Coping at Work

The role of knowledge and coping expectancies in health and sick leave

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Scientific environment

The work presented herein is done as collaboration between Uni Health, a division of Uni Research, and the Clinic for Physical Medicine and Rehabilitation, Vestfold Hospital Trusts, Stavern. The thesis is presented through the faculty of psychology, with supervision from the Research group for stress, health and rehabilitation at Uni Health.

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Life's battles don't always go
to the stronger or faster man
But sooner or later the man who wins
is the man who thinks he can.

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Abstract

The main purpose of this thesis is to explore the effect of response outcome expectancies (coping) and knowledge on health and sick leave.

The theoretical base of the thesis is the Cognitive Activation Theory of Stress (CATS) (Ursin & Eriksen, 2004) and the non-injury model (P. H. Sorensen et al., 2010).

A new inventory for measuring response outcome expectancies (coping, helplessness and hopelessness); the Theoretically Originated Measure of the Cognitive Activation Theory of Stress, or TOMCATS, was developed and tested. The factor structure was confirmed and the convergent validity of TOMCATS was found to be satisfactory (paper 1)

Response outcome expectancies from the TOMCATS inventory were significant predictors of health, and could also predict health independently of socioeconomic status (SES). Individuals with higher SES experienced more coping, less helplessness and hopelessness, and had better health (paper 1).

In order to test the applied value of coping and knowledge, a systematic review of active workplace interventions with sick leave as an outcome was done. While most interventions did not significantly decrease sick leave, there was evidence that graded activity, the Sheerbrooke model and Cognitive Behavior Therapy (CBT) significantly reduced sick leave (paper 2).

AtWork, an active workplace intervention based on the non-injury model, was tested in a cluster randomized controlled trial. The sample was 125 units of two Norwegian municipalities. The results indicated that an approach combining educational meetings, a colleague trained as a peer advisor and an outpatient clinic significantly reduced sick leave. Without the outpatient clinic the intervention had mixed results overall. The intervention was also feasible in the workplace (paper 3).

The conclusion of the thesis is that coping can be measured in a satisfactory way, and that coping is a predictor of health as well as an interesting variable in the understanding of the relationship between health and socioeconomic status. There is evidence that some active workplace interventions are effective in sick leave reduction, but the success rate is low. A non-injury model approach with education, a colleague trained as peer adviser and an outpatient clinic was effective in reducing sick leave, and is a promising alternative to existing interventions.

List of publications

Paper 1 Odeen, M., Westerlund, H., Theorell, T., Leineweber, C., Eriksen, H.R, & Ursin, H. (2012). *Expectancies, Socioeconomic Status, and Self-Rated Health: Use of the Simplified TOMCATS questionnaire.* International Journal of Behavioral Medicine (epub ahead of print)

Paper 2 Odeen, M., Tveito, T. H., Magnussen, L. H., Mæland, S., Larun, L., & Eriksen H.R. (2012). *Systematic review of active workplace interventions to reduce sickness absence.* Occupational Medicine (epub ahead of print)

Paper 3 Odeen, M., Ihlebæk, C., Indahl, A., Wormgoor, M., Lie, S. A., & Eriksen, H. R. (2012). *Effect of information and reassurance at the workplace on sick leave: A cluster randomized trial*. (Submitted to Occupational Environmental Medicine).

Contents

1. Introduction and theoretical framework

1.1 Background and definitions

1.1.1 Health

Originally, the WHO defined health as “A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”(World Health Organization, 1946). This definition has been criticized for being indistinguishable from a definition of happiness, and to be so vague as to be unusable in any practical sense (Saracci, 1997). The WHO Ottawa charter on health promotion, added to this definition by stating that health is: “A resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities" (World Health Organization, 1986) .Viewing health as a resource allows for a broader view of health than a simplified disease/non-disease dichotomy. Hjort (1994) defined health as “having resources to manage the demands of everyday living”. This definition goes further in viewing health as a functional capacity relatively independent of diseases, bodily complaints or symptoms, and thus increases the scope of what might be considered being good health.

The experience of health complaints is common also for everyday healthy individuals. Subjective Health Complaints (SHC) (Eriksen & Ursin, 1999) are common health complaints with no objective findings, or complaints where the subjective experience is inconsistent with the objective findings. Examples of these are different musculoskeletal complaints, gastrointestinal discomforts, tiredness, palpitations, allergic complaints and mood disturbances like feelings of anxiety and depression. SHC do not usually result from of any serious pathology, and usually do not require any treatment. When using a 29 item inventory listing complaints, surveys of the Norwegian population have shown that 91% of the population report at least one complaint during the last month, with a median of five complaints (Indregard, Ihlebæk, & Eriksen, 2012). SHC are found to be common in very diverse cultures and

settings (Eriksen, Hellesnes, Staff, & Ursin, 2004; Grant et al., 2007; Waage et al., 2010; Wilhelmsen et al., 2007).

1.1.2 Musuloskeletal pain and low back pain

The most common SHC is musculoskeletal complaints. The prevalence of chronic musculoskeletal pain in the general population is reported to be between 11% - 50%, depending on the definition and method of measurement (Bergman et al., 2001).This prevalence seems to be rather stable over a 7 year and 14 year period (Ihlebæk, Brage, & Eriksen, 2007; Kamaleri, Natvig, Ihlebaek, Benth, & Bruusgaard, 2009) but other studies have shown an increase over an 11 year period (K. Hagen, Linde, Heuch, Stovner, & Zwart, 2011). Musculoskeletal pain increases with age, and is more prevalent in those with physically demanding work (de Zwart, Broersen, Frings-Dresen, & van Dijk, 1997). There are also consistent findings that musculoskeletal pain is more frequent in women than in men (de Zwart et al., 1997; Wijnhoven, de Vet, & Picavet, 2006).

Musculoskeletal complaints is an umbrella term that covers many different pain conditions, but the most frequent of these is low back pain. Between 12% - 33% of the population will experience low back pain at any given point (Walker, 2000), making the lifetime prevalence between 60-80% (Andersson, 1997; van Tulder et al., 2006; Waddel, 1996). While low back pain usually is not a sign of disease (Airaksinen et al., 2006), it is a painful condition, and the most frequent reason for sick listing in Norway (NAV, 2011). Low back pain has also been reported as the largest single cause for sick leaves in the UK (Frank, 1993) and as a major cause of sick leave in Sweden (Ekman, Johnell, & Lidgren, 2005).

It is common to distinguish low back pain patients by the duration of their complaints. The European guidelines distinguish between acute (< 6 weeks), sub-acute (between 6-12 weeks) and chronic (>12 weeks) low back pain (van Tulder et al., 2006). About 85% of low back pain complaints are subjective health complaints not attributable to pathology or neurological encroachment (van Tulder et al., 2006). Furthermore, about 60% of patients with an acute spell of unspecific low back pain

are fully recovered within 10 days and about 80-90% of cases last less than 12 weeks (Andersson, 1997).

To help identify low back pain patients in need of medical treatment due to pathological changes in the back, a set of "red flags" has been developed. These include a including a history of cancer, a fever, unexplained weight loss, or recent trauma to the back (Deyo & Weinstein, 2001; Henschke, Maher, & Refshauge, 2007).

The European guidelines also include "yellow flags" in order to recognize the role of psychosocial factors in low back pain. These factors increase the possibility of developing chronic low back pain, which again can lead to sick leave and disability pensions. The yellow flags include faulty illness perceptions about back pain as harmful and potentially disabling, inappropriate pain behavior, such as reduced activity, work related issues, and emotional problems (van Tulder et al., 2006).

In general, it is recommended that low back patients are screened for red flags, and if no red flags are present, the patient should receive adequate information and reassurance, and given reasons to stay active. Further assessment is not recommended unless the patient does not improve after the acute stage, or have any red flags in their medical history (van Tulder et al., 2006). Imaging is not indicated as a routine, and carries the risk of adversely affecting the course of the low back pain (Deyo, 2002). Due to the high number of anatomic abnormalities in healthy people, patients may be confused or anxious about findings that are not relevant to their current pain (Deyo, 2002), which may lead to a less favorable prognosis (Foster et al., 2008).

1.1.3 Work and health

Freud once allegedly remarked that what mattered in life was the “ability to work and love”. This is certainly a large oversimplification, but it expresses some of the importance that individuals place on gainful employment in their lives.

However, the relationship between work and health is not straightforward. Work can be both a health risk and a health promoting factor. The concept of the “Working

environment" encompasses the physical environment that work is performed within. The working environment is usually studied in order to explore how it affects health (Tysnes, Eiken, Grimsrud, Sterud, & Aasnæss, 2008) . In addition to the physical working environment, the psychosocial working environment has received scientific interest. According to the World Health Organization, the Psychosocial Work Environment includes the organization of work and the organizational culture; the attitudes, values, beliefs and practices that are demonstrated on a daily basis in the enterprise, and which affect the mental and physical well-being of employees (J. Burton, 2010).

Traditionally work has often been seen as a potential health hazard, and often with good reasons, as evidenced by the historically high rate of fatal occupational injuries (Center for Disease Control, 1999) . In the western world, most of the physical and chemical health risks associated with work (Goldman & Peters, 1981) have been reduced. This is primarily as a result of systematic health safety and environment management and research, as well as government regulations requiring protective equipment and limiting exposure to harmful materials and environments (Center for Disease Control, 1999).

In addition to the acute workplace hazards, such as accidents and exposures to dangerous materials, there is also a concern for less obvious long term workplace dangers. Examples of these are repetitive movements, badly designed workplaces, and inactivity, all of which may threaten health. There has also been fears that increased demands on the employees productivity may result in health problems (Tausig & Fenwick, 2012). In Norway the first comprehensive law that regulated health hazards in the workplace came in 1977 (Arbeidsdepartementet, 1977). This law also included sections specific to the psychosocial working environment, such as limits on how many hours an employee may work in a single week, month or year, as well as rules for employee and management behavior and for design of workplaces. Recent revisions have also included a responsibility for employers to create health promoting workplaces (Arbeidstilsynet, n.d.).

While the physical working environment is important, the psychosocial working environment also matters for health (Amick et al., 2002; Eller et al., 2009; North, Syme, Feeney, Shipley, & Marmot, 1996). Factors of the psychosocial work environment has been linked to important outcomes such as ischemic heart disease (Eller et al., 2009) all-cause mortality (Amick et al., 2002) and mental health (Stansfeld & Candy, 2006).

However, work is not just a health hazard. A comprehensive review of the literature concludes that work in general is good for your health (Waddel & Burton, 2006). Work has obvious advantages, such as economic security, social identity and as a source of self-worth. In addition, work has important but less obvious benefits, such as structuring and dividing time, both in the day and the week. Colleagues are often sources of social support that improve health (Fuhrer, Stansfeld, Chemali, & Shipley, 1999). Also, the activity provided by work can be an important preventive measure against depression and some forms of anxiety (Waddel & Burton, 2006).

Physical activity is well documented as beneficial for health (Pate et al., 1995) but there is also evidence that being at work, may have positive health effects in common conditions such as low back pain (Airaksinen et al., 2006) and mental health (Waddel & Burton, 2006). Sick leave reduction has received scientific attention, both due to the costs of sick leave to societies, and since sick leave can be considered in itself to be a potential health risk for the individual.

1.1.4 Health promotion

Health promotion has been defined as "The process of enabling people to increase control over, and to improve, their health" (World Health Organization, 1986). The World Health Organizations Ottawa charter sets a goal of empowering the individual to "reach their fullest potential for health". It also underlines the importance of the environment, both on the societal level, and the local level, such as the workplace (World Health Organization, 1986). The environment affects the individual's cognitions and behavior through both physical and social mechanisms (Karasek & Theorell, 1990).

A motivation for workplace interventions might be the possibility to promote health in a venue where the treatment providers can reach those who do not actively seek out health promotion efforts. At least theoretically, an intervention at the work place can reach broader and not simply promote health among the healthiest (Zavela, Davis, Cottrell, & Smith, 1988). Interventions in order to prevent sick leave faces additional challenges. Most of the sick leave is taken by relatively few individuals (Tveito, Halvorsen, Lauvaalien, & Eriksen, 2002). These might be difficult to reach at the workplace unless the intervention happens before long term sick leave starts.

Health Promotion is also closely linked to coping (Bandura, 2004). Information about health and the importance of health behaviors such as smoking cessation and weight loss are now well known to most of the population in western societies. The challenge for health promotion is more to *motivate* individuals to live healthier lives. Adherence to recommended treatments is a problem in health care, and most that stop adhering do so early in the course of a treatment (Dunbar-Jacob, Schlenk, & McCall, 2012). Adherence to healthy behaviors is also a challenge (King, Mainous, Carnemolla, & Everett, 2009). There are large individual differences in patient motivation for change (Doherty, Steptoe, Rink, Kendrick, & Hilton, 1998; Rimal, 2001). The individuals expectations of coping is one of the factors that can affect whether or not behavior changes are made and sustained (Bandura, 2004; Maibach, Flora, & Nass, 1991; Rimal, 2000).

1.1.5 Socioeconomic status

Socioeconomic differences in health are substantial (Dalstra et al., 2005). They appear to be stable or increasing not only in low-income countries, but also in countries with stable social structures and well established welfare institutions (Kunst et al., 2005).

Socioeconomic status is also a predictor of sick leave and increased mortality (Christensen, Labriola, Lund, & Kivimäki, 2008; Lund, Kivimäki, Christensen, &

Labriola, 2009). Low socioeconomic status is one of the most important risk factors for disability pension (Månsson & Merlo, 2001) which in itself is a strong predictor of mortality (Gjesdal, Mæland, Svedberg, Hagberg, & Alexanderson, 2008). The majority of disability pensioners in Norway have only primary education and low wages before the disability pension was awarded (Gjesdal, Mæland, Hagberg, & Alexanderson, 2007). Low socioeconomic status is also a predictor of premature mortality within the group of Norwegian disability pensioners (Gjesdal et al., 2007).

The socioeconomic differences in health are distributed as a gradient, rather than in distinct classes (Adler et al., 1994; Marmot, 2001). Explanations offered for these differences may be classified into two probably interacting categories: structural factors and individual factors. Structural factors, sometimes referred to as social factors, denote the environmental, economic, cultural and social context in which people live, and how these affect health and sick leave (Link & Phelan, 1995). Individual factors denote the behavioral choices of the individual, such as smoking, alcohol consumption, choice of foods and exercise, or other health choices the individual makes. (Adler & Ostrove, 1999).

In societies with high levels of poverty and inequality, structural factors may completely overshadow individual factors. However in societies with a high degree of equality and free and universally accessible public services (such as health care and education), the impact of favorable traits or abilities may be more pronounced. Thus the Nordic countries may be especially useful for studying the effects of individual factors in socioeconomic status (SES) differences in health, since they have a high standard of health and living conditions (United Nations Development Programme, 2010).

Coping is one such individual factor (Kristenson, Eriksen, Sluiter, Starke, & Ursin, 2004). An upbringing in a high SES home may bring much more opportunities for coping than an upbringing in a low SES home. Parental styles and peers may also have an effect on the development of coping expectancies, for instance through model learning (Bandura, 1997). Early development of health behaviors that may

have a lasting impact for health is also negatively affected by a low socioeconomic status (Torsheim, Leversen, & Samdal, 2007). Individuals with low socioeconomic status tend to believe more strongly in the influence of chance on health, have a lower life expectancy and a lower health consciousness. These beliefs are again associated with unhealthy behavioral choices (Wardle & Steptoe, 2003).

1.2 Sick leave and its consequences

Statistics Norway define sick leave as agreed work days that are lost because of medical reasons (Statistisk sentralbyrå, 2002).This definition will be used throughout this thesis.

Norway has one of the most comprehensive sick leave compensation schemes in the world. Sick leave can be granted to any employee suffering from "illness or injury" (Folketrygdloven §8-1). The illness or injury must be scientifically based and generally recognized in medical practice, and sick leave cannot be given for social or economic problems (NAV, n.d.). The sick listing doctor is the one who issues or refuses sick leave. The employer may appeal a sick listing to the labor and welfare administration, but this is very rarely done.

The majority of sick leaves and disability pensions are given for conditions such as low back pain, and anxiety/depression (NAV, 2011). In fact, almost twice as many sick leaves are given for the "general and unspecified" diagnostic category than for the cardiology category (NAV, 2011). A large portion of sick leaves and disability pensions is granted for conditions that are difficult for the doctor to objectively verify (R. Overland, Overland, Johansen, & Mykletun, 2008).

When granted sick leave, the employee is compensated with 100% of his or her salary (up to a maximum yearly wage of Nok 475 000 or about 63 000 Eur). Starting from the first day of illness, and lasting for a maximum of one year. The employer is required by law to pay the first 16 days, after that the government assumes all financial responsibility.

If the employee is still on sick leave after one year, the benefit is changed to "work assessment allowance". This benefit is 66% of the original salary, with the same maximum amount as the sick leave benefit, and it is usually given for up to four years, with individually considered extensions. If the employee is able to document a permanent reduction of work capacity over 50% due to medical reasons, he or she can apply for a disability pension. This benefit is individually calculated using the same rules as a normal retirement pension. There is a general political agreement in Norway that benefits should be adequate to sustain an acceptable standard of living, but there is also a general agreement that the use of sick leave and disability should be reduced as much as possible.

Naturally, these benefits are costly for the state. Since 1996 the cost in welfare payments has risen from 9% to 14% of the GNP, in a period of strong GNP growth. The number of employed per pensioner was 7 in 1950. In 2005 this number was about 4.4, and it is projected to be only about 2 in 2050 (Ugreninov, 2005). Major national efforts, such as "Raskere tilbake" (the "faster return to work" project) (NAV, 2012) and "Inkluderende arbeidsliv" (inclusive work life) (www.nav.no/ia) have been undertaken to reduce sick leave, but no changes to the work compensation system have been done as part of this.

Sick leave also has consequences for the individual. Longitudinal data has shown that sick leave is an independent risk factor for health problems (Vahtera et al., 2010) and all-cause mortality (Kivimaki et al., 2003). This is also true for disability pensions (S. Overland, Glozier, Maeland, Aaro, & Mykletun, 2006) . Unemployment is also a strong predictor of all-cause mortality (Gerdtham & Johannesson, 2003). Thus it may seem like staying out of working life may in itself be a risk factor for ill health, although possible confounding variables cannot be ruled out as potential causes of this relationship.

1.2.1 Models of sick leave

While the consequences of sick leave are relatively clear, the causes of sick leave are much more difficult to determine.

There are several models that have been used to explain the reasons for sick leave. A subject area as complicated as sick leave cannot be expected to be understood by using a single perspective, so these models of explanation should be seen as complementary rather than mutually exclusive.

System approach

In the system approach sick leave is considered to be the result of changes in how society negotiates illness and sickness compensation. The major differences in the models are how they see the role of the sick listed individual as well as how sick leave is combatted.

The so called “Biomedical model” sees illness as a reflection of the level of disease and health complaints in the population. See Engel (1977) and Wade (2004) for an explanation of the basic ideas underlying this perspective. Thus, the only way to reduce sick leave is to increase the health (i.e. reduce disease) in the population.

There are also economic models that can be described very simplified as "pull or push models". The pull models see employees as rational actors (in the economic understanding of the word) that choose sick leave or work according to an internal “cost/benefit analysis” by the individual (Nossen, 2009). The individual may take into account economic, social and other considerations. While the General Practitioner is the one granting the sick leave, the patient has a considerable influence in whether or not sick leave is given (Wrapson & Mewse, 2011). According to the pull model, sick leave is combatted by changing the cost/benefit of work, by making work more attractive than sick leave, economically and otherwise. Factors that influence this are both economic and social. The individual tends to adapt to the sick-listing behavior of their colleagues (Hesselius, Nilsson, & Johansson, 2009), and their neighborhood (Virtanen et al., 2010) .

The other model is the "push model". According to this model, the working environment is getting increasingly more brutal, and the demands on employees increase (Mykletun & Øverland, 2009). Employees with poor health are believed to be less attractive employees, and these are excluded from the labor market and

"pushed" into sick leave and disability pension (Hatland, 1991; Krokstad, Johnsen, & Westin, 2002).

While the systems approaches are valuable, they are not without their problems. The biomedical model does not take into account the difference between a person's functional capacity and medical condition. Other factors than physical health may be better predictors of return to work (van der Giezen, Bouter, & Nijhuis, 2000). While it is true that many disability pensions are given for conditions that are difficult to objectively verify (R. Overland et al., 2008), it is unlikely that a simple calculation of costs and benefits underlies the decision to take sick leave. The push model has the problem of being based on an assumption of a work life in continuing deterioration and "brutalization". In Norway, two different reports concluded that there were no evidence of a general deterioration in the working conditions in Norway in modern time (Nilssen, 2002; Tysnes et al., 2008).

Individual approach

There are good reasons to expect that individual factors also matter for sick leave. Sick leave has remained remarkably steady in Norway over long periods of time. In the 27 years from 1975 to 2002 sick leave in Norway fluctuated within a relatively narrow range of about 3.5 percentage points, and with no clear tendency of a steady long term increase or decrease (Gjesdal, 2005) . In the same period Norway experienced a massive increase in national wealth (Statistisk sentralbyrå, 2011), as well as significant progress in medical treatment. This seems inconsistent with the hypothesis that sick leave is caused solely by adverse health resulting from work, or that sick leave can be explained by economical and societal factors alone. Also, the fact that 10% of the work force is behind 82% of the sick leave (Tveito et al., 2002) indicates that considering individual factors in sick leave is a viable supplement to environmental factors. Norway is a country with high wages, strong employee protection and low unemployment. Therefore, it is likely that individual factors become more important for sick leave levels here than in many other countries.

As with the systems approaches, several theories have been used to explain sick leave using factors related to the individual. These models usually focus on the interaction between the individual and the working environment, and how the individual's experiences the work situation affects health outcomes.

One of the most commonly used models is the “Demand-control-support” model (Karasek & Theorell, 1990). This model suggests that the social organizational characteristics and the psychosocial work environment are important in determining health. Within this framework, the individual’s perception of the possibility to control the workday, the tasks and the speed with which the tasks are done, are considered important. High demands are not harmful as long as the employee feels a high degree of control. Low control is also not a large problem when demands are also low. But when high demands are combined with low control, the results are increases in stress and worsened health (Karasek & Theorell, 1990). Reviews of the literature have found mixed evidence for the effect of high demand and low control leading to objective outcomes such as heart disease (de Lange, Taris, Kompier, Houtman, & Bongers, 2003; Eller et al., 2009)

The effort reward imbalance model (Siegrist, 2005) combines both organizational factors and individual factors. Based on social reciprocity theory, effort reward imbalance denotes the situation where an employee feels an imbalance between what he or she gives to the employer in terms of effort, and what he or she receives back, in terms of salary, benefits, promotions etc. In addition, the model emphasizes that those who have a strong work related overcommitment and need for approval might be especially vulnerable to these effects (Siegrist, 1996).

Longitudinal data also shows that there is an association between effort reward imbalance, and cardiovascular health (Peter et al., 1998; Siegrist, Peter, Junge, Cremer, & Seidel, 1990). A review of research on effort reward imbalance also concludes on the validity of the model (Tsutsumi & Kawakami, 2004).

The emphasis in both these models is on the interplay between the individual and the organization. The individual's own cognitive appraisal of the situation is central in

how the objective environment results in health effects in the individual. For instance, according to the effort reward imbalance model, the individual may accept to work hard for low pay in a period to secure a reward (for instance a permanent position), and in that period the individual may not see him or herself as being unfairly treated. If the reward is not given, then the individual will re-appraise the situation and experience a stronger degree of effort reward imbalance (Siegrist, 1996).

The experience of control is also an individual appraisal of the situation. Some individuals may experience control even in challenging situations, while others feel no control even in relatively non-demanding situations. While the demand-control and the effort reward imbalance model both emphasize individual appraisal of a situation, both see the objective conditions in the environment as the major determinant of adverse health effects (Karasek & Theorell, 1990; Siegrist, 2005).

1.2.2 Stress and coping

At the centre of individual theories is the idea that certain exposures, such as the experience of high demands and low control or an effort reward imbalance, increase the risk of harmful health outcomes (Peter et al., 1998; Tsutsumi & Kawakami, 2004). A remaining question is how the adverse exposures are mediated into biological systems (Reme, Eriksen, & Ursin, 2008). The term "stress" was originally used by Hans Selye (1956) to describe adverse health reactions in rats to "noxious stimuli". The reactions were not in fact caused by a noxious agent, but from the rats' exposure to Selye's own clumsy and painful handling of them, which Selye later discovered. Selye coined the term "stress", which later has become a somewhat unclear term to describe different kinds of challenges and experiences that tax the cognitive and physical system (Ursin & Eriksen, 2010).

Animal research (Weiss, 1968) as well as human research (Ursin, Baade, & Levine, 1978) demonstrated that the adverse health effects of a stressor were almost entirely eliminated if the research subjects had prior knowledge that they had access to an effective way to cope with the stressor. The role of coping could be used to explain how and why individual factors were so important in determining whether or not a

stressor would lead to adverse health effects. This research was the basis for the development of a synthesis of the human and animal studies into a common framework for the understanding of stress and coping, the Cognitive Aactivation Theory of Stress (CATS) (Ursin & Eriksen, 2004).

1.3 Theoretical framework

1.3.1 The Cognitive Activation Theory of Stress (CATS)

A common factor for the individual models of sick leave represented earlier is the belief that an external stressor (such as high demands or an effort reward imbalance) in some cases lead to health problems and sometimes do not. A general problem of the individual models of sick leave is the use of somewhat vague concepts such as "stress", "coping" or "control", and the lack of a systematic description of the process of how the learning environment of the individual sometimes have negative health effects and sometimes do not.

CATS is a general theory for the understanding of stress and coping, however it can also be applied to the sick leave field (Eriksen, 1998; Svensen, 2007) since it offers formal definitions and a clear description of the process of coping and non-coping, and a theory of the process of how coping affects health. CATS will be used as the main theoretical model for this thesis. The theory has been presented and elaborated earlier in both a comprehensive (Ursin & Eriksen, 2004) and short form (Eriksen, Murison, Pensgaard, & Ursin, 2005).

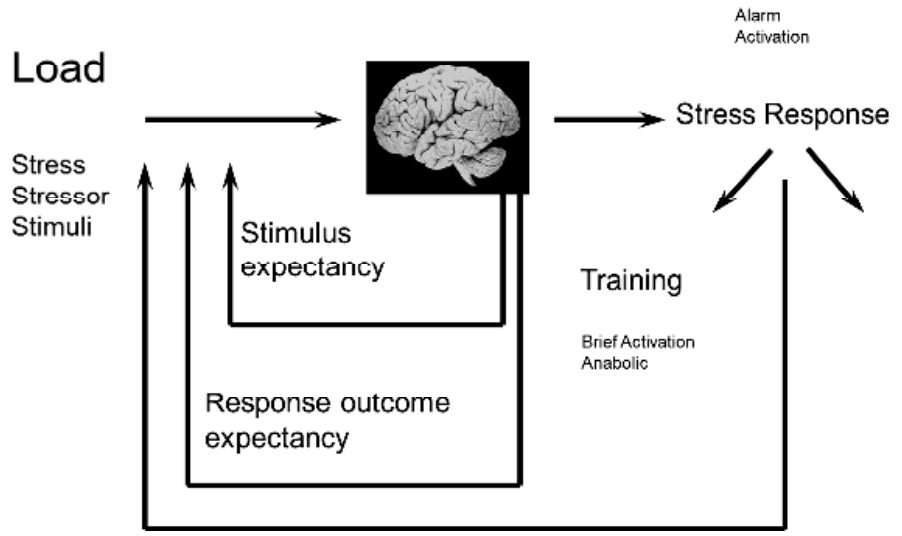

Figure 1: Schematic presentation of CATS, adapted from Eriksen et al. (2005)

According to CATS, "loads" are any stimuli that are either new or not as you expected them to be (the stimulus expectancy) (Ursin & Eriksen, 2004). For instance, taking the bus to work is thoroughly habituated in most of us, and thus it is not likely to be consciously registered. However, if the bus suddenly took a different path than it was supposed to, this would constitute a load. Arousal would then increase and the cognitive system would start processing the information. This increase in arousal can be seen in organisms as simple as fish and as complicated as humans (Eriksen et al., 2005).

There are two kinds of alarm or activation responses (see figure 1). There is a short, anabolic response, with no known pathophysiological effects (train effect), and a sustained, catabolic response with adverse health effects (strain effect) (Eriksen, Olff, Murison, & Ursin, 1999). Whether a stress response will be a train or a strain depends both on the stimulus expectancies and the response outcome expectancies.(Ursin & Eriksen, 2004)

When a stimulus is known, or is of little importance it does not give rise to an increase in activation (Coover, Levine, & Ursin, 1973). However, when a stimulus is either new or signals danger or a challenge, it triggers a general activation response in the individual (Sokolov, 1963).

Whether a discrepancy between a set value and an actual value will lead to an alarm, depends on several factors. It depends on whether the individual places an "affective value" on a the outcome, perceives that it has at least some chance of obtaining the outcome (perceived probability) and that the situation is not already known (habit value) (Ursin & Eriksen, 2004).

According to CATS, whether an activation response will be short or long term depends on the *response outcome expectancies* formed by previous experience with a stimuli or situation. CATS distinguishes between 3 different expectancies. A positive expectancy (coping) is the expectation that most or all of your actions will produce the desired outcome, no expectancy (helplessness) is the belief that your actions have no consequences for the outcome, while a negative response outcome expectancy (hopelessness) means that your actions in fact decreases the chance of a positive outcome. Hopelessness also introduces the element of feeling guilty for failed attempts to cope with a situation.

According to CATS expectancies are made through learning and generalize across areas and time. This also means that response outcome expectancies can be changed with new learning experiences that modify the original expectancy. Within a sick leave context, CATS predicts that individuals that feel helplessness or hopelessness in their work may be more at risk for sick leave. However, if new learning can produce a positive expectancy (coping), the sick leave risk may be decreased.

There has also been critique against models such as CATS. While system theories have been argued to underestimate the individual factor in sick leave, the individual theories have been accused of overestimating the power of the individual and the environment in forming behavior (Krokstad, Magnus, Skrondal, & Westin, 2004; Oort, Lenthe, & Mackenbach, 2005). The field of behavioral genetics (Plomin, 1990)

has increased the understanding of genes as an important predictor of behavior and shown substantial genetic contribution to health behaviors such as smoking and obesity (Carmelli, Swan, Robinette, & Fabsitz, 1992; Lerman et al., 1999; Wardle, Carnell, Haworth, & Plomin, 2008). There has also been demonstrated genetic links to coping styles (Busjahn, Faulhaber, Freier, & Luft, 1999).

Likewise there has been a long debate on whether coping is indeed formed by learning, or is best viewed as an innate and stabile trait (Schwartz, Neale, Marco, Shiffman, & Stone, 1999). Factors such as intelligence (Bailey & Hailey, 1983), monetary resources and social position (Brantley, O'Hea, Jones, & Mehan, 2002) certainly limits the individual's ability to cope with challenges, and this will again impact how expectations are formed.

The concept of sustained activation, although popular as a scientific concept, has not as of yet been decisively shown in any bodily substance (Brosschot, Pieper, & Thayer, 2005; Ursin & Eriksen, 2010). While the early models suggested a constantly elevated level of stress hormones (sustained activation), newer models have looked at factors such as need for recovery (Sluiter, Croon, Meijman, & Frings-Dresen, 2003) elevated evening values of cortisol (Harris, Ursin, Murison, & Eriksen, 2007) or preservative cognitions (Brosschot et al., 2005).

1.3.2 Other theoretical perspectives on stress and coping

A different understanding of stress and coping is that of Lazarus and Folkman (1984). Their argument against the idea of generalized coping expectancies according was that there is no a priori "right" way to cope with a challenge; the strategies have to be assessed in the context that they were made, and by the results they produced.

Albert Banduras concept of "self-efficacy" (Bandura, 1997) differs from the CATS concept on coping by viewing coping *only* in specific contexts. Thus, coping expectations are always related to a given situation and context. Bandura recognizes that individuals may have aggregated coping expectancies, based on a number of specific self-efficacies. However, Bandura does not recognize the existence of a

global self-efficacy that is context independent (Bandura, 1997; Bandura, Reese, & Adams, 1982).

Specific or global coping also has practical consequences. Asking about a specific expectancy (such as “do you believe that you will be able to return to work”), usually gives better results than asking about general expectancies. However, the number of different inventories that have to be made to measure different self-efficacies is very high. This also makes comparisons across studies, cultures and situations difficult. Also, as Ajzen(1988) commented, the concept makes it difficult to measure effects of self-efficacy that impact multiple health behaviors.

1.3.3 Theories of low back pain

While CATS is a general framework for understanding the cognitive processes related to stress and coping, a more specific understanding is necessary for understanding specific conditions, such as low back pain. In this section, a short introduction will be given to the traditional model of understanding, the injury model, before the theoretical foundation of paper 3, the non-injury model is presented.

The injury model

The injury model is the name given to the traditional view and management of unspecific low back pain. Although the model is not a unitary and well defined or delineated model, it is usually represented with some core characteristics.

Within this framework, back pain is caused by injuries/damages to the disc and the spinal column (Adams, 2004). Some researchers have suggested that injuries are the results of pressures being put on the back from improper handling of loads (Hoogendoorn et al., 1999) or other risk factors such as heavy work (Harreby, Hesselsoe, Kjer, & Neergaard, 1997). Another explanation that has been offered is atherosclerosis in the lumbar region (Heuch, Heuch, Hagen, & Zwart, 2010).

Within an injury model framework, unspecific low back pain without the presence of red flags, can be a result of injuries and loads to the back, and is at least theoretically

possible to avoid and prevent by not exposing the back to certain kinds of loads or other risk factors. For treatment, bed rest was recommended early on (Deyo, 1991; The Quebec Task Force on Spinal Disorders, 1987), but most physicians now endorse activity, and some recommend exercise as a possible effective tool in preventing low back pain (A. K. Burton et al., 2006; Malmivaara et al., 1995; Waddell, 1998).

The non-injury model

The consequences of low back pain are the focus of treatment within the non-injury model. This was an idea that originated and developed through clinical experience with conservative low back pain treatment (Indahl, Velund, & Reikeraas, 1995). The ideas were tested with a randomized trial of the effect of treating low back pain as a benign, self-limiting condition. The treatment hastened return to work in those treated, an effect that was sustained over a five year period (Indahl, Haldorsen, Holm, Reikeras, & Ursin, 1998). A replication of the treatment was done by a different clinic which also added a light mobilization program provided by a physiotherapist as part of the treatment (E. M. Hagen, Eriksen, & Ursin, 2000).

This treatment was named the "brief intervention". The method consists of a “therapeutic examination” and conversation, where the doctor or physiotherapist goes through several steps. First, serious or specific pathology or red flags are excluded by thoroughly explaining each step and the meaning of each result to the patient. The physical examination is used as a “therapeutic examination” where all procedures, are explained thoroughly, and findings continually explained to the patient. If no serious pathology is found, the therapeutic examination is designed to create confidence in the robustness of the spine, and confidence that normal activity may be resumed with no serious consequences, apart from maybe transient pain increase. After that the doctor or physiotherapist explains the favorable prognosis of unspecific low back pain, and gives the patient the reasons why activity is recommended. The patient is asked throughout the examination whether they understand the message given, and is encouraged to ask questions after the examination.

The non-injury model is developed based on clinical experience, from the ideas underlying the brief intervention, and basic and applied research on conservative treatment for low back pain. The most important evidence base is the evidence behind the European guidelines (van Tulder et al., 2002) and twin studies which show that the relationship between environmental exposures and degeneration of the spinal disc was weak or non-significant (Battié et al., 1995; Videman et al., 1995; Videman, Gibbons, Kaprio, & Battié, 2010; Videman, Simonen, Usenius, Österman, & Battie, 2000).

The non-injury model acknowledges the existence of specific spinal pathologies that require treatment. All treatments based on the non-injury model always recommends screening for red flags (see section 1.1.2) when a patient first contacts health personnel. The descriptions and understandings given in the model are based on an assumption that the back pain treated is unspecific and that no red flags are present in the patient.

According to the non-injury model, the back is a robust structure, more than capable of handling the loads of everyday life. Unspecific LBP is not seen as an injury caused by loads being put on the spine, and thus it is not possible to avoid having LBP by avoiding specific uses of the spine. (P. H. Sorensen et al., 2010). During a normal life, the back will undergo changes that occasionally lead to pain. Age related anatomic changes in the back are very common, and usually they go unnoticed and do not cause pain (Deyo, 2002).

Treatment of unspecific low back pain is strictly speaking not possible or necessary apart from maybe pain reduction, according to the model. An individual may experience pain, continue with everyday activities and the pain will naturally subside (Malmivaara et al., 1995). The major health risk of unspecific LBP is linked to the illness perception of the patient (Foster et al., 2008). Illness perceptions are what the patient conceives to be the reason for the pain, the patients belief about prognosis and the degree to which the patient can control and/or cope with the illness (Petrie & Weinman, 2006). If the individual perceives the pain to be a sign of an injury, mal-

adaptive behaviors and cognitions may serve to prolong and enhance the pain. These behaviors can be to “brace” the back by the use of back muscles, inactivity, and cancelling of normal activities such as work and leisure activities (Keefe, Wilkins, & Cook, 1984). Fear of movement (Kori, Miller, & Todd, 1990) and involuntary inactivity, are also threats to the health and quality of life of the individual (Waddell, 1998).

While the non-injury model makes the claim that unspecific low back pain cannot be prevented, the consequences of low back pain are preventable (A. K. Burton et al., 2006; P. H. Sorensen et al., 2010). Within a non-injury framework, knowledge of the nature of back pain and the benefits of staying active when experiencing it can reduce fear avoidance and sick leave caused by unspecific low back pain (A. K. Burton et al., 2006). Spreading the message about the good prognosis of low back pain and the reasons to stay active has been tested in a population setting with mixed results (Buchbinder, 2001; Werner, Ihlebæk, Lærum, Wormgoor, & Indahl, 2008).

The "Active back" project (Werner, Lærum, Wormgoor, Lindh, & Indahl, 2007) was the first attempt to use the non-injury model as a partly preventive measure, and the first attempt to use the model for a workplace intervention. The idea behind the active back was to give information about the back to healthy employees, to make the handling of future back pain easier. This was combined with a colleague that offered help and support to colleagues with back pain, as well as a treatment similar to the brief intervention without waiting time for those who experienced back pain. The treatment reduced sick leave in a quasi-experimental study (Werner et al., 2007). If sick leave reduction is possible with a non- injury model, this is an indication that knowledge about the back and expectations about one's ability to go to work despite having pain matters for sick leave, and possibly for health.

1.3.4 Summary of theoretical framework

CATS (Ursin & Eriksen, 2004) and the non-injury model (P. H. Sorensen et al., 2010) are theoretical frameworks that focus on the cognitive processes in the individual and the behavioral decisions that impact health and sick leave. CATS and

the non-injury model are in many ways complimentary understandings of the general effect of coping expectancies and how these can be used to understand health complaints that are not easily understood and handled in traditional health care.

Both CATS and the non-injury model are formulated in a way that allows the formation of operationalized and testable hypotheses. According to CATS, the individual's response outcome expectancies impact health both directly and through choice (such as staying active or passive). If this is true, the result of this should be that those who have predominantly positive response outcome expectancies should have better health and lower sick leave than those who have no expectancies or a negative expectancy. Furthermore, the theory predicts that interventions that change the response outcome expectancy into a positive expectancy (coping) or strengthens the positive expectancy should lead to improvements in health and to reductions in sick leave.

The non-injury model makes clear assumptions about how negative illness perceptions based on an incorrect and fear arousing understanding of LBP, can lead to slower recovery, sick leave and maladaptive behaviors. When these wrong understandings are changed, the model predicts that the individual will reduce its sick leave and experience improvement in the management of the low back pain. Thus an intervention that succeeds in forming new understandings that the individual trusts, should also have the effect of reduced sick leave.

2. Research question and aims

2.1 General research question: What is the effect of response outcome expectancies (coping) and knowledge on health and sick leave?

This thesis has a general research question, which is operationalized into four specific and testable research aims. These aims come from the theoretical predictions of CATS and the non-injury model, as well as from reviewing the existing literature on workplace interventions, coping and health. The goal of this thesis is to examine whether coping expectancies and understandings of low back pain are related to health and sick leave, and whether they can be used in interventions to reduce sick leave and improve health.

The four specific research aims explores different aspects of this relationship. First, a valid way of measuring coping expectancies is determined and tested. Then, the viability of workplace interventions that target coping and sick leave behavior is examined. Finally, the non-injury model is tested in an intervention where coping and information is used to reduce sick leave. The combined goal of these aims is to answer whether changes in coping and understandings impact health and sick leave in measurable and important ways.

The main general research question of the thesis is:

What is the effect of response outcome expectancies (coping) and knowledge on health and sick leave?

2.2 Specific research aims

2.2.1 Research aim 1: To develop a new questionnaire to measure response outcome expectancies (Paper 1)

If an inventory used to measure coping is not valid, then very little can be learned from the results. As previously mentioned one of the defining characteristics of CATS is the idea of generalized response outcome expectancies as predictors of behavior (Eriksen et al., 2005). The non-injury model also puts emphasis on how expectancies about the outcome of activity may hinder or promote active behavior and going to work.

In a previous paper, two potential ways to use established inventories to measure response outcome expectancies were examined (Odéen, Kristensen, & Ursin, 2009). The conclusion pointed to a number of methodological and theoretical problems with the two inventories that were used in most CATS research until then, the Utrecht Coping List (UCL) (Schreurs, Van De Willige, Brosschot, & Grau, 1993) and the General Self Efficacy (GSE) (Schwarzer & Jerusalem, 1995) inventory. There were theoretical problems with the UCL. The inventory measures strategies instead of expectation as CATS is based on (Odéen et al., 2009; Ursin & Eriksen, 2004). There were also theoretical problems with the GSE, in that it measures global self-efficacy, a concept and inventory developed by Ralf Schwarzer and colleagues (Schwarzer & Jerusalem, 1995). The global efficacy expectation is a concept which Bandura explicitly rejects in his theory (Bandura, 1997) and this gives rise to difficulties in how to interpret results within the framework of the self-efficacy theory.

The test of predictive validity indicated that the inventories were not strong predictors of return to work in two separate samples, leading to questions of their usefulness as measures of coping in the field, at least in regards to health and sick leave (Odeen & Kristensen, 2007; Odéen et al., 2009).

The development of a new inventory was a natural next step in order to develop a valid and theoretically sound instrument for CATS (paper 1). Together with Swedish

colleagues a new inventory, the Theoretically Originated Measure of the Cognitive Activation Theory of Stress (TOMCATS) was developed. The goal of the inventory was to have questions that closely mirror the concepts of coping, helplessness and hopelessness, and also predict important outcomes such as health and sick leave. Paper 1 includes a validation study of this instrument, through a test of the convergent validity against the UCL. The first research aim is:

To develop a new questionnaire to measure response outcome expectancies (Paper 1)

2.2.2 Research aim 2: Can response outcome expectancies predict health, and what is the relationship between response outcome expectancies and socioeconomic status? (Paper 1)

After the establishment of a new inventory that measures coping expectancies according to CATS, and the determination of some of its basic psychometric properties, the next step was to study to what degree coping could predict health. The relationship between coping styles and health outcomes has been shown in several longitudinal studies (Bandura, Barbaranelli, Caprara, & Pastorelli, 2001; Bosma, van de Mheen, & Mackenbach, 1999; Steiner, Erickson, Hernandez, & Pavelski, 2002), but most of this research has been done with coping strategies rather than coping expectancies. The goal of this work was to examine whether response outcome expectancies could in fact predict health in a general population.

Furthermore, the relationship between coping, socioeconomic status and heath was examined. There are multiple suggestions that socioeconomic status, health and coping are associated (Wardle & Steptoe, 2003) , and this could potentially contribute to our understanding of the large role socioeconomic status plays for health (Marmot & Wilkinson, 1999; Wilkinson, 2000). When viewing health in a larger perspective, it is also important to understand the role of socioeconomic status in forming the environment that coping expectancies develop in (Bosma et al., 1999; Schwartz et al., 1995).

Furthermore, it is interesting to explore if there in fact are systematic differences between those with high and low socioeconomic status in response outcome

expectancies, as understood in CATS (Ursin & Eriksen, 2004). As described earlier, socioeconomic health gradients are stable or increasing in Europe (Kunst et al., 2005). They exist even in societies with high degrees of equality and public services such as Norway (Norwegian Department of Health, 2005). If coping is associated with health, then there is a possibility that coping can be used as a way to combat socioeconomic differences in health. This is because it is believed that coping and behavior are possible to change systematically with interventions (Kristenson et al., 2004), while the socioeconomic status is much more difficult to change, at least in large populations. The second research aim is:

Can response outcome expectancies predict health, and what is the relationship between response outcome expectancies and socioeconomic status? (Paper 1)

2.2.3 Research aim 3 : Can active workplace interventions reduce sick leave? (paper 2)

There is a general belief that coping and knowledge are factors that can be changed through interventions. To explore this, a systematic review was done. The systematic review examined workplace interventions designed to reduces sick leave, where the employee plays an active role (paper 2). Previous systematic reviews of active workplace interventions with sick leave as the outcome have shown mixed results (Carroll, Rick, Pilgrim, Cameron, & Hillage, 2010; Tveito, Hysing, & Eriksen, 2004; van Oostrom et al., 2009), but have generally been positive to the effectiveness of active interventions. While there are examples of reviews that span diagnostic categories (van Oostrom et al., 2009), previous reviews in the field have predominantly concentrated on low back pain only, or a narrow range of conditions, (Carroll et al., 2010; Tveito, Hysing, et al., 2004).

A number of studies have shown that many patients have comorbid complaints (Grøvle et al., 2011; E. M. Hagen, Svensen, Eriksen, Ihlebaek, & Ursin, 2006; Ihlebæk, Ødegaard, Vikne, Eriksen, & Lærum, 2006; Reme, Tangen, Moe, & Eriksen, 2011). Thus there might be good reasons to study whether interventions may show effect also across diagnostic categories. Also, surveying a relatively wide range

of interventions, the relative efficiency of different approaches can be seen in an overarching perspective.

While it may have been possible to include only interventions that studied the effect of coping, this would have been difficult to operationalize in a meaningful way. CATS (Ursin & Eriksen, 2004), as well as the theory of self-efficacy (Bandura, 1997) also suggests multiple ways that response outcome expectancies can be changed. Learning new information might change both affective values and perceived probabilities of being able to cope, as can direct experience e.g. physical activity (Bandura, 1999). Likewise, Bandura has argued that self-efficacy can be changed through verbal persuasion, model learning or direct experience (Bandura, 1997). Given this, we chose to widen the inclusion to include all interventions where the employee play an active part in the intervention, as opposed to simply being treated, and where the goal of the intervention was to change knowledge, cognitions and behavior in a way that may reduce sick leave. Sick leave was used as the only outcome measure, since it was the main research interest and due to the heterogeneity of other outcome measures in the included articles. The third research aim was:

Can active workplace interventions reduce sick leave? (paper 2)

2.2.4 Research aim 4: What is the effect of the atWork intervention on sick leave, and is the intervention feasible in the workplace? (paper 3)

Previously CATS and the non-injury model have been introduced as ways to understand how sick leave develops and can be reduced. The atWork intervention was developed by Aage Indahl, based on the non-injury model (paper 3). The intervention combines preventive education about low back pain and sick leave, with effort to reduce barriers to stay at work. The model has three components: Information meetings that give evidence based reasons to stay active, a colleague that helps and provides social support to his or her colleagues, and for one of the randomization groups, a fast referral to an outpatient clinic.

Social support is important since social isolation is a risk factor for increased sick leave length in employees with low back pain (Steenstra et al., 2005) and social support has been shown to reduce sick leave for employees with mental health problems (Stansfeld et al., 1997). The outpatient clinic gives employees with more needs the documented effective brief intervention, at a very early stage in an episode of acute low back pain. The effect of this could be independently tested.

The atWork intervention can be seen as an empirical test of the non-injury model. Specifically the intervention tests the hypothesis that health and sick leave is influenced by coping expectations and knowledge. If sick leave can be reduced by this intervention, it is a promising result for the idea of coping expectations and knowledge as targets for health promotion.

What is the effect of the atWork intervention on sick leave, and is the intervention feasible in the workplace? (paper 3)

3. Methods

3.1 Methodological approach

A very broad methodological approach to the general research question has been used in this thesis. Choice of method is guided by a number of concerns, briefly mentioned here.

The primary concern for the choice of method was the research question and the research aims. Research aims 1and 2 concerned associations, and was best answered by epidemiological data that allows large datasets representative of whole countries and regions. Research aim 3 was about a general treatment effect, and thus a systematic review of Randomized controlled trials (RCT) was the natural choice. Research aim 4 asked about a specific, untested treatment, and thus a RCT was chosen, due to the unique ability of the RCT to isolate the intervention from other variables that affect the outcome (Evans, 2003; Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996).

Furthermore, it is important to consider the state of knowledge of a given question. The aims form a logical progression in the scientific exploration of the general research question: From designing instruments and measuring associations, to the exploration of interventions and finally the testing of the theoretical predictions in an RCT.

Real world science, as opposed to textbook examples and ideal practices, requires compromises. Time, financial and human resources, geographical and cultural concerns, and especially ethical concerns make up frames that research has to be done within. Methodological choices do not happen in a vacuum, but should be seen as a compromise where the best possible quality was attained within the frames that the research is bound by.

3.2 Paper 1

Research aim 1: To develop a new questionnaire to measure response outcome expectancies.

Research aim 2: Can response outcome expectancies predict health, and what is the relationship between response outcome expectancies and socioeconomic status?

Although concepts such as personal control, coping and health have been extensively studied (Christie & Barling, 2009; Eriksen & Ursin, 1999; Kristenson et al., 2004), there has never been a direct test of the relationship between response outcome expectancies, as defined by CATS, SES, and health. An epidemiological study was chosen as method, to establish if the relationship existed.

3.2.1 Samples

Two samples were used. Sample 1 consisted of 1702 Norwegian municipal employees, with 81% females, and a mean age of 44 years, from the atWork project. Sample 1 is described in detail in section 3.4.1. Sample 2 was a nationally representative cohort of the Swedish Longitudinal Occupational Survey of Health (SLOSH). The sample consisted of 11441 Swedish respondents, 55% female with a mean age of 49 years (sd=11.6). Eighty five percent of the sample was gainfully employed above a 30% position. The percentage with high school or higher education was 88 %. The mean income was 298 000 SEK or 31 850 Euro.

3.2.2 Procedure

Sample 1: Surveys and consent forms were handed out to all employees in the municipalities at their workplace. Only baseline answers were used for this research question. The response rate was about 50%, A full description of the procedure is given in section 3.4.2.

Sample 2: The data came from a mailed pen-and-paper survey sent out in 2008 to a representative sample of respondents of the Swedish Work Environment Surveys (SWES) in 2003 and 2005. The survey was mailed out in two versions, one for those

gainfully employed above 30%, and one for those not gainfully employed. All questions used in this thesis were used in both the employed and not employed group. The response rate was 61%, a response rate that is better or equal to similar studies (Kinsten et al., 2007).

In addition to the survey data, register data on income and education level was collected for the participants and added to the dataset. The Nordic countries have the advantage of the availability of high quality register data, which in this case was added to the dataset by Statistics Sweden. This ensures very low rates of missing data on key variables. The sample was balanced and diverse in terms of gender, occupation, geography, and level of education (see paper 1).The study was approved by the regional ethics board in Stockholm. Full details on the procedure have been published previously (Kinsten et al., 2007).

3.2.3 Instruments

TOMCATS (the Theoretically Originated Measure of the Cognitive Activation Theory of Stress)

There are numerous well established inventories for measuring coping, such as the ways of coping checklist (Folkman & Lazarus, 1980) , ways of coping questionnaire (Folkman & Lazarus, 1988), locus of control (Rotter, 1966), general self-efficacy (Schwarzer & Jerusalem, 1995), the coping strategy indicator (Amirkhan, 1990), the multidimensional coping inventory (Endler & Parker, 1990) and the COPE (Carver, Scheier, & Weintraub, 1989). In addition there is a large library of coping questionnaires for specific situations and groups, most of which are based on self-efficacy theory (Bandura, 2006). The use of an established inventory ensures that the results will be comparable to other studies of coping. The decision to introduce a new inventory for a concept such as coping was therefore carefully considered.

TOMCATS is based on CATS definitions of coping, helplessness and hopelessness as a positive response outcome expectancy, no response outcome expectancy, and a negative response outcome expectancy respectively. The statements are designed to

reflect generalized beliefs about the ability to cope with problems and challenges. The inventory consists of seven items (see paper 1); a single item for coping, three items for helplessness and three items for hopelessness. The items were: "I can solve most difficult situations with a good result." (coping). "I really don't have any control over the most important issues in my life" (helplessness), "I wish I could change my life, but it's not possible" (helplessness), All my attempts at changing my life are meaningless (helplessness), "It's better that others try to solve my problems than for me to mess things up and make them worse" (hopelessness), "I would have been better off if I didn't try so hard to solve my problems" (hopelessness) and "all my attempts at making things better just makes them worse" (hopelessness). These items are translations of the Swedish and Norwegian versions used in (paper 1). The items are scored on a scale from 1 to 4, where 1="completely true". 1= "not true at all",2="somewhat true" 3="somewhat untrue" and 4="completely untrue" The scores were then reversed so that high scores indicated agreement with the statements. Factor analysis confirmed a three factor structure, and the Chronbach's alpha of helplessness (.85) and hopelessness (.80) was satisfactory. An average value was used to calculate the scores of the helplessness and hopelessness factors, so that all factors had a range of 1-4, with a high score on a factor indicating a high level of coping, helplessness or hopelessness.

A short inventory was chosen since CATS defines coping, helplessness and hopelessness in well defined, unidimensional terms, and this allows a short inventory to be made. Although adding more items usually improves the psychometric properties of a test, pilot tests of versions of the inventory with more items did not improve the psychometric properties or the predictive validity of the inventory.

Utrecht coping list

The Utrecht Coping List (UCL) (Schreurs, Tellegen, Van De Willige, & Brosschot, 1988; Schreurs et al., 1993) was used to test the convergent validity of the TOMCATS inventory. The reasons for choosing the UCL were that it has been used in previous research based on CATS, as well as being a well-established measure of coping. The original UCL consists of 47 items with a score ranging from one to four.

In this thesis, a short version of the UCL with 22 items was used (Eriksen, Olff, & Ursin, 1997). Four factors from the short version of the UCL inventory were used. These were "active problem solving", "passive avoidance", and "depressive reaction pattern", as well as the "instrumental mastery oriented coping" (IMOC) factor. The IMOC factor is calculated from the active problem solving scale and the reversed versions of the passive avoidance and depressive reaction pattern scales. With the active problem solving and IMOC factors a high score indicates high levels of coping, while high scores on the "passive avoidance" and "depressive reaction pattern" indicates lower levels of coping. The similar factor structure to the TOMCATS inventory makes it suitable for a convergent validity comparison with TOMCATS. The short Norwegian version of the UCL (Eriksen et al., 1997; Schreurs et al., 1993) was used in this thesis.

Macarthur scale of subjective social status

The MacArthur Scale of Subjective Social Status is a measure designed to capture an individual's subjective evaluation of his or her social status relative to society. The instrument consists of a drawing of a ladder with 10 rungs, and the respondent is asked to mark his or her social position on the ladder, relative to others in society. This is then translated to a score of one to ten, with ten being the highest score. Subjective SES using the ladder has been found to be associated with both physical and mental health, often more strongly than objective measures of SES (Miyakawa, Magnusson Hanson, Theorell, & Westerlund, 2011; Operario, Adler, & Williams, 2004; Singh-Manoux, Adler, & Marmot, 2003; Singh-Manoux, Marmot, & Adler, 2005). It is also considered a good alternative to objective measurement of SES, since the respondents also take into consideration their future prospects. For instance, young professionals may have similar wages to blue collar employees, but may have a reasonable expectation of an increased SES in the future.

Objective socioeconomic status

Objective socioeconomic status was measured with a combination of income, education and work classification. Income was measured in units of 1 000 SEK. It includes all gross income.

Education level and income were obtained from register data. Education was classified into five categories, less than high school, high school, < 2 years of undergraduate studies, ≥2 years of undergraduate studies, and graduate studies.

Work classification was obtained by asking the respondents about their work title, which was then coded according to the third version of the International Standard Classification of Occupations (ISCO-88).

Self-rated general health

General health was measured by a single question: "How would you rate your general state of health?" Respondents were given 5 alternatives from "very good" to "very bad". The scores were reversed so that high score indicated good health. This single question has been validated as a health outcome measure (DeSalvo, Fisher, et al., 2006; DeSalvo, Bloser, Reynolds, He, & Muntner, 2006; Fylkesnes & Førde, 1991) and is also predictive of mortality (Idler & Benyamini, 1997; Schou, Krokstad, & Westin, 2006).

3.2.4 Statistics

For research aim 1, a principal components factor analysis was done to determine the factor structure of TOMCATS. Three factors were identified corresponding to CATS response outcome expectancies; coping, helplessness, and hopelessness. Bivariate correlations were used to compare TOMCATS to the UCL.

For research aim 2, hierarchical multiple regression analysis was used to analyze the data. The objective socioeconomic status variables were entered separately into the equation. Due to the number of significance tests, Fishers protected T test (Cohen, 2003) was used to control for multiple testing.

3.3 Paper 2

Research aim 3: Can active workplace interventions reduce sick leave?

A systematic review of the literature was chosen to answer this research aim.

3.3.1 Article selection

PubMed, Embase, Psych-Info, ISI Web of Science and the Cochrane Central Register Databases, were searched. The search string consisted of two parts, one for identifying randomized trials and one for identifying articles that measured sick leave. This search returned 2036 unique articles, which were then manually screened. The criteria for selection were that the participants were employed and above 18 years, the interventions had to include an active role for the participants, and sick leave had to be measured quantitavely. In addition, only RCTs were included. In addition the overall risk of bias (Higgins & Green, 2008) had to be medium or low (see paper 2). Seventeen articles were selected, with a total of 24 comparisons. Two of 17 articles had a low risk of bias, and 14 articles used register data for the sick leave outcome.

3.3.2 Procedure

Database search strings were constructed by the review group (see appendix 1 of paper 2) based on the inclusion and exclusion criteria. The search logs were checked for duplicate entries, which reduced the sample to about half, from 4478 to 2036. After this the articles were screened on title and abstract to remove obviously non relevant articles. This left 93 articles that were processed in full text, of which 17 were included in the review. Seventy-six articles were excluded, mainly because they did not fulfill the workplace criteria, had insufficient sick leave reporting, or because the employees did not have an active role in the intervention. Thirteen articles were excluded because of a high overall risk of bias. Once the selection of included articles was finished, data was extracted using a digital data collection form, and scored for risk of bias (Higgins & Green, 2008).

The study did not require an ethical approval, since it did not involve the collection of new data. However, all parts of the work were done according to what the review group considered the highest scientific standards of ethics and integrity. The review group members were not involved in the analysis or assessment of articles where they themselves were authors of, and every effort was made to ensure a fair and equal treatment of all articles.

3.3.3 Data synthesis

A structured narrative synthesis was used for this research aim. Meta-analysis was not used due to the heterogeneity of the outcomes and the follow up times for the sick leave outcome.

The articles were placed into groups, based on an analysis of the content of the intervention. The evidence for each of the interventions was assessed based on the sample size, effect size and risk of bias for each of the articles in the groups of interventions. To be considered a "high quality" RCT, an article had to, among other things, have a low risk of bias. An evidence hierarchy was used to assess the level of evidence for the different categories of interventions(van Tulder, Furlan, Bombardier, & Bouter, 2003).

3.4 Paper 3

Research question 4: What is the effect of the atWork intervention on sick leave, and is the intervention feasible in the workplace?

The fourth research aim concerned the effect of the atWork intervention on sick leave. The non-injury based AtWork intervention has previously been tested in a non-randomized study (Werner et al., 2007), and thus a large scale RCT was the natural choice of method at this point, to test if the results would be the same when applying the rigorous methodological demands of the RCT.

3.4.1 Sample

The sample consisted of approximately 3500 employees of two Norwegian municipalities. 1746 of these responded to questionnaires, while all employees were included in the municipalities' sick leave records. The sample consisted of 81% females, and had a mean age of 44 years. Twenty two percent were managers and the sample had a mean of 14 years of education. The respondents had a variety of jobs, some manual and some administrative, and had different levels of education. Some of the participants were also shift workers. The employees belonged to 125 different work units (such as a school, a nursing home or a planning office). The units thus represented the municipalities' natural working groups. Randomization and the analysis of the sick leave data was done on the unit level.

3.4.2 Procedure

Surveys and consent forms were handed out to all employees in the municipalities. The respondents could choose to respond using pen and paper, and in some cases by computer. Before the surveys were administered, comprehensive information was given, and motivation work done to inform and motivate the employees to respond. Despite of this, only about 50% chose to respond to the surveys. The surveys were sent out at the start of the intervention, and after 1 year. The primary outcome of sick leave was measured using the municipalities' sick leave records. These records were on the unit level, so the sick leave outcome was not affected by the low response rate.

The units were randomized into 3 different intervention groups. These were Education and Peer Support (EPS), Education, Peer Support, and Outpatient Clinic (EPSOC) and a no-treatment control group. Two educational meetings, with approximately 2-3 months intervals between them, were offered to all employees in the EPS and EPSOC groups. Each of the educational meetings lasted for 45 minutes, and the purpose was to educate the employees and leaders about LBP. During the first Educational Meeting, "peer advisers" for each of the units were recruited among the employees. The peer adviser was a fellow employee, with no former training in medicine or related fields. The peer adviser's role was not to give a diagnosis or to

recommend treatment options, but to give social support, and to use their knowledge of the working environment to help their colleagues to stay at work, despite having pain. When necessary, the peer adviser offered help with work modification. If an employee had persistent LBP, or felt unsure about the nature of the back pain, the peer advisers were instructed to advise them to contact their General Practitioner, or if assigned to the EPSOC group, to contact the outpatient clinic.

In addition to the educational meetings and access to a peer adviser, the EPSOC group included access to medical evaluation and treatment, at one of two outpatient clinics. All employees referred to the clinic by the peer advisers, went through an initial individual assessment, including a physical examination by a physiotherapist, followed by two reinforcing educational workshops with other patients, where the message of the educational meetings was repeated. The examination was done in order to screen for any condition requiring further medical assessment or treatment, and to give the employee insight and reassurance. In case additional medical care or assessment was required, the employee was referred to relevant specialist care.

The study was approved by the regional ethics board (REK-vest), the national privacy authorities (NSD) and the privacy ombudsman at Oslo University Hospital.

3.4.3 Instruments

For research aim 4, TOMCATS (see section 3.2.3), self-rated general health (see section 3.2.3), subjective health complaints, Tampa Scale, and Deyo's myths of low back pain were used.

Subjective health complaints

The subjective health complaints inventory (Eriksen, Ihlebæk, & Ursin, 1999) was used to assess musculoskeletal complaints and low back pain, using the musculoskeletal factor and a single question on low back pain from the SHC inventory. The subjective health complaints inventory had the advantages of offering a fast way to assess the presence or absence of musculoskeletal and low back pain in the group. The inventory asks whether the respondent has experienced any of 29

listed health complaints in the last 30 days. The severity of the complaints is rated from 0 (no complaints) to 3 (severe complaints). Factor analysis of the inventory revealed 5 factors: Musculoskeletal pain, "pseudoneurology", gastrointestinal, allergy and flu (Eriksen, Ihlebæk, et al., 1999). The Musculosceletal factor used in this thesis had a Chronbach's alpha value of .74, the highest of the five factors in the inventory, while the lowest is flu with an alpha value of .58 (Eriksen, Ihlebæk, et al., 1999). The factor also has shown a one month test retest reliability of .55 (Eriksen et al., 1997), which is satisfactory considering that musculoskeletal pain varies somewhat over time (Ihlebæk & Eriksen, 2004a) . A Norwegian version of the scale was used.

Tampa scale

The Tampa scale of Kinesiophobia (Kori et al., 1990) was used to assess fear-avoidance. In this thesis a Norwegian version with13 items with a four point scale from strongly disagree (1) to strongly agree (4) was used. A mean value of all items was calculated. The Tampa scale has shown to be reliable and valid in acute LBP patients (Swinkels-Meewisse, Swinkels, Verbeek, Vlaeyen, & Oostendorp, 2003).The most important reason for using the Tampa scale was to use a well validated and tested inventory in order to make the data more comparable to other studies.

Deyo's low back pain myths

Deyo's low back pain myths are seven statements that have been disproved by scientific studies (Deyo, 1998). These statements have been made into an inventory that asks respondents to score their belief in the myths on a five point scale (Ihlebæk & Eriksen, 2003). Most of the myths use a strong biomechanical perspective and claim that low back pain is a sign of pathology. In the time since the myths were first described, there has been a considerable information effort to disprove them, both internationally and in Norway (Buchbinder, 2001; Werner et al., 2008). There is evidence that belief in the myths has in fact been nearly eliminated in health professionals (Ihlebæk & Eriksen, 2004b). The reduction is also happening in the population, but at a slower pace (Ihlebæk & Eriksen, 2005). Two of the myths, regarding heavy lifting as the cause of low back pain, and the usefulness of x-ray

imaging are the most resistant to extinction. These were specifically targeted in the atWork intervention and were the ones used in the analysis in paper 3, since they were the only two widely believed myths in the sample.

3.4.4 Statistics

The data collected from the municipalities was on the unit level. The data was analyzed at the unit level, based on the premise that interventions should be measured at the level which they are initiated (G. Sorensen, Emmons, Hunt, & Johnston, 1998).

The size of the units varied greatly, and the initial sick leave levels varied between intervention groups. A generalized linear mixed model (GLMM) Poisson regression was chosen as method, since the data were Poisson distributed, and since the GLMM method allowed us to control for variance in sick leave between units at baseline.

However, the variance in sick leave was much higher than assumed in the Poisson distribution. This lead to an overestimation of the statistical significance of the differences between the groups and inflated P values, which was corrected by applying a control for overdispersion (Vangeneugden, Molenberghs, Verbeke, & Demétrio, 2011). Stein Atle Lie, a professor of statistics, was a co-author of the paper and responsible for the GLMM analysis.

4. Results

4.1 Research aim 1

To develop a new questionnaire to measure response outcome expectancies (Paper 1)

A new coping inventory, the Theoretically Originated Measure of the Cognitive Activation Theory of Stress (TOMCATS) was developed as a tool to measure response outcome expectancies. In a principal components analysis, three distinct factors were identified: hopelessness (initial eigenvalue, 3.50), helplessness (initial eigenvalue, 1.63) and coping (initial eigenvalue, 0.91). Chronbach's alpha for helplessness was (.85) and for hopelessness (.80).

The inventory was used in a validation sample of 1704 Norwegian municipal employees, in order to compare it to an established coping measure, the Utrecht Coping List (Schreurs et al., 1993) . The three factors (coping, helplessness and hopelessness) from the TOMCATS were tested against the factors of "active problem solving", "passive avoidance", and "depressive reaction pattern" in the UCL, as well as the combined factor "instrumental mastery oriented coping" (IMOC). The coping item in the TOMCATS questionnaire showed significant positive correlations with the UCL IMOC factor (r=.030) and active coping (r=.027), and negative correlations with passive avoidance (r=-.18) and depressive reaction pattern (r=-.22). Helplessness and passive avoidance were also correlated (r=.31), as were hopelessness and depressive reaction pattern (r=.47). However, there were no clear distinction between helplessness and hopelessness in the way they correlated with the UCL passive avoidance and depressive reaction pattern factors.

In summary, the empirical factor structure of TOMCATS conformed to the theoretical expectations. The convergent validity was also satisfactory. The brief TOMCATS questionnaire showed acceptable and significant correlations with a traditional coping questionnaire. After establishing these basic properties of the TOMCATS inventory, the next natural questions are whether the inventory can

predict the central outcome measures such as health, and how it is related to the well-established relationship between health and socioeconomic status.

4.2 Research aim 2

Can response outcome expectancies predict health, and what is the relationship between response outcome expectancies and socioeconomic status? (Paper 1)

The one item TOMCATS coping scale, and the three item helplessness scores showed a statistically significant gradient over a subjective socioeconomic status (SES) scale (paper 1). Coping increased, and helplessness and hopelessness decreased with higher subjective SES.

In a multiple regression analysis with control for age and gender, TOMCATS scores explained more variance (r^2=0.16) in self-reported health than both subjective (r^2=0.08) and objective SES (r^2=0.02).

Research aims 1 and 2 have established the measurement of coping and the relation between coping and relevant outcome measures. While associations such as these are important, the value of coping as a potential area for interventions is more crucial from a health promotion point of view. This is the focus of the third and fourth research questions.

4.3 Research aim 3

Can active workplace interventions reduce sick leave? (Paper 2)

A systematic review was done to attempt to answer this question. From an original database of 2036 articles we assessed 93 for eligibility. 17 articles were included for analysis, with a total of 24 comparisons. Analysis of risk of bias showed 2 articles with a low risk of bias and 15 articles with a medium risk of bias. Five interventions from four different studies showed a statistically significant effect on sick leave.

The articles were grouped into cognitive interventions, educational interventions, composite interventions and physical activity interventions.

Within the cognitive interventions, a combination of CBT and Problem Solving Therapy (PST) reduced sick leave in employees with depression and high risk of sick leave (n=139) (Lexis et al., 2011). Other cognitive interventions had no significant effect on sick leave. None of five educational interventions showed an effect on sick leave. Within the composite interventions, only the Sheerbrooke model (Loisel et al., 1997) significantly reduced sick leave, while 5 other composite interventions did not reduce sick leave significantly. Out of 8 physical activity interventions, graded activity significantly reduced sick leave in two studies (Lindström et al., 1992; Staal et al., 2004). Five exercise interventions did not significantly reduce sick leave.

In summary, there was moderate evidence that graded activity reduced sick leave, and limited evidence that the Sheerbrooke model and CBT reduced sick leave. There was also moderate evidence that workplace education and exercises were not effective in reducing sick leave. For other types of interventions the evidence was insufficient to conclude.

In the introduction the non-injury model was introduced (see section 1.3.3), a model with strong evidence of sick leave reduction in the clinical area (E. M. Hagen et al., 2000; Indahl et al., 1998, 1995). The third research question shows that workplace interventions have a low success rate. In light of this it is interesting to examine if the non-injury model's approach to low back pain may be a way to reduce sick leave. This was done by testing the non-injury model based atWork intervention, which is the topic of the fourth research question.

4.4 Research aim 4

What is the effect of the atWork intervention on sick leave, and is the intervention feasible in the workplace? (Paper 3)

This research question was tested by a cluster randomized controlled trial in 125 units of public sector employees of two Norwegian municipalities. The units had about 3500 employees. The units were randomized into three groups: Education and Peer Support (EPS) (n= 41 units), Education and Peer Support with a fast referral option to an Outpatient Clinic (EPSOC) (n= 42 units), and a control group (CON) (n= 42 units). Sick leave data from the municipalities' records were used for the sick leave outcome.

120 units were analyzed (intention to treat, 5 units lacked sick leave data). Both intervention groups had a reduction in sick leave by 7% during the first year of the intervention, compared to the year before, while sick leave in the control group was increased by 5%.

Overall, there was a significant sick leave reduction in the EPSOC group (Rate Ratio (RR) = 0.82 (C.I 0.71 to 0.96) but not the EPS group (RR =0 .91; C.I 0.80 - 1.01).

There were also different results in the two municipalities. In Kongsberg, EPS significantly reduced sick leave (RR= 0.77, C.I 0.64 to 0.92), but EPSOC failed to reach significance (RR= 0.84, C.I 0.70 to 1.01). In Horten, EPSOC was significant (RR = 0.77, C.I 0.61- 0.98) while EPS had no effect (RR=1, C.I 0.84 to 1.20).

Belief in low back pain myths were significantly reduced in both the EPS and EPSOC groups, and pain related fear of movement (Tampa scale) was significantly reduced in all three groups. Furthermore, there was a significant reduction in low back pain in the EPSOC group and an increase in helplessness in the EPS group, but the changes in helplessness and low back pain were small and probably not an indication of an important change.

Educational meetings, based on a non-injury model with peer support and fast referral to outpatient clinics, were feasible at the workplace, and effective in reducing sick leave among Norwegian public sector employees. Without the outpatient clinic the intervention was significant in one municipality, but not overall. The intervention

also reduced faulty back beliefs in both intervention groups, and fear avoidance in all groups.

5. Discussion

The discussion is structured around the four research aims and the general research question. The discussion of methodological strengths and weaknesses of the individual results, as well as implications of the results for research and practice, is covered under each of the specific research aims. The understanding of the results and the methodological strengths and weaknesses of the thesis as a whole is covered under the general research question. In addition, this section provides the alternative interpretations, the general summary, and the conclusion.

5.1 Specific research aims

5.1.1 Research aim 1

To develop a new questionnaire to measure response outcome expectancies (Paper 1)

In the first research aim, the development of the TOMCATS questionnaire represents a new approach to measurement of the response outcome expectancies in CATS (Ursin & Eriksen, 2004). The Utrecht Coping List (UCL) is a well-established measure of coping (Eriksen et al., 1997; Schreurs et al., 1988) and the TOMCATS factors of coping, helplessness and hopelessness correlated with their corresponding UCL factors of active problem solving, passive avoidance and depressive reaction pattern, as well as the Combined factor of instrumental mastery oriented coping (IMOC) (see section 4.1). This is a first step in establishing the validity of the TOMCATS factor structure and of TOMCATS' convergent validity. The results indicate that the helplessness and hopelessness factors are not clearly distinguished from each other in the way they correlate with their corresponding UCL factors of passive avoidance and depressive reaction pattern respectively. It is possible that hopelessness is a relatively uncommon expectancy in the general population, and thus the individuals reporting high hopelessness do not impact outcomes noticeably in continuous analysis with a high number of participants not reporting hopelessness.

Analysis of group differences between individuals reporting hopelessness and those not reporting hopelessness would then be more appropriate in future research. The measurement of the distinction between helplessness and hopelessness should receive more attention in future validation studies of TOMCATS.

The validation samples were large and consisted of participants that were diverse in terms of educational level, occupation, age and socioeconomic status (paper 1), giving the study a high internal validity.

TOMCATS was developed in order to have an inventory that closely mirrored the CATS concept of coping, helplessness and hopelessness as learned response outcome expectancies. While the results of paper 1 was a test of the factor structure and convergent validity of TOMCATS in a nationally representative Swedish sample, this is only the first step in a long process of studying the validity and reliability of the TOMCATS inventory in different settings and samples to establish its external validity. Especially test-retest validity testing, and studies examining coping in different populations are important. These studies are needed in order to examine the usefulness of TOMCATS in groups other than the general population, such as clinical groups. Furthermore, it is important to ensure that the generalized response outcome expectancies that TOMCATS measures are stable over time in periods where no significant new learning has occurred, as suggested in CATS (Ursin & Eriksen, 2004).

The need for further validation is a necessary and important caveat in the use of the TOMCATS questionnaire, and should be noted when interpreting results from the questionnaire. The empirical base of the TOMCATS inventory is for the time being not developed enough to give a general recommendation for its use as a general coping inventory, but hopefully this will change in the future. The initial data indicates that TOMCATS may prove to be a useful short inventory to measure coping, especially for studies of healthy individuals, where surveys typically needs to be shorter than in clinical samples in order to prevent low response rates.

TOMCATS is an alternative for those who want to use a short questionnaire with items that are based on a definition of coping as an acquired response outcome expectancy (Ursin & Eriksen, 2004). The downside to this is that TOMCATS gives only basic data on coping, and the relative strength of the coping, helplessness, and hopelessness factors. TOMCATS does not give more complex and detailed information about coping. How much detail is needed when measuring coping depends primarily on the researchers' theoretical orientation, interest and research question. Dual use of questionnaires is also possible, for instance, a specific self-efficacy concept can be combined with, for instance, a general coping questionnaire. This can be done in order to have both a stronger prediction of behavior from a specialized self-efficacy questionnaire, and the broader generalizations that the more general inventories allow, such as generalizing from one health behavior to others.

The TOMCATS inventory can easily be used in future research projects, which again can contribute to more knowledge of the validity and usefulness of the inventory in different groups. Hopefully, this will improve knowledge about the effect of coping expectancies in different settings and populations, as well as give insight into the role of response outcome expectancies in important areas such as health outcomes, sick leave and behavior change.

While a valid factor structure and convergent validity of an instrument such as TOMCATS, its real value lies in how it can predict other key outcomes such as health and socioeconomic status. If TOMCATS can show predictive validity for health and socioeconomic status, this will be an important step in establishing it as a useful instrument in health research. This predictive validity is what is examined in research aim 2.

5.1.2 Research aim 2

Can response outcome expectancies predict health, and what is the relationship between response outcome expectancies and socioeconomic status? (Paper 1)

Response outcome expectancies measured with the TOMCATS inventory were significantly correlated with subjective and objective socioeconomic status (SES) and general health. Individuals with higher subjective SES had more coping expectancies than lower SES individuals. Those with higher scores on coping expectancies also had better health.

Thus the results from paper 1 are consistent with the idea that coping and response outcome expectancies matter for health and SES (Kristenson et al., 2004). The association between coping and health was also stronger than the association between SES and health in this sample. However, the full model with subjective and objective SES as well as the TOMCATS factors of coping, helplessness and hopelessness explained only a small part of the variance in health (r^2=.18).

These results are in line with previous findings that high coping individuals have fewer subjective health complaints (Eriksen & Ursin, 1999), fewer physical symptoms (Scheier & Carver, 1985), fewer mental health problems (Johnsen, Laberg, Eid, & others, 1998; Tveito, Passchier, Duivenvoorden, & Eriksen, 2004) and reports a higher quality of life (Tveito, Passchier, et al., 2004). Other studies has also found that active coping strategies are more prevalent in those with a higher socioeconomic status (Billings & Moos, 1981; Kristenson et al., 2004).

Some caveats are important to notice when interpreting these results. The reverse causality, that health causes coping and improves socioeconomic status, cannot be excluded based on these data, as they are cross-sectional. This relationship is likely to be reciprocal and difficult to entangle.

Furthermore, a common method bias may underlie the answers on both health and coping, such as an innate tendency to view events and attributes in a positive or negative light, often referred to as negative and positive affect (Watson & Pennebaker, 1989). As with all epidemiological data, confounding variables that were not measured in the study, such as personality factors, cultural factors or other factors cannot be excluded as the cause of the effects.

The data on coping, health and SES used in research question 2 are based on a nationally representative population sample. The SLOSH study is a longitudinal study. With each new data collection, the sample is "boosted" by inviting new respondents (Kinsten et al., 2007). The sample in paper 1 consists of a combination of old and new respondents and thus some attrition bias may be present in the data.

Similar studies have reported lower response rates for individuals with a lower SES (Harald, Salomaa, Jousilahti, Koskinen, & Vartiainen, 2007) and poorer health (Drivsholm et al., 2006) which means that caution should be used in generalizing to these groups. The quality and representativeness of the data is likely to be lower for low SES respondents. However, such a representativeness bias is more likely to lead to an underestimation of the effect than an overestimation. Among those with a low SES, it is likely that those with high coping and good health have higher response rates than those with low coping, which would cause the correlations between coping, SES and health to decrease. Furthermore. sweden is a society with a high average health status and small differences in health and SES. Studies from countries with larger differences in health and socioeconomic status are needed to examine if coping is as highly correlated in these countries as well.

From a health promotion perspective, reducing the socioeconomic differences in health is a major goal (World Health Organization, 1986). In a developmental perspective, previous research has shown that those with higher scores on coping tend to have better trajectories of SES and health (Bandura et al., 2001; Kristenson et al., 2004) as well as more adaptive attitudes to health (Wardle & Steptoe, 2003). Studies of similarity of coping styles in monozygotic twins indicate that there is a genetic component in coping styles (Busjahn et al., 1999). In sum, the results from paper 1seems to indicate that improving coping expectancies may be one way of promoting health, especially in populations with a low SES.

The relationship between coping and health is an indication that active interventions that focus on promoting coping may be a promising avenue for health promotion. As mentioned in section 1.2, sick leave is a risk factor for poor health and decreased

quality of life (Kivimaki et al., 2003; Vahtera et al., 2010). Sick leave research is also an area where there has been much interest in using active interventions that promote individual coping and activity to reduce sick leave. In the third research aim, this research is explored through a systematic review, in order to learn more of the potential benefit of such interventions.

5.1.3 Research aim 3

Can active workplace interventions reduce sick leave? (Paper 2)

While the majority of the identified active interventions were not effective in reducing sick leave, the interventions that did reduce sick leave were graded activity (Lindström et al., 1992; Staal et al., 2004), the Sheerbrooke model (Loisel et al., 1997) and CBT combined with Problem Solving Therapy (PST) (Lexis et al., 2011).

Graded activity focuses on reducing fear and establishing coping expectations in the individuals. The key element of the intervention is a very gradual increase of physical activity. In the case of low back pain, the intervention is not meant to increase muscle strength or physical fitness, but to build confidence in the ability of the back to handle physical activity without being injured (Staal et al., 2004). This approach has much in common with the non-injury model approach (P. H. Sorensen et al., 2010) and the atWork intervention (paper 3) in that they are active interventions that focus on the perception and understanding of pain, and on the establishment of coping expectancies. Those who had less fear avoidance and who perceived their disability to be moderate also returned to work more rapidly after receiving the graded activity intervention (Staal et al., 2008).

The CBT intervention (Lexis et al., 2011) was given to employees with a high risk of sick leave due to mental health problems. The intervention was focused on employees not on sick leave at the start of the trial (Lexis et al., 2011). The methodology of CBT has a focus on coping expectations and the employee's or patient's own understanding of the situation (Beck, 1995), and it has been argued that it is similar in method to the Brief Intervention (see section 1.3.3) which also significantly reduced

sick leave (Indahl et al., 1995). In this review, the CBT intervention was done with employees at risk for depression (Lexis et al., 2011), but CBT has also been tried with musculoskeletal complaints with mostly positive results in patients and general population individuals at risk for sick leave (Linton & Ryberg, 2001; Marhold, Linton, & Melin, 2001). However, more research is needed before any firm conclusions can be drawn about the effectiveness of CBT in reducing sick leave.

The Sheerbrooke model consists of multiple elements, among them back school, multidisciplinary treatment, and workplace ergonomic intervention. It is likely that the workplace component is the effective element of the intervention, since this part of the intervention explained most of the variance in the sick leave reduction (Loisel et al., 1997). The workplace component was also successfully replicated as a stand-alone intervention in a culturally adapted version in the Netherlands (Anema et al., 2007). The intervention includes the formation of a group for with representatives from unions, the employer, an ergonomist, and the sick listed employee to discuss the situation (Loisel et al., 1997). The significant sick leave reduction of the Sheerbrooke model may be a result of this involvement of multiple stakeholders at the workplace (Carroll et al., 2010).

Effective factors found in multiple studies could give more insight into what makes some interventions more effective than others. In this review, however, there were too few significant studies to draw any conclusions with a sufficient degree of certainty. The articles with significant results tended to be targeted at those at risk, involve more than one stakeholder and promote coping of the working situation rather than promoting health in general.

However, the overall success rate from workplace interventions was low, even when including only high and medium quality studies. This could either be because of methodological issues with the review, or because the interventions did not reduce sick leave.

In our synthesis of the results, a structured narrative method with an evidence hierarchy (van Tulder et al., 2003) was used. Meta-analysis was not used because of

the heterogeneity of the sample, the different ways to measure sick leave used, and the diversity of follow up periods. There are important caveats to notice when using a structured narrative synthesis method and an evidence hierarchy. Studies with low power may be given more weight than they should, and may then lead to an underestimation of the effect (Verbeek, Ruotsalainen, & Hoving, 2011). Variations in study quality may also lead to erroneous conclusions, but this may also be true for meta-analysis (Detsky, Naylor, O'Rourke, McGeer, & L'Abbé, 1992; Higgins & Green, 2008) . In the current review, a number of high quality studies and/or studies with high power did not report significant reductions in sick leave (IJzelenberg, Meerding, & Burdorf, 2007; Nurminen et al., 2002; van Rhenen, Blonk, Schaufeli, & van Dijk, 2007). This reduces the possibility of erroneous conclusion resulting from the inclusion multiple low power and low quality trials.

Fourteen studies with a high risk of bias were excluded. Including these studies would have meant that more participants would have been included in the synthesis, and an increased external validity. However the synthesis' results would then have been based on studies with a high risk of bias, and thus have a lower internal validity.

A balance between internal and external validity has been attempted by including articles with a low or medium risk of bias, and excluding articles with a high risk of bias. Review level selection bias is a risk related to the articles included in the review. All studies, except for one (Loisel et al., 1997) were from the Netherlands or the Nordic countries. This may be due to the sickness compensation scheme in the Netherlands and the Nordic countries, where the government and employer pay most or all of the costs of sick leave. This may act as an incentive to fund more sick leave research, but funding is only one possible reason for the narrow geographical range in the review. Nevertheless, this is a challenge to the external validity of the findings, when generalized to areas outside of a European or North American context. There were no US studies included, even though the United States is a major contributor to sick leave and return to work research (Rollin & Gehanno, 2012). One potential reason for this was the way sick leave was measured in US studies. Five US studies were excluded based on the "insufficient sick leave reporting" criterion (paper 2). In

most cases, only work related or accident related sick leave was reported, and thus the data were incompatible with the European data that includes all sick leave.

By grouping interventions into broader categories, our subjective judgments about which interventions should be seen as representing the same or similar intervention content was used. Many workplace interventions often use large, composite intervention programs e.g. (IJzelenberg et al., 2007; Lambeek, van Mechelen, Knol, Loisel, & Anema, 2010; Loisel et al., 1997; Tveito & Eriksen, 2009) and some studies could naturally fit into multiple categories, which makes it more difficult for review authors to divide such studies into meaningful categories. In the end, the usefulness of the categories must be considered by the individual reader.

The results from the review are based on published information only. There is a possibility that interventions that have an effect on sick leave are not published. The reasons for this may for instance be that companies do not want sick leave results available to others for commercial reasons.

Other explanations are that confounding factors such as organizational changes prevent workplace interventions to be completed as planned, or make inferences difficult. This may cause a publication bias in the published literature.

In the review, where we concluded that there is moderate evidence that a group of interventions did not reduce sick leave, it was based on large and/or high quality trials where there were no significant effects. This was the case of worksite exercise (Eriksen et al., 2002; Nurminen et al., 2002). In the case of worksite education, none of the four studies (Bernaards, Bosmans, Hildebrandt, van Tulder, & Heymans, 2011; Frost, Haahr, & Andersen, 2007; Speklé et al., 2010; van Poppel, Koes, van der Ploeg, Smid, & Bouter, 1998) showed an effect on sick leave, and two of these were large studies (Frost et al., 2007; Speklé et al., 2010) . Thus the conclusion is that there is moderate evidence that exercise and educational interventions do not reduce sick leave. The conclusion is not that there is lack of evidence.

The conclusion that a given type of intervention is not effective is true for the results that are included at the time of the reviews' literature search. New research and innovations in intervention content may change the conclusion in the future. Furthermore, the rapid development of clinical trials registers may also alleviate the problems with "grey" literature and give more precise estimates of publication bias in the future.

There may also be other reasons than methodological ones for why the included interventions were not successful. The interventions may simply be ineffective. One explanation for this, may be hat some of the basic premises that underlie many of the interventions may be wrong and in need of revision.

In many interventions, the premise is that sick leave reduction is achieved simply through improving symptoms in the employee. This is an idea that can be seen as analogue to the biomedical model (see section 1.2.1). The problem with this is that the biomedical model may be too simple for the complex phenomenon of sick leave. For example, there is mounting evidence that the relationship between low back pain and perceived causes such as “wrong” sitting positions, improper lifting techniques and other biomechanical causes is not as clear as previously assumed (Battié et al., 1995; A. K. Burton et al., 2006; Kujala et al., 1996; Videman et al., 2006, 2010). Thus it is not unexpected that interventions focusing on, for instance, lifting techniques (van Poppel et al., 1998) did not result in sick leave reductions, even if there was a small effect on low back pain.

Other systematic reviews of active workplace interventions have found evidence for the effectiveness of changes in the work organization or work environment (van Oostrom et al., 2009), as well as physical exercise and comprehensive multidisciplinary interventions (Tveito, Hysing, et al., 2004). In some cases, such as for physical exercise, the conclusion in paper 2 differs from the conclusion in a previous review (Tveito, Hysing, et al., 2004). There may be several reasons for this, one may be that two of the studies included in the review by Tveito (Gundewall, Liljeqvist, & Hansson, 1993; Kellett, Kellett, & Nordholm, 1991) were excluded in

paper 2 due to a high risk of bias. Another reason may be that new studies published after the first review (Tveito, Hysing, et al., 2004) showed no effect in reducing sick leave (Brox & Froystein, 2005; van Rhenen et al., 2007). Finally, the reviews included slightly different populations. The review by Tveito et al (2004) evaluated the preventive effect of physical activity for sick leave related to low back pain, while the goal in paper 2 was to include participant with other complaints and conditions as well. For instance, 4 articles with mental health was included (Lexis et al., 2011; Rebergen, Bruinvels, Bezemer, van der Beek, & van Mechelen, 2009; van Oostrom et al., 2010; van Rhenen et al., 2007) .

Sick leave reductions can be used as a "selling point" to justify the costs of workplace interventions to employers and governments, but employers should be skeptical of the probability of sick leave reductions unless the method has been shown to be effective in high quality studies. This does not mean that active workplace interventions have no positive effects, or that employers should necessarily avoid them. Valuable effects, other than changes in sick leave, include increased employee health (Pedersen et al., 2009) and employee physical activity (Proper et al., 2003). For work related outcomes such as job satisfaction and productivity, more research is needed to determine if worksite interventions are effective or not (Proper et al., 2002; van Oostrom et al., 2009). However, if sick leave reduction is the primary goal of an intervention, careful consideration should be given to the intervention and its content before expecting an effect from the intervention.

In light of the many interventions and high quality trials that failed to significantly reduce sick leave, interventions based on new approaches and ideas may be called for. This is what was tested in the final research aim (paper 3). In the atWork intervention, effective elements from paper 2 as well as those identified in other systematic reviews (Carroll et al., 2010; Hoefsmit, Houkes, & Nijhuis, in press) were used. This included involving more stakeholders (Carroll et al., 2010), starting before 6 weeks of sick leave (Hoefsmit et al., in press) and promoting coping and giving the employees confidence that their back was strong and that they could trust (paper 2).

5.1.4 Research aim 4

What is the effect of the atWork intervention on sick leave, and is the intervention feasible in the workplace? (Paper 3)

The atWork intervention reduced sick leave when it included fast access to an outpatient clinic. When the outpatient clinic was omitted, the results were not conclusive. In addition to the effect on sick leave, belief in low back pain myths was reduced in both of the two intervention groups, and fear avoidance was reduced in all groups after the intervention.

This thesis also shows the atWork intervention is feasible to implement at the workplace. The intervention was successfully offered to 125 units with about 3000 employees within the planned timeframe, and with a small staff who also had other tasks outside of the project. The low utilization rate of the outpatient clinics also indicated that the actual demand for treatment was low, once the intervention had been initiated.

The results may be seen as further confirmation of the non-injury model's ability to reduce sick leave. This has been established in the clinic through multiple RCTs (e.g E. M. Hagen et al., 2000; Indahl et al., 1998, 1995). The model have shown effect in a non-randomized workplace intervention (Werner et al., 2007), but in this thesis it has been shown that this effect is also present in an RCT. The non-injury model may also have preventive effects, because the preventive elements within atWork, such as the educational meetings, seem to have been effective.

There have been a number of large workplace interventions for LBP and musculoskeletal pain without significant sick leave reductions. These interventions have focused on education on lifting and handling (Daltroy et al., 1997), and workplace screening and ergonomics (Frost et al., 2007; Haukka et al., 2008). An intervention similar to atWork, where education, rapid help and ergonomic advice were combined did not reduce sick leave (IJzelenberg et al., 2007). However, an

integrated care approach did hasten return to work in sick listed individuals that had been on sick leave for >12 weeks (Lambeek et al., 2010).

There are some limitations in the methodology and the design of the atWork study. For the primary outcome, the municipalities' sick leave records were used. The sick leave data is very accurate from an employer's perspective, as it gives precise information about changes in sick leave utilization for different units in the organization. Using these data ensured full data sets and made it possible to perform good intention to treat analysis in the study. However, it is difficult to directly link the intervention at the individual level to the sick leave outcome, since the data was on the unit level and did not give information about individual employees.

The response rate in paper 3 was about 50%, which introduces the possibility of a selection bias for the outcomes other than sick leave. A number of factors affect survey response rates (Edwards, 2002; Nakash, Hutton, Jørstad-Stein, Gates, & Lamb, 2006). The survey was distributed abundantly to the respondents. On the other hand, the survey was quite long, although it was shortened in the first follow up. In a clinical setting, questionnaire length is less important if the survey is considered relevant and interesting (McColl et al., 2001). However, the participants in atWork were healthy employees, and therefore less likely to find health and low back pain questions relevant and/or interesting. Unfortunately, time and budget did not allow for a full pilot of the questionnaires, procedures and intervention, which potentially could have improved response rates by improving the design and the method of distribution based on employee feedback. On the other hand, all questionnaires, except for TOMCATS, were questionnaires that had previously been used in similar settings, and the main part of the intervention had been shown to be feasible (Werner et al., 2007).

While the relative difference in sick leave between the intervention groups and the control group was about 12 *percent*, this was only about *one percentage point* change. Because of a high number of employees, high wages and substantial sick leave obligations, considerable savings can be made even from such small changes.

However, the applied value of such a small reduction can be discussed, especially when applied to other countries where the cost of sick leave is less for the government or the employer.

The TOMCATS inventory (paper 1) was used to measure coping expectancies in the employees. Although there were some minor statistically significant changes in coping in some of the groups, the intervention did not show any clinically relevant changes in coping. The reason for this may be that the majority of the employees did not experience back pain, and thus were not likely to have their coping expectancies changed by the intervention.

There are some challenges in the implementation of the atWork model. The intervention requires on-site and face-to-face education with regular follow up sessions. Most workplaces have a natural turnover rate, which creates a need for new employees to be educated. If this need of maintenance is not followed up, there will be a large long-term deployment of the intervention. There is a need to study the relative importance of the educational meetings, the peer adviser and the outpatient clinic in more detail. Since there is a moderate effect of the intervention, cost/benefit analysis is recommended in future studies of atWork.

Within atWork, the individual, with help and support from a colleague is empowered to handles normal, acute unspecific low back pain, where there are no “red flags”. The employee can manage the back pain by regulating his or her activity according to how much pain can be tolerated, and without the need for health services unless the back pain does not subside. From a health promotion perspective, the atWork intervention can thus be seen as an empowerment intervention (Wallerstein, 1992) that allows the participants to take greater control over their own health and sick leave.

5.2 General research question

What is the effect of response outcome expectancies (coping) and knowledge on health and sick leave?

The question of how the individuals' coping expectancies and understanding of his or her situation impacts health and sick leave has been explored through four specific research aims. The questions have covered methodology, epidemiological studies, a systematic review of the existing literature, and finally a randomized controlled trial.

Taken together, the thesis indicate that coping expectancies and knowledge seem to matter for health and sick leave. It is possible to make interventions based on the principles of CATS and the non-injury model in a way that can potentially reduce sick leave. The effect of increasing knowledge and changing coping expectancies may be increased participation in working life (papers 2 and 3), reduced pain related fear, and reduced maladaptive beliefs about low back pain (paper 3), although there were no significant changes in coping after the atWork intervention. This may be because of a high number of participants that did not have back pain or sick leave during the intervention. It is possible that these participants did not feel that the intervention was relevant or necessary, and it is unlikely that they would experience changes in coping as a result of the intervention. More research is needed to better understand and measure potential changes in coping as a result of interventions.

The results also show that individuals with higher socioeconomic status have better health (paper 1) and have more coping expectancies (paper 1). The design does not allow for a conclusion of the causal effects. Many of the interventions evaluated in paper 2 use some form of education or information to increase knowledge, but it seems that the graded activity intervention (Lindström et al., 1992) and the atWork intervention (paper 3) had a particular focus on this area compared to other interventions.

Almost any effort at health promotion may affect the current or future illness perceptions of the participants. These perceptions are important for the response outcome expectancies that the participants establish (Petrie & Weinman, 1997). If advice and instructions, consciously or unconsciously promote uncertainty and carefulness in the patients, the patients are more likely to develop avoidance, helplessness and hopelessness. The non-injury model is based on the idea that acute

unspecific low back pain has a "good prognosis when left untampered" (Indahl et al., 1995). Performing normal activities is not harmful, and the patient can return to normal activities even when in pain, without injuring the back. This message may create or restore a sense of coping in the individual, since the individual is free to do what he or she wants, without any external restrictions. It is also the individual that decide what level of pain can be accepted. By adding a preventive element, any potential maladaptive beliefs and behaviors are also stopped “at the doorstep”, and not allowed to develop into erroneous beliefs and maladaptive behaviors at a later stage.

This understanding of the data is based on the theoretical framework of the thesis, CATS (Ursin & Eriksen, 2004) and the non-injury model (P. H. Sorensen et al., 2010). However, other interpretations of the data may be relevant. The strong focus on the individual and its cognitive processes can be challenged by research that has focused more strongly on the social and organizational environment and how these factors may influence the relationship between health, sick leave and coping.

5.2.1 Alternative interpretations

A central question in the interpretation of the data is whether coping and changes in knowledge are *caused* by changes in health and sick leave, or if it is a byproduct of behavioral changes caused by other confounders that influence behavior. If, for instance, social pressure makes you stop smoking, the achievement of having stopped smoking can then produce positive emotions and a sense of coping. An experience of coping that is simply a cognitive process that does not lead to changes in behavior and/or outcome acquisition is more similar to a defense mechanism than a predictor of change (Cramer, 1998; Haan, 1977). Likewise, new knowledge has limited value for health promotion if it does not lead to any behavioral changes. While we know that the intervention is designed to change expectations that govern behavior, there is still a lack of documentation of a causal relationship.

Although the CATS theory can be used to understand organizational problems (Meurs & Perrewé, 2011; Svensen, 2007) it is primarily a theory that focus on the

individual learning experience more than the social and organizational context (Ursin & Eriksen, 2004). The same can be said about the non-injury model (P. H. Sorensen et al., 2010). However, the social and socioeconomic context does affect sick leave (Vahtera, Virtanen, Kivimaki, & Pentti, 1999; Virtanen et al., 2010). Furthermore, sick leave is influenced by organizational changes, such as reorganization (Westerlund, Theorell, & Alfredsson, 2004) and downsizing (Rege, Telle, & Votruba, 2009; Wahlstedt & Edling, 1997; Westerlund, Ferrie, et al., 2004), as well as social support in the workplace and job satisfaction (Hoogendoorn, van Poppel, Bongers, Koes, & Bouter, 2004).

Work site interventions are often organized in groups, and group dynamics may influence the perceived or real attitudes colleagues have towards sick leave. If sick leave is on the agenda at the workplace, this in itself can change how the organization understands and manages sick leave. The organizational perspective is emphasized in theories such as effort reward imbalance (Siegrist, 2005) and the demand/control support model (Karasek & Theorell, 1990). However, organizational factors such as job satisfaction, demand/control, and effort reward imbalance, are usually not systematically measured in studies such as those reviewed in paper 2.

The attention given to employees in active interventions such as atWork, may lead to self-monitoring of sick leave decisions by employees (Snyder, 1974). Qualitative studies point to sick leave decisions being made without much cognitive processing, at least in the first days of sick leave (Morken, Haukenes, & Magnussen, 2012). When a sick leave intervention is done at the workplace, employees are made more aware of their sick leave. This might cause them to reduce their sick leave. However, this effect is not likely to last, since self-monitoring usually is gradually reduced over time (Snyder, 1974). There is a lack of long term (more than 1 year) follow-up studies on sick leave interventions, and this means that it is difficult to exclude the potential effect of self-monitoring on sick leave reduction.

It is also important not to disregard the potential utility of sick leave. The push model (see section 1.2.1) argues that employees with poor health will have more sick leaves,

and some level of sick leave is clearly necessary if working life is to include these workers. Sickness presence (Aronsson, Gustafsson, & Dallner, 2000) is the term used for describing individuals that are going to work when they should stay at home due to their medical condition, which may be the result if sick leave reductions are pushed too far.

That being said, sickness presence is a term with its own innate difficulties. While sickness presence is a potential problem, it is very difficult to determine in which situations an employee "should" stay at home (Vingård, Alexanderson, & Norlund, 2004), especially given the vast variety of tasks, demands, and roles that employees in different professions and positions have.

5.2.2 Strengths and limitations of the samples, procedures and data.

The major strength of this thesis is the number of participants in paper 1 and 3, and the number of screened and reviewed studies in paper 2. A large N is a vital and often overlooked factor in determining the external validity of research results. Especially when considering the validity of small treatment effects, a large N is important (Moore, Gavaghan, Tramèr, Collins, & McQuay, 1998).

When operating within limited resources, a large number of participants and units may unfortunately reduce the amount of control and quality assurance that can be applied to ensure that the procedures and instruments are being used as intended and described in the protocol.

In this thesis, a broad methodological approach and large samples, has been used. The drawback of this approach is that the ability to gain a deeper understanding of the results is reduced. Thus the thesis is restricted in its ability to answer the "why" questions produced from the results, except from interpreting results in light of theory and other published studies.

Finally, many of the interventions in paper 2 as well as the atWork intervention in paper 3 used a "treatment as usual" control group. This means that all groups got the

ordinary treatment that is offered by the health services provider, as well as any sick leave efforts that the workplace had independently of the RCT. Participants in the control group did not receive any intervention as part of the trial, and therefore there is no change in their normal situation. Because of this, there is a danger that sick leave reductions are caused by the attention given to the employees in the intervention groups, rather than an effect of the interventions themselves. In some cases, an attention control group is used to control for this effect, but in the atWork intervention, a treatment as usual control group was used for practical reasons. In other cases, a well-established "gold standard" may be used as a control group, to see if a new intervention is more effective than the best currently available intervention.

5.2.3 Future research directions and challenges

The reality of comorbidity (Ihlebæk et al., 2007), composite problems (Tveito et al., 2002) and the similarity between different groups of patients (Wessely, Nimnuan, & Sharpe, 1999) have to be acknowledged by the scientific community if real progress in understanding of this area is to be made. Interventions, research methods and review methodology need to be applicable to the large number of patients with multiple subjective health complaints (Grøvle et al., 2011; E. M. Hagen et al., 2006). This is especially important for sick leave (NAV, 2011; R. Overland et al., 2008).

The popularity and use of systematic reviews have increased greatly with the establishment of the Cochrane (www.cochrane.org) and Campbell (www.campbell.org) libraries. While this development has been crucial in the establishment of evidence based medicine (Ellis, Mulligan, Rowe, & Sackett, 1995; Straus & Smith, 2004), it has also led to the subdividing of reviews into diagnostic groups. This approach runs the risk of ignoring the important communalities between patient groups. It may also hinder the discovery of potential general principles of effective interventions, which may be effective across diagnostic groups. Overarching reviews should be an integral part of the review literature in order to prevent this from happening.

The non-injury model lacks a complete and comprehensive theoretical description by its author, which would make the understanding of the model easier in the scientific community. This is a work that is currently in progress (Aage Indahl, personal communication). Qualitative research into the mechanisms of non-injury based treatments and how treatment providers and patients/employees understand them might also be beneficial.

We are likely to see the end of widespread popular beliefs in the “low back pain myths” in the near future (Ihlebæk & Eriksen, 2005). This may lead to a decrease in the utility of the atWork intervention, since maladaptive low back pain beliefs become less common, and reduce the need for specific interventions to encourage normal activity when having back pain.

However, the general principle of the non-injury model can be applied in other areas than low back pain. Currently, there is an effort to test such an intervention targeting mental health problems, and not low back pain. However, no scientific trials on this treatment have yet been initiated. The lifetime prevalence of any DSM-III-R psychiatric complaint is reported to be between 40-50% (Bijl, Ravelli, & van Zessen, 1998; Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Physical activity is beneficial for mental health (Hamer, Stamatakis, & Steptoe, 2009; Paluska S.A. & Schwenk T.L., 2000) and inactivity is a health risk (Corcoran, 1991). As with unspecific low back pain, mental health problems are usually recurring (Kennedy, Abbott, & Paykel, 2003), and are managed, rather than cured in most cases (Simon & Von Korff, 1995). Reassurance, reasons to stay active, and peer support in an occupational setting may be a viable model also for mental health care. This is especially promising, given the reductions in sick leave that has been achieved by CBT in employees with a high risk of depression (Lexis et al., 2011).

Unlike treatments that offer symptomatic relief, treatments and interventions that focus on knowledge and coping give the individual "tools" to manage their health complaints themselves, without the need for outside help. These tools consist of cognitive and behavioral strategies that can be used by the individual when needed.

For instance, the effects of CBT treatments have been shown to persist beyond termination of treatment (Butler, Chalder, & Wessely, 2001; Lamb et al., 2012; Linton & Nordin, 2006).

6. Conclusion

In research aim 1, the TOMCATS inventory for measuring response outcome expectancies was developed and tested. The results showed a factor structure with three factors corresponding to coping, helplessness and hopelessness. The convergent validity of the inventory was satisfactory. In research aim 2, the results showed that response outcome expectancies correlated with health and socioeconomic status, and those with high socioeconomic status had high scores on coping and better self-rated health. In research aim 3, the results showed that active workplace interventions aiming to change knowledge and coping expectancies in order to reduce sick leave have a low rate of success, but there is evidence that graded activity (Lindström et al., 1992), CBT (Lexis et al., 2011) and the Sheerbrooke model (Loisel et al., 1997) reduced sick leave. In research question 4, the results showed that the atWork intervention was feasible and reduced sick leave, fear avoidance, and improved knowledge about low back pain.

Overall, coping can be measured, and individuals with good health report more coping than individuals with poor health. Furthermore, those with high SES also report more coping than individuals with low socioeconomic status. Active interventions in the workplace can reduce sick leave in some cases. AtWork, a non-injury model intervention has the potential to reduce sick leave, and is a feasible active workplace intervention. Interventions based on the non-injury model should receive more scientific attention. There seems to be evidence that coping and knowledge are potential promising approaches for health promotion and sick leave reductions. More research is clearly needed to elaborate this, but the empirical foundation of the role of coping expectancies and knowledge as shapers of health and sick leave is stronger with this thesis than it was before.

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