to have no conflicts of interest including any financial, personal or other relationships with other people or organizations that could inappropriately influence this work.

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**Table 1.** Schematic overview of the material and methods employed in the three papers of the present thesis.

Aims	Sample (response rate) %	Study design	Independent variables	Dependent variables	Statistical analyses
<b>Paper 1</b>					
<p>(i) To identify the prognostic value of health complaints, education, illness perceptions, fear avoidance beliefs, and coping for non-working after work rehabilitation.</p> <p>(ii) To explore the inter-relationship between these variables.</p> <p>(iii) To identify which of the variables could explain the highest variance in the main predictor of non-working.</p>	n=135 (79%)	Prospective cohort with follow-up at 3 months and at 12 months	Age, gender, education, SHC, cognitions (FABQ and IPQ), coping (GPSES, UCL, "coping", Hopelessness)	(i) Work-related activity (ii) Non-working at 3 and 12 months follow-up	Logistic regression, and Hierarchical multiple regression
<b>Paper 2</b>					
To test a mediation model where fear avoidance beliefs for work were hypothesized to mediate the effect of musculoskeletal and pseudoneurological health complaints, functional ability, and education on continued sick leave during follow-up after work rehabilitation.	n=1155 (89%)	Prospective cohort with 3 years and 4 months follow-up	Total days of previous sick leave last 2 years, education, SHC, functional ability, FABW	Total days on sickness benefits during 3 years and 4 months follow-up	Structural equation modeling (SEM-analyses)
<b>Paper 3</b>					
To examine if age, gender, diagnosis, occupation, and previous sick leave predicted different probabilities of being at work and of registered sickness benefits, and differences in the transitions between any of these states during follow-up after work rehabilitation.	n=584 (95%)	Prospective cohort with 4 years follow-up	Age, gender, diagnosis, occupation, previous sick leave	Full work, partial SL/MR, full SL, MR, VR, partial DP, full DP	Proportional hazards regression models
Abbreviations: SHC: Subjective health complaints, FABQ: Fear avoidance beliefs questionnaire, FABW: Fear avoidance beliefs for work, IPQ: Illness perceptions questionnaire, GPSES: General perceived self-efficacy scale, UCL: Utrecht coping list, SL: sick leave, MR: medical rehabilitation allowance, VR: vocational rehabilitation allowance, DP: disability pension.					



Irene Øyeflaten

3864 RAULAND

Vår dato: 14.08.2003

Vår ref: 200300698 GHA /RH

Deres dato:

Deres ref:

## KVITTERING FRA PERSONVERNOMBUDET

Vi viser til melding om behandling av personopplysninger, mottatt 31.07.2003. Meldingen gjelder prosjektet:

*10203 Mestring hos langtidsykemeldte*

Norsk samfunnsvitenskapelig datatjeneste AS er utpekt som personvernombud av Universitetet i Oslo, jf. personopplysningsforskriften § 7-12. Ordningen innebærer at meldeplikten til Datatilsynet er erstattet av meldeplikt til personvernombudet.

### Personvernombudets vurdering

Etter gjennomgang av meldeskjema og dokumentasjon finner personvernombudet at behandlingen av personopplysningene vil være regulert av § 7-25 i personopplysningsforskriften. Dette betyr at behandlingen av personopplysningene vil være unntatt fra konsesjonsplikt etter personopplysningsloven § 33 første ledd, men underlagt meldeplikt etter personopplysningsloven § 31 første ledd, jf. personopplysningsforskriften § 7-20.

Unntak fra konsesjonsplikten etter § 7-25 gjelder bare dersom vilkårene i punktene a) – e) alle er oppfylt:

- a) førstegangskontakt opprettes på grunnlag av offentlig tilgjengelige registre eller gjennom en faglig ansvarlig person ved virksomheten der respondenten er registrert,
- b) respondenten, eller dennes verge dersom vedkommende er umyndig, har samtykket i alle deler av undersøkelsen,
- c) prosjektet skal avsluttes på et tidspunkt som er fastsatt før prosjektet settes i gang,
- d) det innsamlede materialet anonymiseres eller slettes ved prosjektavslutning,
- e) prosjektet ikke gjør bruk av elektronisk sammenstilling av personregistre.

Personvernombudets vurdering forutsetter at prosjektet gjennomføres slik det er beskrevet i vedlegget.

### **Ny melding**

Det skal gis ny melding dersom behandlingen endres i forhold til de punktene som ligger til grunn for personvernombudets vurdering.

Selv om det ikke skjer endringer i behandlingsopplegget, skal det gis ny melding tre år etter at forrige melding ble gitt dersom prosjektet fortsatt pågår.

Ny melding skal skje skriftlig til personvernombudet.

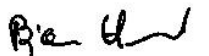
### **Offentlig register**

Personvernombudet har lagt ut meldingen i et offentlig register, [www.nsd.uib.no/personvern/register/](http://www.nsd.uib.no/personvern/register/)

### **Ny kontakt**

Personvernombudet vil ved prosjektets avslutning, 31.10.2004, rette en henvendelse angående arkivering av data benyttet i prosjektet.

Vennlig hilsen

  
Bjørn Henrichsen

  
Grethe Halvorsen

Kontaktperson: Grethe Halvorsen tlf: 55583542

Vedlegg: Personvernombudets vurdering

Kopi: Behandlingsansvarlig Hege Randi Eriksen



# Prosjektbeskrivelse

**Behandlingsansvarlig:**

Hege Randi Eriksen

Institutt for biologisk og medisinsk psykologi  
Universitetet i Bergen

Årstadveien 21

5009 BERGEN

**Daglig ansvar/prosjektleder:**

Irene Øyeflaten

Seksjon for helsefag  
Universitetet i Oslo

Postboks 1153 Blindern

0316 OSLO

## 10203 Mestring hos langtidssykemeldte

Formålet med prosjektet er å undersøke

- 1) om det er sammenheng mellom det å være sykemeldt og ha lav mestringsevne,
- 2) om en 4-ukers tverrfaglig intervensjonsmodell etter en aktørmodell bedrer mestringsevnen og
- 3) om en eventuell bedret mestringsevne fører tilbake til yrkesaktivitet og om dette holder seg 1 år etter intervensjon.

Prosjektet har startet opp. Personvernombudet minner om at forskningsprosjekt hvor det skal behandles personopplysninger skal meldes før datainnsamlingen settes i gang.

Utvalget omfatter alle brukere ved Attføringscenteret i Rauland (AIR) som ble tatt inn i løpet av en 3 måneders periode sommeren 2002, rundt 130 personer over 18 år. Førstegangskontakt med utvalget ble opprettet av legesekretæren ved senteret som sendte ut informasjonsskriv om prosjektet sammen med brev om inntak (jf. pkt. a).

Til nå er det samlet inn opplysninger gjennom spørreskjema ved 2 måneder før inntak, etter 4-ukers intervensjon (det vil si ved utskrivning) samt gjennom et 3-måneders tilbakemeldingsskjema fra bruker.

Fra spørreskjemaene er det samlet inn opplysninger om kjønn, alder, utdanning, antall barn, fysisk form, trening, arbeid og smerter, røyk og alkohol, søvn, helseproblemer siste 30 døgner, sykdomsforståelse, oppfatning av egne plager og årsakene til plagene, helsebekymringer, evne til problemløsning, takling av problem og ubehagelige hendelser, trening og oppholdet ved AIR.

Utvalget skal nå, 1 år etter utskrivning, besvare et nytt spørreskjema som handler om mange av de samme spørsmålene som tidligere samt et skjema om nåværende arbeidssituasjon og eventuelle økonomiske ytelser. I tillegg skal det kobles på opplysninger vedrørende sykemeldingsforhold fra saksrapporten ved trygdekantoret og opplysninger om diagnose, sykemeldingslengde og yrke fra journalen ved AIR.

Det er registrert sensitive personopplysninger i form av helseopplysninger (jf. POL § 2 pkt. 8 c).

Opplysningene er registrert på isolert pc og pc i nettverk. Direkte personidentifiserbare opplysninger er erstattet med et referansenummer som viser til en navneliste. Listen oppbevares atskilt fra det øvrige datamaterialet. Ved prosjektslutt skal opplysningene anonymiseres slik at det ikke er mulig å direkte eller indirekte identifisere enkeltpersoner i materialet (jf. pkt. d).

Ved de første datainnsamlingene fikk utvalget skriftlig informasjon om at det skulle gjøres en brukerundersøkelse ved AIR og at dataene skal analyseres ved Universitetet i Bergen. I og med at dataene også skal inngå i prosjektleders hovedfagsprosjekt med ovennevnte problemstillinger og i og med at journal- og tryggedata skal kobles på spørreskjemadataene, vil prosjektleder nå sende ut ytterligere informasjon om prosjektet og innhente samtykke til ovennevnte (jf. pkt. b).

Det skal ikke gjøres bruk av elektronisk sammenstilling av personregistre (jf. pkt. e).

Prosjektslutt er angitt til 31.10.2004 (jf. pkt. c).

Personvernombudet opplyser om at prosjektleder bør ta kontakt med Regional komité for medisinsk forskningsetikk (REK) for å forhøre seg om prosjektet er fremleggelsespliktig. Dersom prosjektet er fremleggelsespliktig, legger ombudet til grunn for sin vurdering at prosjektet sendes til REK. Ombudet ber i så fall om å få ettersendt en kopi av REKs svar når prosjektleder mottar dette.

UNIFOB HELSE	
SAK NR. 07/4265	DOK. NR. 3
ARKIV NR. 482	MOTTATT 06.03.07



Harald Hårfagres gate 29  
N-5007 Bergen  
Norway  
Tel: +47-55 58 21 17  
Fax: +47-55 58 96 50  
nsd@nsd.uib.no  
www.nsd.uib.no  
Org.nr. 985 321 884

Hege Randi Eriksen  
Unifob Helse  
UNIFOB AS  
Christiesgt. 13  
5015 BERGEN

Vår dato: 01.03.2007

Vår ref: 16139/SM

Deres dato:

Deres ref:

### TILRÅDING AV BEHANDLING AV PERSONOPPLYSNINGER

Vi viser til melding om behandling av personopplysninger, mottatt 12.01.2007. Meldingen gjelder prosjektet:

16139 *Vil selvrapportert funksjonsevne, arbeidsbeskrivelse, subjektive helseplager og smerterelatert frykt gi et klinisk og prediktivt bidrag for tilbakeføring til arbeid hos langtidssykmeldte individer, etter arbeidsfattet rehabiliter?*

Behandlingsansvarlig *UNIFOB AS, ved institusjonens øverste leder*  
Daglig ansvarlig *Hege Randi Eriksen*

Personvernombudet har vurdert prosjektet, og finner at behandlingen av personopplysninger vil være regulert av § 7-27 i personopplysningsforskriften. Personvernombudet tilrår at prosjektet gjennomføres.

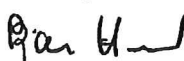
Personvernombudets tilråding forutsetter at prosjektet gjennomføres i tråd med opplysningene gitt i meldeskjemaet, korrespondanse med ombudet, eventuelle kommentarer samt personopplysningsloven/-helseregisterloven med forskrifter. Behandlingen av personopplysninger kan settes i gang.


Det gjøres oppmerksom på at det skal gis ny melding dersom behandlingen endres i forhold til de opplysninger som ligger til grunn for personvernombudets vurdering. Endringsmeldinger gis via et eget skjema, <http://www.nsd.uib.no/personvern/endrings skjema>. Det skal også gis melding etter tre år dersom prosjektet fortsatt pågår. Meldinger skal skje skriftlig til ombudet.

Personvernombudet har lagt ut opplysninger om prosjektet i en offentlig database, <http://www.nsd.uib.no/personvern/register/>

Personvernombudet vil ved prosjektets avslutning, 31.12.2020 rette en henvendelse angående status for behandlingen av personopplysninger.

Vennlig hilsen

  
Bjørn Henrichsen

  
Siv Midthassel

Kontaktperson: Siv Midthassel tlf: 55 58 83 34

Vedlegg: Prosjektvurdering



## Prosjektvurdering - Kommentar

---

16139

Ombudet forstår det slik at Unifob er behandlingsansvarlig for prosjektet og at deltakende sentre bistår med datainnsamling og oppbevaring på vegne av Unifob. Det forutsettes at denne behandling/ansvarsfordeling formelt er avklart mellom institusjonene.

Det legges til grunn at utvalget informeres om alle sider av prosjektet, jf. telefonsamtale med prosjektleder 28.02.2007. Det forutsettes at følgende opplysninger fremgår av informasjonsskrivet:

- prosjektleders kontaktadresse (ved evt spørsmål)
- at deltakelse ikke vil få konsekvenser for behandlingen ved senteret (tydeliggjør hva som er del av behandling (første spørreskjema) og hva som er forskning)
- prosjektets varighet og hva som vil skje med data ved prosjektslutt (for brukere: at datamaterialet anonymiseres 31.12.2020 dersom ikke annet er avtalt med den enkelte, for teammedlemmer: at personopplysninger anonymiseres innen 31.12.2011)
- mulighet for å bli kontaktet for evt oppfølgingsundersøkelse innen prosjektslutt
- at opplysninger behandles konfidensielt og at prosjektmedarbeidere har taushetsplikt (ikke anonym behandling og uten henvisning til helsepersonelloven)

Det kan med fordel fremgå at prosjektet er til rådd av Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste.

Det forutsettes at det utformes et eget skriv med tilsvarende informasjon til teammedlemmer. Informasjonen kan gis skriftlig eller muntlig. Som avtalt med prosjektleder ettersendes reviderte informasjonsskriv før de utdeles til utvalget.

Fra NAV innhentes Trygdedata om sykefravær og yrkesaktivitet ved 3 måneder, 12 måneder og inntil 10 år etter oppholdet.

Det registreres indirekte personidentifiserbare opplysninger om teammedlemmer, herunder stilling i kombinasjon med navngitt institusjon. Opplysninger for teammedlemmer anonymiseres innen 31.12.2011 ved at indirekte personidentifiserbare opplysninger fjernes/tilstrekkelig kategoriseres.

Det øvrige datamaterialet anonymiseres ved prosjektslutt dersom ikke annet er avtalt med den enkelte. Prosjektslutt er satt til 31.12.2020. Det kan bli aktuelt å kontakte utvalget for evt oppfølgingsundersøkelse. Det legges til grunn at utvalget er informert om dette. Dersom det ikke foreligger nytt samtykke til videre deltakelse innen prosjektslutt 31.12.2020 vil datamaterialet anonymiseres ved at verken direkte eller indirekte personidentifiserbare opplysninger fremgår, navneliste/koblingsnøkler slettes. Anonymisering innebærer videre at manuelle skjema destrueres og at organisasjonsnummer og referansenummer (som tilsvarende ARR-referansenummer) slettes.

Det må sendes egen melding for evt oppfølgingsstudie i god tid før utvalget kontaktes og innen prosjektslutt. Det forutsettes at de nødvendige tillatelser foreligger før evt oppfølgingsstudie igangsettes.

Personvernombudet legger til grunn at prosjektet er tilrådd av Regional komité for medisinsk forskningsetikk før datainnsamling starter og ber prosjektleder ettersende kopi av tilråding når denne foreligger.



# UNIVERSITETET I BERGEN

Regional komité for medisinsk forskningsetikk, Vest-Norge (REK Vest)

Professor Hege Randi Eriksen  
Unifob helse og institutt for utdanning og helse, UiB  
Christies gate 13  
5015 BERGEN

Deres ref

Vår ref  
026.07 – 07/1291/ars

Dato  
21.03.2007.

**Ad. prosjekt: Norsk tittel: Vil selvrapportert funksjonsevne, arbeidsbeskrivelse, subjektive helseplager og smerterelatert frykt gi et klinisk og prediktivt bidrag for tilbakeføring til arbeid hos langtidssykmeldte individer, etter arbeidsrettet rehabilitering? (026.07).**

Det vises til ditt svarbrev datert 12.03.07 med vedlagt reviderte informasjonsskriv.

REK Vest v/leder har vurdert saken.

Informasjonsopplegget virker fortsatt noe rotete. I skrivet som heter "Forespørsel om å delta..." er noen opplysninger om hva deltakelse innebærer tatt inn, mens der også er et annet skriv som heter "Informasjon om forskningsprosjektet" hvor en del andre opplysninger er tatt inn. All vesentlig informasjon om prosjektet, dvs. opplysninger som er av betydning for et eventuelt valg om å delta, bør være i samme skriv; i Forespørselen om å delta. Samtykkeerklæringen bør også komme i forlengelsen av dette dokumentet. Foruten opplysninger om at en skal fylle ut spørreskjema osv. må en ta inn opplysningene om lagring/kobling osv, og at data lagres i 10 år. I opplysningene om frivillighet må det også fremgå at dersom samtykket trekkes tilbake, kan en også få slettet eller anonymisert de opplysninger som er lagret, slik at de ikke kan benyttes i videre koplinger.

Studien er da endelig klarert fra denne komité sin side.

Vi ønsker dere lykke til med gjennomføringen og minner om at komiteen setter pris på en sluttrapport, eventuelt en kopi av trykt publikasjon når studien er fullført.

Med vennlig hilsen

  
Jon Lekven  
leder

  
Arne Salbu  
sekretær



Unifo Helse  
UNIFOB AS  
Christiesgt 13  
5015 BERGEN

Att.: Irene Øyeflaten

Deres ref:

Vår ref:

07/14587-1  
Saksbehandler: Tone  
Gangnæs

Vår dato: 22.10.07

## Vedtak om dispensasjon fra taushetsplikten for forskningsprosjektet "Egenopplevelser og tilbakevending av sykmeldte til arbeidet"

Vi viser til søknad av 23. august 2007 om dispensasjon fra taushetsplikten i forbindelse med ovennevnte prosjekt.

Målet med prosjektet er å undersøke om selvrapportert funksjonsevne, arbeidsbeskrivelse, subjektive helseplager og smerterelatert frykt kan gi et klinisk og prediktivt bidrag til arbeid etter arbeidsrettet rehabilitering. Undersøkelsen gjennomføres ved å beskrive og sammeligne brukere ved ulike rehabiliteringsinstitusjoner i Norge, ved bruk av spørreskjema blant brukerne og bruk av registerdata. I den forbindelse søkes det om mulighet for innhenting av trygdedata om sykefravær og yrkesaktivitet i forkant av og ved 3 måneder, 12 måneder og inntil 10 år etter rehabiliteringsoppholdet. Det ønskes tilgang til følgende registerdata fra Arbeids- og velferdsetaten; sykepenge, rehabilitering/attføring, uførestønader og dagpenger ved arbeidsledigheter med start og stopp dato for alle de ulike ytelsene.

Til søknaden er vedlagt tilråding av behandling av personopplysninger fra personvernombudet ved Norsk samfunnsvitenskaplig datatjeneste AS, datert 1. mars 2007. Det er blitt foretatt de nødvendige avklaringer fra Regional komite for medisinsk forskningsetikk, Vest Norge, som har gitt sin tilråding i brev av 21. mars 2007.

De omsøkte opplysninger skal utleveres til forskningsprosjektet er aidentifiserte registerdata, men på grunn av muligheten for identifiserbare forekomster er opplysningene underlagt taushetsplikt, jf arbeids og velferdsforvaltningslovens § 7. Etter forvaltningslovens § 13 d har NAV fullmakt til å dispensere fra taushetspliktbestemmelser i forbindelse med opplysninger til bruk for forskning.

NAV er etter en helhetsvurdering kommet frem til at det er rimelig å gi slik dispensasjon. Opplysningene utleveres aidentifisert til forskningsprosjektet som tilsier at det er en mindre risiko for at enkeltpersoner kan identifiseres. Personvern hensyn antas derfor å være tilstrekkelig ivaretatt.

NAV er av den oppfatning at utleveringen ikke utgjør en uforholdsmessig ulempe for de personer som undersøkelsen er ment å omfatte jf. forvaltningsloven § 13 d første ledd. Det gis derfor dispensasjon fra taushetsplikten, men under forutsetning av at følgende vilkår overholdes jf. forvaltningsloven § 13 d annet ledd:

1. Rapport eller annen publisering av undersøkelsen må ikke inneholde personidentifiserbare opplysninger. Vi legger til grunn at personantall under fem medfører fare for personidentifisering.
2. Vi forutsettes at de tilrådninger som er gitt av Personvernombudet og regional medisinsk forskningsetisk komite følges.
3. Utlevering av opplysninger og kostnader knyttet til slik utlevering må ev. være avklart og avtalt med Statistisk Sentralbyrå.
4. Det er en viss mulighet for at de avpersonifiserte opplysningen kan identifisere enkeltpersoner. Søkeren og andre deltakere i prosjektet pålegges taushetsplikt etter reglene i arbeids- og velferdsforvaltningslovens § 7 og forvaltningsloven § 13e.
5. Det omtalte materialet kan bare være tilgjengelig for de som trenger dette i forbindelse med det konkrete forskningsprosjektet.
6. Alt materiale som ikke er anonymisert, og der identifikasjon kan være mulig, må oppbevares innelåst eller tilsvarende elektronisk sikret. Søkeren må påse at opplysningen oppbevares slik at de ikke kommer utvedkommende i hende, og makuleres forsvarlig når prosjektet er gjennomført.

Dette vedtaket kan påklages innen 3 uker, jf. forvaltningslovens § 29. Klagen fremsettes for Arbeids- og velferdsetaten v/NAV drift og utvikling, som forbereder klagesaken til Arbeids- og inkluderingsdepartementet.



Eventuelle henvendelser for datautlevering kan rettes til Seksjon for Statistikk og utredning i Arbeids- og velferdsdirektoratet, Postboks 5 St. Olavs plass, 0130 Oslo (e-postadresse: [nav.statistikk.utredning@nav.no](mailto:nav.statistikk.utredning@nav.no)).

Med hilsen  
NAV drift og utvikling  
Fagavdeling Fag, drift og utvikling

  
Sven Ove Svensson  
Avdelingsdirektør

  
Morten N. Skogvik

Kopi: Seksjon for Statistikk og utredning, Arbeids- og velferdsdirektoratet



# UNIVERSITETET I OSLO

DET MEDISINSKE FAKULTET

Ottar Berg  
Postadresse  
Postnr. og -sted

**Dato:** 09.11.04  
**Deres ref.:**  
**Vår ref.:** S-04210

**Regional komité for medisinsk forskningsetikk**  
**Sør- Norge (REK Sør)**  
Postboks 1130 Blindern  
NO-0318 Oslo

Telefon: 228 44 666  
Telefaks: 228 44 661  
E-post: [rek-2@medisin.uio.no](mailto:rek-2@medisin.uio.no)  
Nettadresse: [www.etikkom.no](http://www.etikkom.no)

## **Treårs oppfølging AIR (Attføringssettret i Rauland)**

Vi takker for brev datert 21.10.04 med vedlegg.

Komiteen tar svar på merknader til etterretning, og avventer en eventuell ny søknad til prosjektets del 2.

Komiteen tilrår at prosjektet gjennomføres.

Vi ønsker lykke til med prosjektet!

Med vennlig hilsen

Sigurd Nitter-Hauge (sign)  
Professor dr.med.  
Leder

Tone Haug  
Rådgiver  
Sekretær



Attføringscenteret i Rauland AS  
v/ Ottar Berg  
3864 RAULAND

Datatilsynet	
2004/1803-7	
14 APR. 2005	
AN.	434.1
Saksb. HPG	Avskr.

Deres ref

Vår ref (bes oppgitt ved svar)  
2004/1803-~~6~~ HPG/-  
7

Dato  
04.04.2005

## KONSESJON TIL Å BEHANDLE PERSONOPPLYSNINGER- OMGJØRING AV TIDLIGERE VEDTAK

Datatilsynet viser til Deres søknad av 14.12.2004 om konsesjon til å behandle personopplysninger og etterfølgende korrespondanse i saken, senest innvilget konsesjon av 24.02.2005 og e-post av 04.03.2005.

I telefon av 04.03.2005 gjør De saksbehandler oppmerksom på at De likevel ikke trenger å innhente informasjon fra AETAT. Dette gikk også frem av brev av 08.02.2005 som ble oversendt tilsynet per e-post. Det betyr at deltakerne i prosjektet er fullt ut informert om hvor personopplysninger hentes fra. Datatilsynet har vurdert saken på nytt og funnet grunnlag for å omgjøre deler av vedtaket, jf. forvaltningslovens § 33.

Datatilsynet har vurdert søknaden og gir Dem med hjemmel i personopplysningsloven § 33, jf. § 34, konsesjon til å behandle personopplysninger til følgende formål: "3-års oppfølging etter yrkesrettet, multidisiplinær, kognitiv tilnærming til langtidssykemeldte brukere med sammensatte problemer – en retrospektiv undersøkelse".

Behandlingsansvarlig er Attføringscenteret i Rauland AS (AIR) ved øverste leder. Gjennomføringen av det daglige ansvaret kan delegeres.

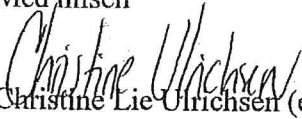
Konsesjonen er gitt under forutsetning av at behandlingen foretas i henhold til søknaden og de bestemmelser som følger av personopplysningsloven med forskrifter.


Dersom det skjer endringer i behandlingen i forhold til de opplysninger som er gitt i søknaden, må dette fremmes i ny konsesjonssøknad. Det presiseres at konsesjonen, i samsvar med søknaden, er tidsbegrenset til **28.02.2006**. Personidentifiserbare data må da slettes eller anonymiseres. Med bakgrunn i lang saksbehandlingstid, er tidsfristen er satt noe lenger enn det omsøkte.

Datatilsynet tar forbehold om at konsesjonen kan bli trukket tilbake eller at nye og endrede vilkår kan bli gitt dersom dette er nødvendig ut fra personvern hensyn.

Vedtaket kan påklages til Personvernemnda medhold av helseregisterloven § 36 jf. personopplysningsloven § 42 fjerde ledd jf. forvaltningsloven §§ 28 flg., se vedlagte informasjonsskriv om klageretten. En eventuell klage må oversendes Datatilsynet innen tre-3-uker fra mottagelsen av dette brev.

Med hilsen

  
Christine Lie Ulrichsen (e f)  
seniorrådgiver

  
Hanne P. Gulbrandsen  
seniorrådgiver  
(saksbehandler,  
telefon 22 39 69 00)

kopi: NSD ved personvernombudet (deres ref. 200400878 LT/RH)

Arkiv  
3005



Harald Hårfagres gate 29  
N-5007 Bergen  
Norway  
Tel: +47-55 58 21 17  
Fax: +47-55 58 96 50  
nsd@nsd.uib.no  
www.nsd.uib.no  
Grunnr. 985 321 834

Ottar Berg  
Spesialsykehuset for rehabilitering Stavem  
Rikshospitalet HF  
Postboks 160  
3291 STAVERN

Dato: 2. november 2006

Vår ref: 11306 GT/MLR

Deres dato:

Deres ref:

## OVERFØRING AV OPPFØLGINGSANSVAR TIL PERSONVERNOMBUDET VED RIKS- HOSPITALET HF

Vi viser til tidligere korrespondanse i forbindelse med prosjektmelding for forskningsprosjektet:

11306 3 års oppfølging etter yrkesrettet, multidisiplinær kognitiv tilnærming til langtidssykereldte brukere med sammensatte problemer – en retrospektiv undersøkelse

Rikshospitalet HF har etablert en egen ordning med internt ombud for behandling av personopplysninger i forskning, og har sagt opp avtalen om at NSD skal fungere som personvernombud for forskningsprosjekter ved institusjonen. Fra 1. august 2006 har Personvernombudet ved Rikshospitalet HF overtatt ansvaret for videre oppfølging av ovennevnte prosjekt. NSD har oversendt opplysninger om prosjektet til ombudet ved Rikshospitalet HF. Spørsmål om prosjektet eller personvernombudsordningen ved Rikshospitalet HF kan rettes til:

Personvernombud ved Rikshospitalet HF  
Aksel Sogstad, tlf.: 23 07 50 34  
E-post: aksel.sogstad@rikshospitalet.no

Vennlig hilsen

Vigdis Kvalheim

Geir Teigland



Datatilsynet  
Postboks 8177 Dep.  
0034 Oslo

Dato: 23.08.2006

Vår ref: 11306 GT/RH

Deres dato:

Deres ref: 2004/1803-5 HPG/-

## FORLENGELSE AV KONSESJON

Viser til konsesjon for prosjektet:

11306      *3 års oppfølging etter yrkesrettet, multidisiplinær kognitiv tilnærming til langtidssykemeldte brukere med sammensatte problemer - en retrospektiv undersøkelse*

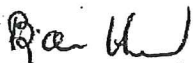
Prosjektleder: Ottar Berg

Personvernombudet mottok 12.07.2006 tilbakemelding på statushenvendelse til prosjektleder for ovennevnte prosjekt. Prosjektleder opplyser overfor ombudet at prosjektets første del nå er i innspurtsfasen, og at det er behov for en noe utvidet prosjektperiode for å ferdigstille analysene.

Prosjektleder opplyser at det i første omgang er behov for en utvidelse av prosjektperioden frem til 01.11.2006, eventuell avslutning eller ytterligere videreføring vil da være avklart. Videreføring forutsetter at prosjektet meldes særskilt til personvernombudet.

Personvernombudet anbefaler at prosjektets konsesjon blir forlenget.

Vennlig hilsen

  
Bjørn Henrichsen

  
Geir Teigland

✓ Kopi: Ottar Berg

**Doctoral Theses at The Faculty of Psychology,**  
**University of Bergen**

<b>1980</b>	Allen, H.M., Dr. philos.	Parent-offspring interactions in willow grouse ( <i>Lagopus L. Lagopus</i> ).
<b>1981</b>	Myhrer, T., Dr. philos.	Behavioral Studies after selective disruption of hippocampal inputs in albino rats.
<b>1982</b>	Svebak, S., Dr. philos.	The significance of motivation for task-induced tonic physiological changes.
<b>1983</b>	Myhre, G., Dr. philos.	The Biopsychology of behavior in captive Willow ptarmigan.
	Eide, R., Dr. philos.	PSYCHOSOCIAL FACTORS AND INDICES OF HEALTH RISKS. The relationship of psychosocial conditions to subjective complaints, arterial blood pressure, serum cholesterol, serum triglycerides and urinary catecholamines in middle aged populations in Western Norway.
	Værnes, R.J., Dr. philos.	Neuropsychological effects of diving.
<b>1984</b>	Kolstad, A., Dr. philos.	Til diskusjonen om sammenhengen mellom sosiale forhold og psykiske strukturer. En epidemiologisk undersøkelse blant barn og unge.
	Løberg, T., Dr. philos.	Neuropsychological assessment in alcohol dependence.
<b>1985</b>	Hellesnes, T., Dr. philos.	Læring og problemløsning. En studie av den perseptuelle analysens betydning for verbal læring.
	Håland, W., Dr. philos.	Psykoterapi: relasjon, utviklingsprosess og effekt.
<b>1986</b>	Hagtvet, K.A., Dr. philos.	The construct of test anxiety: Conceptual and methodological issues.
	Jellestad, F.K., Dr. philos.	Effects of neuron specific amygdala lesions on fear-motivated behavior in rats.
<b>1987</b>	Aarø, L.E., Dr. philos.	Health behaviour and sosioeconomic Status. A survey among the adult population in Norway.
	Underlid, K., Dr. philos.	Arbeidsløyse i psykososialt perspektiv.
	Laberg, J.C., Dr. philos.	Expectancy and classical conditioning in alcoholics' craving.
	Vollmer, F.C., Dr. philos.	Essays on explanation in psychology.
	Ellertsen, B., Dr. philos.	Migraine and tension headache: Psychophysiology, personality and therapy.
<b>1988</b>	Kaufmann, A., Dr. philos.	Antisocial atferd hos ungdom. En studie av psykologiske determinanter.

	Mykletun, R.J., Dr. philos.	Teacher stress: personality, work-load and health.
	Havik, O.E., Dr. philos.	After the myocardial infarction: A medical and psychological study with special emphasis on perceived illness.
<b>1989</b>	Bråten, S., Dr. philos.	Menneskedyaden. En teoretisk tese om sinnets dialogiske natur med informasjons- og utviklingspsykologiske implikasjoner sammenholdt med utvalgte spedbarnsstudier.
	Wold, B., Dr. psychol.	Lifestyles and physical activity. A theoretical and empirical analysis of socialization among children and adolescents.
<b>1990</b>	Flaten, M.A., Dr. psychol.	The role of habituation and learning in reflex modification.
<b>1991</b>	Alsaker, F.D., Dr. philos.	Global negative self-evaluations in early adolescence.
	Kraft, P., Dr. philos.	AIDS prevention in Norway. Empirical studies on diffusion of knowledge, public opinion, and sexual behaviour.
	Endresen, I.M., Dr. philos.	Psychoimmunological stress markers in working life.
	Faleide, A.O., Dr. philos.	Asthma and allergy in childhood. Psychosocial and psychotherapeutic problems.
<b>1992</b>	Dalen, K., Dr. philos.	Hemispheric asymmetry and the Dual-Task Paradigm: An experimental approach.
	Bø, I.B., Dr. philos.	Ungdoms sosiale økologi. En undersøkelse av 14-16 åringers sosiale nettverk.
	Nivison, M.E., Dr. philos.	The relationship between noise as an experimental and environmental stressor, physiological changes and psychological factors.
	Torgersen, A.M., Dr. philos.	Genetic and environmental influence on temperamental behaviour. A longitudinal study of twins from infancy to adolescence.
<b>1993</b>	Larsen, S., Dr. philos.	Cultural background and problem drinking.
	Nordhus, I.H., Dr. philos.	Family caregiving. A community psychological study with special emphasis on clinical interventions.
	Thuen, F., Dr. psychol.	Accident-related behaviour among children and young adolescents: Prediction and prevention.
	Solheim, R., Dr. philos.	Spesifikke lærevansker. Diskrepanskriteriet anvendt i seleksjonsmetodikk.
	Johnsen, B.H., Dr. psychol.	Brain assymetry and facial emotional expressions: Conditioning experiments.
<b>1994</b>	Tønnessen, F.E., Dr. philos.	The etiology of Dyslexia.
	Kvale, G., Dr. psychol.	Psychological factors in anticipatory nausea and vomiting in cancer chemotherapy.



	Asbjørnsen, A.E., Dr. psychol.	Structural and dynamic factors in dichotic listening: An interactional model.
	Bru, E., Dr. philos.	The role of psychological factors in neck, shoulder and low back pain among female hospitale staff.
	Braathen, E.T., Dr. psychol.	Prediction of exellence and discontinuation in different types of sport: The significance of motivation and EMG.
	Johannessen, B.F., Dr. philos.	Det flytende kjønnet. Om lederskap, politikk og identitet.
<b>1995</b>	Sam, D.L., Dr. psychol.	Acculturation of young immigrants in Norway: A psychological and socio-cultural adaptation.
	Bjaalid, I.-K., Dr. philos	Component processes in word recognition.
	Martinsen, Ø., Dr. philos.	Cognitive style and insight.
	Nordby, H., Dr. philos.	Processing of auditory deviant events: Mismatch negativity of event-related brain potentials.
	Raaheim, A., Dr. philos.	Health perception and health behaviour, theoretical considerations, empirical studies, and practical implications.
	Seltzer, W.J., Dr.philos.	Studies of Psychocultural Approach to Families in Therapy.
	Brun, W., Dr.philos.	Subjective conceptions of uncertainty and risk.
	Aas, H.N., Dr. psychol.	Alcohol expectancies and socialization: Adolescents learning to drink.
	Bjørkly, S., Dr. psychol.	Diagnosis and prediction of intra-institutional aggressive behaviour in psychotic patients
<b>1996</b>	Anderssen, N., Dr. psychol.	Physical activity of young people in a health perspective: Stability, change and social influences.
	Sandal, Gro Mjeldheim, Dr. psychol.	Coping in extreme environments: The role of personality.
	Strumse, Einar, Dr. philos.	The psychology of aesthetics: explaining visual preferences for agrarian landscapes in Western Norway.
	Hestad, Knut, Dr. philos.	Neuropsychological deficits in HIV-1 infection.
	Lugoe, L.Wycliffe, Dr. philos.	Prediction of Tanzanian students' HIV risk and preventive behaviours
	Sandvik, B. Gunnhild, Dr. philos.	Fra distriktsjordmor til institusjonsjordmor. Fremveksten av en profesjon og en profesjonsutdanning
	Lie, Gro Therese, Dr. psychol.	The disease that dares not speak its name: Studies on factors of importance for coping with HIV/AIDS in Northern Tanzania
	Øygaard, Lisbet, Dr. philos.	Health behaviors among young adults. A psychological and sociological approach
	Stormark, Kjell Morten, Dr. psychol.	Emotional modulation of selective attention: Experimental and clinical evidence.

	Einarsen, Ståle, Dr. psychol.	Bullying and harassment at work: epidemiological and psychosocial aspects.
<b>1997</b>	Knivsberg, Ann-Mari, Dr. philos.	Behavioural abnormalities and childhood psychopathology: Urinary peptide patterns as a potential tool in diagnosis and remediation.
	Eide, Arne H., Dr. philos.	Adolescent drug use in Zimbabwe. Cultural orientation in a global-local perspective and use of psychoactive substances among secondary school students.
	Sørensen, Marit, Dr. philos.	The psychology of initiating and maintaining exercise and diet behaviour.
	Skjæveland, Oddvar, Dr. psychol.	Relationships between spatial-physical neighborhood attributes and social relations among neighbors.
	Zewdie, Teka, Dr. philos.	Mother-child relational patterns in Ethiopia. Issues of developmental theories and intervention programs.
	Wilhelmsen, Britt Unni, Dr. philos.	Development and evaluation of two educational programmes designed to prevent alcohol use among adolescents.
	Manger, Terje, Dr. philos.	Gender differences in mathematical achievement among Norwegian elementary school students.
<b>1998</b>		
V	Lindstrøm, Torill Christine, Dr. philos.	«Good Grief»: Adapting to Bereavement.
	Skogstad, Anders, Dr. philos.	Effects of leadership behaviour on job satisfaction, health and efficiency.
	Haldorsen, Ellen M. Håland, Dr. psychol.	Return to work in low back pain patients.
	Besemer, Susan P., Dr. philos.	Creative Product Analysis: The Search for a Valid Model for Understanding Creativity in Products.
H	Winje, Dagfinn, Dr. psychol.	Psychological adjustment after severe trauma. A longitudinal study of adults' and children's posttraumatic reactions and coping after the bus accident in Måbødalen, Norway 1988.
	Vosburg, Suzanne K., Dr. philos.	The effects of mood on creative problem solving.
	Eriksen, Hege R., Dr. philos.	Stress and coping: Does it really matter for subjective health complaints?
	Jakobsen, Reidar, Dr. psychol.	Empiriske studier av kunnskap og holdninger om hiv/aids og den normative seksuelle utvikling i ungdomsårene.
<b>1999</b>		
V	Mikkelsen, Aslaug, Dr. philos.	Effects of learning opportunities and learning climate on occupational health.
	Samdal, Oddrun, Dr. philos.	The school environment as a risk or resource for students' health-related behaviours and subjective well-being.
	Friestad, Christine, Dr. philos.	Social psychological approaches to smoking.

	Ekeland, Tor-Johan, Dr. philos.	Meining som medisin. Ein analyse av placebofenomenet og implikasjoner for terapi og terapeutiske teoriar.
H	Saban, Sara, Dr. psychol.	Brain Asymmetry and Attention: Classical Conditioning Experiments.
	Carlsten, Carl Thomas, Dr. philos.	God lesing – God læring. En aksjonsrettet studie av undervisning i fagtekstlesing.
	Dundas, Ingrid, Dr. psychol.	Functional and dysfunctional closeness. Family interaction and children's adjustment.
	Engen, Liv, Dr. philos.	Kartlegging av leseferdighet på småskoletrinnet og vurdering av faktorer som kan være av betydning for optimal leseutvikling.
<b>2000</b>		
V	Hovland, Ole Johan, Dr. philos.	Transforming a self-preserving "alarm" reaction into a self-defeating emotional response: Toward an integrative approach to anxiety as a human phenomenon.
	Lillejord, Sølvi, Dr. philos.	Handlingsrasjonalitet og spesialundervisning. En analyse av aktørperspektiver.
	Sandell, Ove, Dr. philos.	Den varme kunnskapen.
	Oftedal, Marit Petersen, Dr. philos.	Diagnostisering av ordavkodingsvansker: En prosessanalytisk tilnæringsmåte.
H	Sandbak, Tone, Dr. psychol.	Alcohol consumption and preference in the rat: The significance of individual differences and relationships to stress pathology
	Eid, Jarle, Dr. psychol.	Early predictors of PTSD symptom reporting; The significance of contextual and individual factors.
<b>2001</b>		
V	Skinstad, Anne Helene, Dr. philos.	Substance dependence and borderline personality disorders.
	Binder, Per-Einar, Dr. psychol.	Individet og den meningsbærende andre. En teoretisk undersøkelse av de mellommenneskelige forutsetningene for psykisk liv og utvikling med utgangspunkt i Donald Winnicotts teori.
	Roald, Ingvild K., Dr. philos.	Building of concepts. A study of Physics concepts of Norwegian deaf students.
H	Fekadu, Zelalem W., Dr. philos.	Predicting contraceptive use and intention among a sample of adolescent girls. An application of the theory of planned behaviour in Ethiopian context.
	Melesse, Fantu, Dr. philos.	The more intelligent and sensitive child (MISC) mediational intervention in an Ethiopian context: An evaluation study.
	Råheim, Målfrid, Dr. philos.	Kvinnerens kroppserfaring og livssammenheng. En fenomenologisk – hermeneutisk studie av friske kvinner og kvinner med kroniske muskelsmerter.
	Engelsen, Birthe Kari, Dr. psychol.	Measurement of the eating problem construct.
	Lau, Bjørn, Dr. philos.	Weight and eating concerns in adolescence.

**2002**

- V Ihlebæk, Camilla, Dr. philos. Epidemiological studies of subjective health complaints.
- Rosén, Gunnar O. R., Dr. philos. The phantom limb experience. Models for understanding and treatment of pain with hypnosis.
- Høines, Marit Johnsen, Dr. philos. Fleksible språkrom. Matematikklæring som tekstutvikling.
- Anthun, Roald Andor, Dr. philos. School psychology service quality. Consumer appraisal, quality dimensions, and collaborative improvement potential
- Pallesen, Ståle, Dr. psychol. Insomnia in the elderly. Epidemiology, psychological characteristics and treatment.
- Midthassel, Unni Vere, Dr. philos. Teacher involvement in school development activity. A study of teachers in Norwegian compulsory schools
- Kallestad, Jan Helge, Dr. philos. Teachers, schools and implementation of the Olweus Bullying Prevention Program.

**H**

- Ofte, Sonja Helgesen, Dr. psychol. Right-left discrimination in adults and children.
- Netland, Marit, Dr. psychol. Exposure to political violence. The need to estimate our estimations.
- Diseth, Åge, Dr. psychol. Approaches to learning: Validity and prediction of academic performance.
- Bjuland, Raymond, Dr. philos. Problem solving in geometry. Reasoning processes of student teachers working in small groups: A dialogical approach.

**2003**

- V Arefjord, Kjersti, Dr. psychol. After the myocardial infarction – the wives' view. Short- and long-term adjustment in wives of myocardial infarction patients.
- Ingjaldsson, Jón Þorvaldur, Dr. psychol. Unconscious Processes and Vagal Activity in Alcohol Dependency.
- Holden, Børge, Dr. philos. Følger av atferdsanalytiske forklaringer for atferdsanalysens tilnærming til utforming av behandling.
- Holsen, Ingrid, Dr. philos. Depressed mood from adolescence to 'emerging adulthood'. Course and longitudinal influences of body image and parent-adolescent relationship.
- Hammar, Åsa Karin, Dr. psychol. Major depression and cognitive dysfunction- An experimental study of the cognitive effort hypothesis.
- Sprugevica, Ieva, Dr. philos. The impact of enabling skills on early reading acquisition.
- Gabrielsen, Egil, Dr. philos. LESE FOR LIVET. Lesekompetansen i den norske voksenbefolkningen sett i lys av visjonen om en enhetsskole.
- H Hansen, Anita Lill, Dr. psychol. The influence of heart rate variability in the regulation of attentional and memory processes.
- Dyregrov, Kari, Dr. philos. The loss of child by suicide, SIDS, and accidents: Consequences, needs and provisions of help.

**2004**

V

- Torsheim, Torbjørn, Dr. psychol. Student role strain and subjective health complaints: Individual, contextual, and longitudinal perspectives.
- Haugland, Bente Storm Mowatt Dr. psychol. Parental alcohol abuse. Family functioning and child adjustment.
- Milde, Anne Marita, Dr. psychol. Ulcerative colitis and the role of stress. Animal studies of psychobiological factors in relationship to experimentally induced colitis.
- Stornes, Tor, Dr. philos. Socio-moral behaviour in sport. An investigation of perceptions of sportspersonship in handball related to important factors of socio-moral influence.
- Mæhle, Magne, Dr. philos. Re-inventing the child in family therapy: An investigation of the relevance and applicability of theory and research in child development for family therapy involving children.
- Kobbeltvedt, Therese, Dr. psychol. Risk and feelings: A field approach.

**2004**

H

- Thomsen, Tormod, Dr. psychol. Localization of attention in the brain.
- Løberg, Else-Marie, Dr. psychol. Functional laterality and attention modulation in schizophrenia: Effects of clinical variables.
- Kyrkjebø, Jane Mikkelsen, Dr. philos. Learning to improve: Integrating continuous quality improvement learning into nursing education.
- Laumann, Karin, Dr. psychol. Restorative and stress-reducing effects of natural environments: Experiential, behavioural and cardiovascular indices.
- Holgensen, Helge, PhD Mellom oss - Essay i relasjonell psykoanalyse.

**2005**

V

- Hetland, Hilde, Dr. psychol. Leading to the extraordinary? Antecedents and outcomes of transformational leadership.
- Iversen, Anette Christine, Dr. philos. Social differences in health behaviour: the motivational role of perceived control and coping.

**2005**

H

- Mathisen, Gro Ellen, PhD Climates for creativity and innovation: Definitions, measurement, predictors and consequences.
- Sævi, Tone, Dr. philos. Seeing disability pedagogically – The lived experience of disability in the pedagogical encounter.
- Wiium, Nora, PhD Intrapersonal factors, family and school norms: combined and interactive influence on adolescent smoking behaviour.
- Kanagaratnam, Pushpa, PhD Subjective and objective correlates of Posttraumatic Stress in immigrants/refugees exposed to political violence.
- Larsen, Torill M. B. , PhD Evaluating principals` and teachers` implementation of Second Step. A case study of four Norwegian primary schools.
- Bancila, Delia, PhD Psychosocial stress and distress among Romanian adolescents and adults.

**2006**

- V Hillestad, Torgeir Martin, Dr. philos. Normalitet og avvik. Forutsetninger for et objektivt psykopatologisk avviksbegrep. En psykologisk, sosial, erkjennelsesteoretisk og teorihistorisk framstilling.
- Nordanger, Dag Øystein, Dr. psychol. Psychosocial discourses and responses to political violence in post-war Tigray, Ethiopia.
- Rimol, Lars Morten, PhD Behavioral and fMRI studies of auditory laterality and speech sound processing.
- Krumsvik, Rune Johan, Dr. philos. ICT in the school. ICT-initiated school development in lower secondary school.
- Norman, Elisabeth, Dr. psychol. Gut feelings and unconscious thought: An exploration of fringe consciousness in implicit cognition.
- Israel, K Pravin, Dr. psychol. Parent involvement in the mental health care of children and adolescents. Emperical studies from clinical care setting.
- Glasø, Lars, PhD Affects and emotional regulation in leader-subordinate relationships.
- Knutsen, Ketil, Dr. philos. HISTORIER UNGDOM LEVER – En studie av hvordan ungdommer bruker historie for å gjøre livet meningsfullt.
- Matthiesen, Stig Berge, PhD Bullying at work. Antecedents and outcomes.

**2006  
H**

- Gramstad, Arne, PhD Neuropsychological assessment of cognitive and emotional functioning in patients with epilepsy.
- Bendixen, Mons, PhD Antisocial behaviour in early adolescence: Methodological and substantive issues.
- Mrumbi, Khalifa Maulid, PhD Parental illness and loss to HIV/AIDS as experienced by AIDS orphans aged between 12-17 years from Temeke District, Dar es Salaam, Tanzania: A study of the children's psychosocial health and coping responses.
- Hetland, Jørn, Dr. psychol. The nature of subjective health complaints in adolescence: Dimensionality, stability, and psychosocial predictors
- Kakoko, Deodatus Conatus Vitalis, PhD Voluntary HIV counselling and testing service uptake among primary school teachers in Mwanza, Tanzania: assessment of socio-demographic, psychosocial and socio-cognitive aspects
- Mykletun, Arnstein, Dr. psychol. Mortality and work-related disability as long-term consequences of anxiety and depression: Historical cohort designs based on the HUNT-2 study
- Sivertsen, Børge, PhD Insomnia in older adults. Consequences, assessment and treatment.

**2007**

- V Singhammer, John, Dr. philos. Social conditions from before birth to early adulthood – the influence on health and health behaviour
- Janvin, Carmen Ani Cristea, PhD Cognitive impairment in patients with Parkinson's disease: profiles and implications for prognosis

	Braarud, Hanne Cecilie, Dr.psychol.	Infant regulation of distress: A longitudinal study of transactions between mothers and infants
	Tveito, Torill Helene, PhD	Sick Leave and Subjective Health Complaints
	Magnussen, Liv Heide, PhD	Returning disability pensioners with back pain to work
	Thuen, Elin Marie, Dr.philos.	Learning environment, students' coping styles and emotional and behavioural problems. A study of Norwegian secondary school students.
	Solberg, Ole Asbjørn, PhD	Peacekeeping warriors – A longitudinal study of Norwegian peacekeepers in Kosovo
<b>2007</b>		
<b>H</b>	Søreide, Gunn Elisabeth, Dr.philos.	Narrative construction of teacher identity
	Svensen, Erling, PhD	WORK & HEALTH. Cognitive Activation Theory of Stress applied in an organisational setting.
	Øverland, Simon Nygaard, PhD	Mental health and impairment in disability benefits. Studies applying linkages between health surveys and administrative registries.
	Eichele, Tom, PhD	Electrophysiological and Hemodynamic Correlates of Expectancy in Target Processing
	Børhaug, Kjetil, Dr.philos.	Oppseding til demokrati. Ein studie av politisk oppseding i norsk skule.
	Eikeland, Thorleif, Dr.philos.	Om å vokse opp på barnehjem og på sykehus. En undersøkelse av barnehjemsbarns opplevelser på barnehjem sammenholdt med sanatoriebarns beskrivelse av langvarige sykehusopphold – og et forsøk på forklaring.
	Wadel, Carl Cato, Dr.philos.	Medarbeidersamhandling og medarbeiderledelse i en lagbasert organisasjon
	Vinje, Hege Forbech, PhD	Thriving despite adversity: Job engagement and self-care among community nurses
	Noort, Maurits van den, PhD	Working memory capacity and foreign language acquisition
<b>2008</b>		
<b>V</b>	Breivik, Kyrre, Dr.psychol.	The Adjustment of Children and Adolescents in Different Post-Divorce Family Structures. A Norwegian Study of Risks and Mechanisms.
	Johnsen, Grethe E., PhD	Memory impairment in patients with posttraumatic stress disorder
	Sætrevik, Bjørn, PhD	Cognitive Control in Auditory Processing
	Carvalho, Susana Fonseca, PhD	Prevention of bullying in schools: an ecological model
<b>2008</b>		
<b>H</b>	Brønnick, Kolbjørn Selvåg	Attentional dysfunction in dementia associated with Parkinson's disease.

	Posserud, Maj-Britt Rocio	Epidemiology of autism spectrum disorders
	Haug, Ellen	Multilevel correlates of physical activity in the school setting
	Skjerve, Arvid	Assessing mild dementia – a study of brief cognitive tests.
	Kjønniksen, Lise	The association between adolescent experiences in physical activity and leisure time physical activity in adulthood: a ten year longitudinal study
	Gundersen, Hilde	The effects of alcohol and expectancy on brain function
	Omvik, Siri	Insomnia – a night and day problem
<b>2009</b>		
<b>V</b>	Molde, Helge	Pathological gambling: prevalence, mechanisms and treatment outcome.
	Foss, Else	Den omsorgsfulle væremåte. En studie av voksnes væremåte i forhold til barn i barnehagen.
	Westrheim, Kariane	Education in a Political Context: A study of Knowledge Processes and Learning Sites in the PKK.
	Wehling, Eike	Cognitive and olfactory changes in aging
	Wangberg, Silje C.	Internet based interventions to support health behaviours: The role of self-efficacy.
	Nielsen, Morten B.	Methodological issues in research on workplace bullying. Operationalisations, measurements and samples.
	Sandu, Anca Larisa	MRI measures of brain volume and cortical complexity in clinical groups and during development.
	Guribye, Eugene	Refugees and mental health interventions
	Sørensen, Lin	Emotional problems in inattentive children – effects on cognitive control functions.
	Tjomslund, Hege E.	Health promotion with teachers. Evaluation of the Norwegian Network of Health Promoting Schools: Quantitative and qualitative analyses of predisposing, reinforcing and enabling conditions related to teacher participation and program sustainability.
	Helleve, Ingrid	Productive interactions in ICT supported communities of learners
<b>2009</b>		
<b>H</b>	Skorpen, Aina Øye, Christine	Dagliglivet i en psykiatrisk institusjon: En analyse av miljøterapeutiske praksiser
	Andreassen, Cecilie Schou	WORKAHOLISM – Antecedents and Outcomes
	Stang, Ingun	Being in the same boat: An empowerment intervention in breast cancer self-help groups
	Sequeira, Sarah Dorothee Dos Santos	The effects of background noise on asymmetrical speech perception



	Kleiven, Jo, dr.philos.	The Lillehammer scales: Measuring common motives for vacation and leisure behavior
	Jónsdóttir, Guðrún	Dubito ergo sum? Ni jenter møter naturfaglig kunnskap.
	Hove, Oddbjørn	Mental health disorders in adults with intellectual disabilities - Methods of assessment and prevalence of mental health disorders and problem behaviour
	Wageningen, Heidi Karin van	The role of glutamate on brain function
	Bjørkvik, Jofrid	God nok? Selvaktelse og interpersonlig fungering hos pasienter innen psykisk helsevern: Forholdet til diagnoser, symptomer og behandlingsutbytte
	Andersson, Martin	A study of attention control in children and elderly using a forced-attention dichotic listening paradigm
	Almås, Aslaug Grov	Teachers in the Digital Network Society: Visions and Realities. A study of teachers' experiences with the use of ICT in teaching and learning.
	Ulvik, Marit	Lærerutdanning som danning? Tre stemmer i diskusjonen
<b>2010</b>		
<b>V</b>	Skår, Randi	Læringsprosesser i sykepleieres profesjonsutøvelse. En studie av sykepleieres læringserfaringer.
	Roald, Knut	Kvalitetsvurdering som organisasjonslæring mellom skole og skoleeigar
	Lunde, Linn-Heidi	Chronic pain in older adults. Consequences, assessment and treatment.
	Danielsen, Anne Grete	Perceived psychosocial support, students' self-reported academic initiative and perceived life satisfaction
	Hysing, Mari	Mental health in children with chronic illness
	Olsen, Olav Kjellevold	Are good leaders moral leaders? The relationship between effective military operational leadership and morals
	Riese, Hanne	Friendship and learning. Entrepreneurship education through mini-enterprises.
	Holthe, Asle	Evaluating the implementation of the Norwegian guidelines for healthy school meals: A case study involving three secondary schools
<b>H</b>	Hauge, Lars Johan	Environmental antecedents of workplace bullying: A multi-design approach
	Bjørkelo, Brita	Whistleblowing at work: Antecedents and consequences
	Reme, Silje Endresen	Common Complaints – Common Cure? Psychiatric comorbidity and predictors of treatment outcome in low back pain and irritable bowel syndrome
	Helland, Wenche Andersen	Communication difficulties in children identified with psychiatric problems

Beneventi, Harald	Neuronal correlates of working memory in dyslexia
Thygesen, Elin	Subjective health and coping in care-dependent old persons living at home
Aanes, Mette Marthinussen	Poor social relationships as a threat to belongingness needs. Interpersonal stress and subjective health complaints: Mediating and moderating factors.
Anker, Morten Gustav	Client directed outcome informed couple therapy
Bull, Torill	Combining employment and child care: The subjective well-being of single women in Scandinavia and in Southern Europe
Viig, Nina Grieg	Tilrettelegging for læreres deltakelse i helsefremmende arbeid. En kvalitativ og kvantitativ analyse av sammenhengen mellom organisatoriske forhold og læreres deltakelse i utvikling og implementering av Europeisk Nettverk av Helsefremmende Skoler i Norge
Wolff, Katharina	To know or not to know? Attitudes towards receiving genetic information among patients and the general public.
Ogden, Terje, dr.philos.	Familiebasert behandling av alvorlige atferdsproblemer blant barn og ungdom. Evaluering og implementering av evidensbaserte behandlingsprogrammer i Norge.
Solberg, Mona Elin	Self-reported bullying and victimisation at school: Prevalence, overlap and psychosocial adjustment.
<b>2011</b> <b>V</b>	
Bye, Hege Høivik	Self-presentation in job interviews. Individual and cultural differences in applicant self-presentation during job interviews and hiring managers' evaluation
Notelaers, Guy	Workplace bullying. A risk control perspective.
Moltu, Christian	Being a therapist in difficult therapeutic impasses. A hermeneutic phenomenological analysis of skilled psychotherapists' experiences, needs, and strategies in difficult therapies ending well.
Myrseth, Helga	Pathological Gambling - Treatment and Personality Factors
Schanche, Elisabeth	From self-criticism to self-compassion. An empirical investigation of hypothesized change processes in the Affect Phobia Treatment Model of short-term dynamic psychotherapy for patients with Cluster C personality disorders.
Våpenstad, Eystein Victor, dr.philos.	Det tempererte nærvær. En teoretisk undersøkelse av psykoterautens subjektivitet i psykoanalyse og psykoanalytisk psykoterapi.
Haukebø, Kristin	Cognitive, behavioral and neural correlates of dental and intra-oral injection phobia. Results from one treatment and one fMRI study of randomized, controlled design.
Harris, Anette	Adaptation and health in extreme and isolated environments. From 78°N to 75°S.

	Bjørknes, Ragnhild	Parent Management Training-Oregon Model: intervention effects on maternal practice and child behavior in ethnic minority families
	Mamen, Asgeir	Aspects of using physical training in patients with substance dependence and additional mental distress
	Espevik, Roar	Expert teams: Do shared mental models of team members make a difference
	Haara, Frode Olav	Unveiling teachers' reasons for choosing practical activities in mathematics teaching
<b>2011</b>		
<b>H</b>	Hauge, Hans Abraham	How can employee empowerment be made conducive to both employee health and organisation performance? An empirical investigation of a tailor-made approach to organisation learning in a municipal public service organisation.
	Melkevik, Ole Rogstad	Screen-based sedentary behaviours: pastimes for the poor, inactive and overweight? A cross-national survey of children and adolescents in 39 countries.
	Vøllestad, Jon	Mindfulness-based treatment for anxiety disorders. A quantitative review of the evidence, results from a randomized controlled trial, and a qualitative exploration of patient experiences.
	Tolo, Astrid	Hvordan blir lærerkompetanse konstruert? En kvalitativ studie av PPU-studenters kunnskapsutvikling.
	Saus, Evelyn-Rose	Training effectiveness: Situation awareness training in simulators
	Nordgreen, Tine	Internet-based self-help for social anxiety disorder and panic disorder. Factors associated with effect and use of self-help.
	Munkvold, Linda Helen	Oppositional Defiant Disorder: Informant discrepancies, gender differences, co-occurring mental health problems and neurocognitive function.
	Christiansen, Øivin	Når barn plasseres utenfor hjemmet: beslutninger, forløp og relasjoner. Under barnevernets (ved)tak.
	Brunborg, Geir Scott	Conditionability and Reinforcement Sensitivity in Gambling Behaviour
	Hystad, Sigurd William	Measuring Psychological Resiliency: Validation of an Adapted Norwegian Hardiness Scale
<b>2012</b>		
<b>V</b>	Roness, Dag	Hvorfor bli lærer? Motivasjon for utdanning og utøving.
	Fjermestad, Krister Westlye	The therapeutic alliance in cognitive behavioural therapy for youth anxiety disorders
	Jenssen, Eirik Sørnes	Tilpasset opplæring i norsk skole: politikeres, skolelederes og læreres handlingsvalg
	Saksvik-Lehouillier, Ingvild	Shift work tolerance and adaptation to shift work among offshore workers and nurses

	Johansen, Venke Frederike	Når det intime blir offentlig. Om kvinners åpenhet om brystkreft og om markedsføring av brystkreftsaken.
	Herheim, Rune	Pupils collaborating in pairs at a computer in mathematics learning: investigating verbal communication patterns and qualities
	Vie, Tina Løkke	Cognitive appraisal, emotions and subjective health complaints among victims of workplace bullying: A stress-theoretical approach
	Jones, Lise Øen	Effects of reading skills, spelling skills and accompanying efficacy beliefs on participation in education. A study in Norwegian prisons.
<b>2012</b>		
<b>H</b>	Danielsen, Yngvild Sørebo	Childhood obesity – characteristics and treatment. Psychological perspectives.
	Horverak, Jøri Gytre	Sense or sensibility in hiring processes. Interviewee and interviewer characteristics as antecedents of immigrant applicants' employment probabilities. An experimental approach.
	Jøsendal, Ola	Development and evaluation of BE smokeFREE, a school-based smoking prevention program
	Osnes, Berge	Temporal and Posterior Frontal Involvement in Auditory Speech Perception
	Drageset, Sigrunn	Psychological distress, coping and social support in the diagnostic and preoperative phase of breast cancer
	Aasland, Merethe Schanke	Destructive leadership: Conceptualization, measurement, prevalence and outcomes
	Bakibinga, Pauline	The experience of job engagement and self-care among Ugandan nurses and midwives
	Skogen, Jens Christoffer	Foetal and early origins of old age health. Linkage between birth records and the old age cohort of the Hordaland Health Study (HUSK)
	Leversen, Ingrid	Adolescents' leisure activity participation and their life satisfaction: The role of demographic characteristics and psychological processes
	Hanss, Daniel	Explaining sustainable consumption: Findings from cross-sectional and intervention approaches
	Rød, Per Arne	Barn i klem mellom foreldrekonflikter og samfunnsmessig beskyttelse
<b>2013</b>		
<b>V</b>	Mentzoni, Rune Aune	Structural Characteristics in Gambling
	Knudsen, Ann Kristin	Long-term sickness absence and disability pension award as consequences of common mental disorders. Epidemiological studies using a population-based health survey and official ill health benefit registries.
	Strand, Mari	Emotional information processing in recurrent MDD

	Veseth, Marius	Recovery in bipolar disorder. A reflexive-collaborative exploration of the lived experiences of healing and growth when battling a severe mental illness
	Mæland, Silje	Sick leave for patients with severe subjective health complaints. Challenges in general practice.
	Mjaaland, Thera	At the frontiers of change? Women and girls' pursuit of education in north-western Tigray, Ethiopia
	Odéen, Magnus	Coping at work. The role of knowledge and coping expectancies in health and sick leave.
	Hynninen, Kia Minna Johanna	Anxiety, depression and sleep disturbance in chronic obstructive pulmonary disease (COPD). Associations, prevalence and effect of psychological treatment.
	Flo, Elisabeth	Sleep and health in shift working nurses
	Aasen, Elin Margrethe	From paternalism to patient participation? The older patients undergoing hemodialysis, their next of kin and the nurses: a discursive perspective on perception of patient participation in dialysis units
	Ekornås, Belinda	Emotional and Behavioural Problems in Children: Self-perception, peer relationships, and motor abilities
	Corbin, J. Hope	North-South Partnerships for Health: Key Factors for Partnership Success from the Perspective of the KIWAKKUKI
	Birkeland, Marianne Skogbrott	Development of global self-esteem: The transition from adolescence to adulthood
<b>2013</b>	Gianella-Malca, Camila	Challenges in Implementing the Colombian Constitutional Court's Health-Care System Ruling of 2008
<b>H</b>	Hovland, Anders	Panic disorder – Treatment outcomes and psychophysiological concomitants
	Mortensen, Øystein	The transition to parenthood – Couple relationships put to the test
	Årdal, Guro	Major Depressive Disorder – a Ten Year Follow-up Study. Inhibition, Information Processing and Health Related Quality of Life
	Johansen, Rino Bandlitz	The impact of military identity on performance in the Norwegian armed forces
	Bøe, Tormod	Socioeconomic Status and Mental Health in Children and Adolescents
<b>2014</b>	Nordmo, Ivar	Gjennom nåløyet – studenters læringserfaringer i psykologutdanningen
<b>V</b>	Dovran, Anders	Childhood Trauma and Mental Health Problems in Adult Life
	Hegelstad, Wenche ten Velden	Early Detection and Intervention in Psychosis: A Long-Term Perspective
	Urheim, Ragnar	Forståelse av pasientagresjon og forklaringer på nedgang i voldsrater ved Regional sikkerhetsavdeling, Sandviken sykehus

	Kinn, Liv Grethe	Round-Trips to Work. Qualitative studies of how persons with severe mental illness experience work integration.
	Rød, Anne Marie Kinn	Consequences of social defeat stress for behaviour and sleep. Short-term and long-term assessments in rats.
	Nygård, Merethe	Schizophrenia – Cognitive Function, Brain Abnormalities, and Cannabis Use
	Tjora, Tore	Smoking from adolescence through adulthood: the role of family, friends, depression and socioeconomic status. Predictors of smoking from age 13 to 30 in the “The Norwegian Longitudinal Health Behaviour Study” (NLHB)
	Vangsnes, Vigdis	The Dramaturgy and Didactics of Computer Gaming. A Study of a Medium in the Educational Context of Kindergartens.
	Nordahl, Kristin Berg	Early Father-Child Interaction in a Father-Friendly Context: Gender Differences, Child Outcomes, and Protective Factors related to Fathers’ Parenting Behaviors with One-year-olds
<b>2014</b>	Sandvik, Asle Makoto	Psychopathy – the heterogeneity of the construct
<b>H</b>	Skotheim, Siv	Maternal emotional distress and early mother-infant interaction: Psychological, social and nutritional contributions
	Halleland, Helene Barone	Executive Functioning in adult Attention Deficit Hyperactivity Disorder (ADHD). From basic mechanisms to functional outcome.
	Halvorsen, Kirsti Vindal	Partnerskap i lærerutdanning, sett fra et økologisk perspektiv
	Solbue, Vibeke	Dialogen som visker ut kategorier. En studie av hvilke erfaringer innvandrerdømmere og norskfødte med innvandrereforeldre har med videregående skole. Hva forteller ungdommenes erfaringer om videregående skoles håndtering av etniske ulikheter?
	Kvalevaag, Anne Lise	Fathers’ mental health and child development. The predictive value of fathers’ psychological distress during pregnancy for the social, emotional and behavioural development of their children
	Sandal, Ann Karin	Ungdom og utdanningsval. Om elevar sine opplevingar av val og overgangsprosessar.
	Haug, Thomas	Predictors and moderators of treatment outcome from high- and low-intensity cognitive behavioral therapy for anxiety disorders. Association between patient and process factors, and the outcome from guided self-help, stepped care, and face-to-face cognitive behavioral therapy.
	Sjølie, Hege	Experiences of Members of a Crisis Resolution Home Treatment Team. Personal history, professional role and emotional support in a CRHT team.
	Falkenberg, Liv Eggset	Neuronal underpinnings of healthy and dysfunctional cognitive control

	Mrdalj, Jelena	The early life condition. Importance for sleep, circadian rhythmicity, behaviour and response to later life challenges
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