Reduced work participation of working age population with health problems is a key societal concern in many Western countries, including Finland. Thus, activating people with partial work ability and keeping them in the workforce has been a common objective of many social and health policies. Scientific evaluation of the effectiveness of the policy measures has, however, been limited. This study examined the effectiveness and efficacy of partial sickness benefit and related partial sick leave on return to work, work retention and work participation in Finland when compared to regular full sick leave. Different study designs and methods were adopted to overcome the methodological challenges encountered in the study.
Effect of partial sick leave on work participation

Johanna Kausto

People and Work
Research Reports 102

Finnish Institute of Occupational Health
Helsinki 2013
JOHANNA KAUSTO

Hjelt Institute
Department of Public Health
Faculty of Medicine
University of Helsinki, Finland

Finnish Institute of Occupational Health
Helsinki, Finland

ACADEMIC DISSERTATION

To be presented, with the permission of the Faculty of Medicine of the University of Helsinki, for public examination in Lecture hall 3, Biomedicum Helsinki 1, Haartmaninkatu 8, on January 24th 2014, at 12 o’clock noon.

Supervisors: Professor Eira Viikari-Juntura
Finnish Institute of Occupational Health
Helsinki, Finland

Docent Svetlana Solovieva
Finnish Institute of Occupational Health
Helsinki, Finland

Reviewers: Docent Pekka Virtanen
University of Tampere
Tampere, Finland

Professor Ute Bültmann
University of Groningen
Groningen, The Netherlands

Opponent: Professor Mika Gissler
National Institute for Health and Welfare
Helsinki, Finland and
Nordic School of Public Health
Gothenburg, Sweden
CONTENTS

LIST OF ORIGINAL PUBLICATIONS ............................................. 6
ABBREVIATIONS ..................................................................... 7
ABSTRACT ................................................................................ 8
TIIVISTELMÄ ............................................................................. 11
1 INTRODUCTION ....................................................................... 14
2 MAIN CONCEPTS AND FRAMEWORK OF THE STUDY .............. 17
  2.1 Definitions ........................................................................... 17
  2.2 Underlying models ............................................................ 19
  2.3 Measures of work disability, return to work and work participation........................................... 22
  2.4 Societal context of work disability and work participation......................................................... 23
  2.5 Framework for the study ................................................. 25
3 OVERVIEW OF THE LITERATURE ........................................ 27
  3.1 Empirical evidence on the determinants of return to work and work participation......................... 27
  3.2 Empirical evidence on workplace-based interventions targeted at return to work or work participation ... 32
  3.3 Literature on societal incentives and disincentives of return to work ........................................ 38
  3.4 Study designs, bias and confounding .................................. 40
  3.5 Summary of the reviewed literature and implications for the present study .................................. 43
4 AIMS OF THE PRESENT STUDY ............................................. 46
5 MATERIALS AND METHODS ............................................... 47
  5.1 General description of the analytical approach ............... 47
  5.2 Data sources ...................................................................... 47
  5.3 Study designs and procedures ......................................... 48
  5.4 Study populations ............................................................ 52
  5.5 Outcomes and covariates ................................................. 54
CONTENTS

5.6 Statistical methods ................................................................. 56
5.7 Ethical considerations ............................................................. 59

6 RESULTS ..................................................................................... 62
  6.1 Effects of partial sick leave on return to work and work retention – scientific knowledge from other countries ................................................................. 62
  6.2 Effects of partial sick leave on return to work, work retention and work participation in the Finnish working population with prolonged sickness absence .......... 66
    6.2.1 Characteristics of the individuals in the studied sick leave groups .............................................. 66
    6.2.2 Occurrence and risk of medically certified recurrent sick leaves ................................................. 66
    6.2.3 Occurrence of disability pensions ................................................. 67
    6.2.4 Association between type of sick leave and disability pensions ................................................... 68
    6.2.5 Association between type of sick leave and work participation ...................................................... 71
  6.3 Effects of partial sick leave on return to work, and subsequent sickness absence at an early phase of disability in a sample of Finnish employees .................. 71
  6.4 Results by main diagnostic categories ........................................ 74
  6.5 Results by age and socioeconomic position .................................. 77

7 DISCUSSION ................................................................................. 78
  7.1 Primary findings of the study ...................................................... 78
  7.2 Interpretation of the findings ...................................................... 79
    7.2.1 Selection into partial sick leave .............................................. 79
    7.2.2 Effects of partial sick leave on work participation ................................................................. 80
    7.2.3 Potential mechanisms behind the associations .................. 82
    7.2.4 Gender and age differences .................................................. 83
    7.2.5 Differences between diagnostic categories ................. 85
    7.2.6 Socioeconomic differences ................................................. 87
    7.2.7 Feasibility of partial sick leave .............................................. 89
  7.3 Methodological aspects .............................................................. 91
    7.3.1 Validity of the study ........................................................... 91
    7.3.2 Other aspects ................................................................. 93

8 CONCLUSIONS AND IMPLICATIONS OF THE STUDY .......... 95
CONTENTS

ACKNOWLEDGEMENTS .......................................................... 97
REFERENCES ....................................................................... 98
ORIGINAL PUBLICATIONS ............................................... 111
LIST OF ORIGINAL PUBLICATIONS


The original articles have been reproduced with the permission of the copyright holders.
# Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARR</td>
<td>Absolute risk reduction</td>
</tr>
<tr>
<td>DID</td>
<td>Difference-in-differences</td>
</tr>
<tr>
<td>GEE</td>
<td>Generalized estimating equation</td>
</tr>
<tr>
<td>GLM</td>
<td>General linear model</td>
</tr>
<tr>
<td>ICD-10</td>
<td>International Classification of Diseases, 10th edition</td>
</tr>
<tr>
<td>ICF</td>
<td>International Classification of Functioning, Disability and Health</td>
</tr>
<tr>
<td>LBP</td>
<td>Low back pain</td>
</tr>
<tr>
<td>MSD</td>
<td>Musculoskeletal disease</td>
</tr>
<tr>
<td>NNT</td>
<td>Number needed to treat</td>
</tr>
<tr>
<td>PS</td>
<td>Propensity score</td>
</tr>
<tr>
<td>RCT</td>
<td>Randomized controlled trial</td>
</tr>
<tr>
<td>RRR</td>
<td>Relative risk reduction</td>
</tr>
<tr>
<td>RTW</td>
<td>Return to work</td>
</tr>
<tr>
<td>SEP</td>
<td>Socioeconomic position</td>
</tr>
<tr>
<td>SII</td>
<td>Social Insurance Institution</td>
</tr>
<tr>
<td>WAI</td>
<td>Work Ability Index</td>
</tr>
</tbody>
</table>
ABSTRACT

In Finland, partial sickness benefit is used to promote recovery and return to work (RTW) to full-time employment after sickness absence since 2007. This thesis aimed to examine the effectiveness and efficacy of the benefit and related partial sick leave on RTW, work retention and work participation mainly in four diagnostic categories: musculoskeletal diseases, mental disorders and traumas and tumors. The first of the five substudies was a literature review which investigated the empirical evidence on the use and effects of partial sick leave on RTW in the Nordic countries. Three of the substudies were longitudinal register-based studies examining the effects of partial sick leave on RTW, work retention and work participation in working populations with prolonged sickness absence. In addition, it was assessed whether the effects differed between men and women or by age, socioeconomic position or diagnostic category. The fifth study, a randomized controlled trial (RCT), focused on the efficacy of partial sick leave on sustained RTW at an earlier phase of work disability attributable to musculoskeletal diseases.

Two register-based samples (n = 38,865 and n = 68,924) of the working population with prolonged sickness absence were drawn from the sickness insurance register of the Social Insurance Institution of Finland (SII). Comprehensive prospective and retrospective register data on work participation were collected from the national registers of the SII and the Finnish Centre for Pensions. There were methodological and analytical challenges in comparing work participation between the studied groups in the register-based substudies, namely the selection of individuals into partial sick leave and the complexity of the context. This was taken into account by investigating the study questions in different study samples, with different study designs and several statistical methods. A contra-
A systematic search of literature was carried out in 2008 and replicated in 2012. A total of five methodologically rigorous studies from other Nordic countries were identified. In four of them, partial sick leave was associated with an increased likelihood of return to regular working hours or a higher subsequent employment rate. Some of the reviewed studies suffered from methodological limitations.

The register-based substudies showed that both men and women on partial sick leave when compared with individuals on full sick leave, had their first recurrent sick leave sooner and they also had more periods of sick leaves during the follow-up. Approximately 60% of subjects on partial sick leave and 30% of those on full sick leave had at least one recurrent sick leave during the follow-up time. The adjusted risks of the first recurrent sick leave were 1.8 and 1.7 for men and women, respectively, when subjects on partial sick leave were compared with those on full sick leave. Partial sickness benefit reduced the risk (change in absolute risk) of full disability pension by 6% but conversely increased the risk of partial disability pension by 8% compared with full sick leave. In men, the use of full disability pension was reduced by 10% and in women by 4%. Corresponding 5% and 9% increases in the use of partial disability pension were detected. The effects were stronger in the group of mental disorders than in the group of musculoskeletal diseases.

During a follow-up period of five years, the decline in work participation was 5% smaller among those on partial sick leave than in the comparison group. The favorable effect of partial sick leave on work participation was found in those aged from 45 to 65 years, in those with mental disorders and among those with a higher socioeconomic position. No major difference was found in the effect between men and women.

In the RCT, both the intervention and the control group consisted of 31 participants with early work disability due to musculoskeletal diseases. In addition to the clinical data collected by the physicians, the participants filled in six questionnaires during the follow-up year. Survey information was linked with register-based data on sickness absences and employment periods, obtained from the registers of the occupational health services and employers. Time to RTW sustained for at least four weeks was found to be shorter in the intervention group (median 12
versus 20 days, p = 0.10) and the fully adjusted hazard ratio of RTW was 1.8 (95% CI 1.2–2.8). Compliance with the intervention was high.

Overall, the results were rather consistent across the four substudies revealing beneficial effects of partial sick leave on RTW and work participation irrespective of the methodological differences and varying outcomes. Partial sick leave was found to be an effective and efficient way of enhancing RTW and work participation. The findings of this study suggest that, even if the practice so far has been mainly benefitted by women, the use of partial sick leave can be recommended among men as well. Partial sick leave is a relevant measure both in musculoskeletal and mental disorders, at least in the context of the Finnish societal system. More attention needs to be paid to the implementation of the measure among young workers and individuals in physically strenuous, low pay jobs. To conclude, the overall results suggest that partial sickness benefit – if applied in a larger scale in the future – may prove to be an effective tool in increasing the work participation of working population with long term sickness absence.

Tutkimus koostuu viidestä osatutkimuksesta, joista ensimmäisessä selvitettiin kirjallisuuskatsauksen avulla, mitä tutkimustietoa osasairausvapaan käytöstä ja vaikutuksista on kertynyt muista Pohjoismaista. Toinen, kolmas ja neljäs osatutkimus olivat pitkittäisiä rekisteritutkimuksia, joissa tutkittiin osasairauspäivärahan käytön vaikutuksia työhön paluuseen, työssä jatkamiseen ja työhön osallistumiseen pitkittäisellä sairauspoissaalon jälkeen. Lisäksi tarkasteltiin eroavatko nämä vaikutukset miesten ja naisten välillä, eri ikä- tai sairausryhmissä tai sosioekonomisen aseman mukaan. Viides osatutkimus oli satunnaistettu interventiotutkimus, jossa osasairausvapaan vaikutuksia työhön paluuseen ja työssä jatkamiseen tuki- ja liikuntaelinen sairausyrityksen työkyvyttömyyden varhaisemmassa vaiheessa.

Rekisteritutkimuksissa tutkittavat (n = 38 865 ja n = 68 924) poimittiin Kelan sairausvakuutusrekisteristä. Samasta rekisteristä saatiin tutkittavien taustatiedot sekä kattavat etenevät ja takautuvat tiedot sairauspäivärahakausista ja kansaneläkkeistä. Nämä tiedot yhdistettiin Eläketurvakeskuksen ansainta- ja eläkerekistereistä poimittuihin tietoihin. Osasairauspäivärahan (osasairausvapaan) ja tavanomaisen sairauspäivärahan (sairausloman) vaikutuksia verrattessa menetelmällisenä haasteena on osasairauspäivärahan saajien valikoitumisen huomioiminen tutki-
musasetelmassa ja analyysissä. Tämän vuoksi tutkimuksessa sovellettiin satunnaistettua kokeellista tutkimusasetelmaa ja rekisteritutkimuksissa niin sanottua kontrastilähestymistapaa (propensiteettipistemääran analyysia ja difference-in-differences-menetelmää).


Rekisteritutkimukset osoittivat, että osasairauspaivärahapäivästä jälkeen sairausloma uusiutui nopeammin kuin tavanomaisen sairausloman jälkeen. Osasairauspaivärahahypotesi oli seuranta-aikana myös sairauslomapäiviä verrokkiryhmää enemmän. Osasairausvapaan yhteys sairauslomalle paluuseen oli miehissä 1,8- ja naisissa 1,7-kertainen tavanomaisella sairauslomalla verrattuna, kun taustatekijät vakioitiin. Koko aineistossa osasairausvapaan vähennä täyden työkyvyyttömyystilanteen absoluuttista riskiä 6 %:lla ja kasvattaa osatyökyvyyttömyystilanteen absoluuttista riskiä 8 %:lla. Miehissä vastaavat luvut olivat 10 % ja 5 % ja naisilla 4 % ja 9 %. Yhteydet olivat voimakkaampia mielenterveyden häiriöiden kuin tuki- ja liikuntaelinten sairauskien ryhmässä.


Interventiotutkimukseen osallistui 31 henkilöä sekä osasairausvapaarikyvyn ylennyt että vertailuryhmässä. He olivat hakeutuneet työturvakeskusjärjestöjen ja liikuntailinsairauden aiheuttaman työkyvyyttömyyden vuoksi. Lähtötilanteessa kerättyjen kliinisten tiedojen lisäksi tutkittavat vastasi sairauslomaryhmän aikana kuuteen kyselyyn, joista saadut tiedot yhdistettiin työterveyshuoltojen ja työnantajien rekisteröityjä saatuihin sairauspoissaolo- ja työsuhtetietoihin. Osasairausvapaalla olleet palasivat työhön ilman uutta sairauslomaa keskimäärin 12 päivää, kun verrokkiryhmässä vastaava aika oli 20 päivää (p = 0,01). Työhön paluun vakioitu todennäköisyys oli osasairausvapaaryhmässä 1,8-kertainen (95% LV
TIIVISTELMÄ

1,2–2,8) verrokkiryhmään verrattuna. Osa-aikainen työskentely toteutui interventioryhmässä suunnitellusti.

1 INTRODUCTION

One of the central issues in the current political discussion in Finland, as well as in many other European countries, concerns not only the need for increasing work participation of the population but also means to achieve this goal. This need is based on several developments. The population of Finland is aging rapidly. It has been estimated that by 2030, the share of working age population of the total population in Finland will be roughly a half (Statistics Finland 2012). There has been a long term decline in the annual time spent in paid work in many countries, including Finland (OECD 2009). At the same time, the number of disability beneficiaries has been rising in many countries during the last decades and it has been argued that the demography or economic cycles explain only part of these changes (OECD 2010). In Finland, a decline in the number of recipients of disability benefits took place in the 1990’s, at least partially as a result of policy changes in the beginning of that decade. Since then, the total number of disability beneficiaries has remained relatively stable (Finnish Centre for Pensions 2012). Currently approximately one-third of the working age population in Finland has a longstanding health problem that affects their work ability; a proportion among the highest in Europe. Of those who move to long term disability benefits, only a tiny fraction (1% in Finland in 2007) ever return to the labor force (Bevan et al. 2009).

In addition to the financial implications, reduced work participation at working age has definite individual and population level effects on health and wellbeing (Loisel and Côté 2013). The detrimental health effects of unemployment are well known, even associations with a higher mortality risk have been reported (Roelfs et al. 2011). Recent findings indicate that long term sickness absence is also harmful for the individual
1 INTRODUCTION

and expensive for the society. Lengthy periods of sickness absence have been found to be associated with an increased risk of recurrent sick leaves, permanent disability and the award of disability pension (Gjesdal et al. 2004; Kivimäki et al. 2004; Lund et al. 2008; Laaksonen et al. 2013). Some evidence also exists on the effects of long term sick leave on social marginalization (including unemployment) (Backhans et al. 2005; Bryngelson 2009; Wikman et al. 2012).

These trends have resulted in changes in national policies. The activating labor market policy has aimed to the flexible combining of disability benefits and earned income in order to activate people with a partial work ability and keep them in the workforce (OECD 2007; Bevan et al. 2009). In Finland, a partial disability pension has been available already for several decades, but partial sickness benefit was only introduced as late as in 2007. A parallel development has been seen in the transdisciplinary research areas of work disability prevention and rehabilitation where a change in the paradigm is argued to be ongoing (Loisel et al. 2001). The focus of research and practice is shifting from disability and the limitations experienced by individuals to their remaining work ability and resources. A large number of trials on the effects of different interventions on work disability outcomes have been carried out. At the same time it has been claimed that there has not been sufficient evaluation of the effectiveness of policy changes, programs and measures at the population level (OECD 2010). Likewise, taking into account the fact that sick leave is among the most frequently prescribed treatments by physicians, it is surprising that there is little evidence for the effects of sick leave on many aspects of life (Vingård et al. 2004).

The starting point for this study was the preparation of a legislative proposal for introducing partial sickness benefit in Finland. At the time, it was recognized that a partial sickness benefit was available in the other Nordic as well as in some other Northern European countries. However, no rigorous summaries on the use, feasibility and effectiveness of the benefit had been presented. It was assumed that allowing the possibility to combine partial sick leave with part-time work would serve as a useful way to prevent or postpone work disability in these individuals. At the time there was discussion in Finland, at what stage of disability (after a shorter or a longer period of work absence) should partial sick leave be available. It was decided that in the first phase the benefit would not
be available until after 60 week days of sickness absence. Whether the benefit would be later offered already at earlier stages of work disability, was to be decided only after investigating the use and efficacy of early part time sick leave on health-related outcomes, such as the return to work and work retention. A randomized controlled trial targeted on employees with musculoskeletal disorders was carried out for this purpose (Martimo et al. 2008). The present study was intended to broaden the knowledge on the topic. A systematic search and a review of the earlier literature and statistics on the topic was carried out. In addition to the efficacy (i.e. effects in a controlled study setting) of early partial sick leave on work participation (how individuals return to work, and how they remain at work), the study examined the effectiveness (i.e. effects in a real world setting) of the partial sickness benefit and related partial sick leave at the population level. Challenges in this area of research arise from the complexity (multifactorial and multilevel nature) of the context and set particular requirements for the methods which can be used to examine these questions.
2 MAIN CONCEPTS AND FRAMEWORK OF THE STUDY

The present study was situated in the context of one of the several conceptual models for work disability and RTW or work participation. The most prominent of these models are summarized below in order to illuminate the multidimensionality and complexity of the research area. These models (as models for sickness absence and presenteeism) are interdisciplinary in their nature, drawing from a rather large array of different scientific theories. As a whole, these theories will not be addressed in this summary, apart from a few excerpts that are utilized to explain the findings of the study. Some of the definitions and measures of work disability, return to work and work participation will be outlined in this section. A general overview of the structural context of work reintegration is also provided.

2.1 Definitions

Work disability

Since employees with impaired work ability are the starting point of this study, work disability and work ability are central concepts here. Our understanding of the phenomenon of work (dis)ability has developed over the years from a rather narrow biomedical approach to a wider viewpoint. At present, there are different characterizations of work disability and it is defined e.g. as “a person’s inability to remain at or return to work during the course of or after an illness”. The interaction between the person and his/her work is emphasized in this definition (Costa-Black et al. 2013).
Legislative definitions of work disability, e.g. in the assessment of eligibility for partial and full sickness benefits, disability pensions and rehabilitation benefits, are also relevant in this study. In the Finnish National Pensions Act, individuals are considered disabled if “they, due to illness, defect or injury, are incapable of performing their regular job or other comparable employment considered to be suitable for them and to ensure a reasonable income having regard to their age, professionals skills and other circumstances”.

**Return to work and work participation**

Return to work (RTW), work retention and work participation are partly overlapping constructs that can, as well, be defined in several ways (Wasiak et al. 2007). Differentiating between these concepts is to some extent arbitrary and they are defined differently depending on the discipline, underlying theory, and the purpose of the study. In labor studies, work (or vocational) participation generally refers to the proportion of a country’s working age population that is either employed or actively seeking for work (ILO 2011). In rehabilitation research, the interest is often broader covering participation in the different domains of life (home, paid work and community) and including aspects related to carrying out everyday activities and fulfilling various social roles (e.g. Järvikoski and Karjalainen 2008).

Lagerveld et al. (2010) define work participation as “the capability and/or opportunity to participate in the workforce, fulfilling one’s work role”. This definition is considered to cover both the time- and status-dimensions of the concept (time to return to work and work status) and also to involve different phases of the disability process from short-term sickness absence to early retirement. A distinction is made between work participation and work functioning; the latter referring to the self-reported loss of productivity at work and the limitations experienced in fulfilling one’s work role. As a concept, return to work (RTW) can likewise be defined as a process or an outcome (Schultz et al. 2007). RTW has been defined for instance as “a complex human behavior change, involving physical recovery, motivation, behavior, and interaction with a number of parties” (Franche and Krause 2002). A process view on RTW differentiates four distinct phases in the process: off work, work re-entry, maintenance, and advancement (Young et al.2005a).
Wasiak et al. (2007) present a somewhat different and a relatively complex categorization of these concepts with RTW being conceptualized as “an individual's cognitive and behavioral response to the occurrence of work disability”. The authors distinguish three types of RTW-related outcomes: RTW-tasks and actions, context-dependent outcomes, and process-outcomes. Vocational participation and work participation are among the tasks and actions that individuals take during the RTW-process. Work participation is seen to consist of several dimensions: work-related abilities and capacities, productivity, type of duties (full, light, modified), position, employer, work readiness, whether the individual is working in good health, and whether the work-related goal has been achieved. In the categorization presented by Wasiak et al. the context-dependent RTW-outcomes are either personal (RTW-intentions, -expectations, -motivations, and -satisfaction) or environmental (compensation status, policy and guideline adherence, management and care appropriateness, reintegration and, interaction with stakeholders). RTW-process outcomes are categorized as time-oriented (for instance RTW-pattern, time to return to workplace, time to maintained work, duration of time off-work, and compensated lost work time), service-oriented (utilization of services), human resource-oriented (for instance, replacement costs), productivity-oriented (lost productivity), and monetarily oriented (for instance, health care costs).

The term work retention is usually used as a synonym for sustained (successful) RTW. In a recent study Hees et al. (2012) reported that employees, employers and physicians, all considered sustainability of RTW as important. However, they differed in the attributes that they considered important in defining successful RTW. Employers and physicians emphasized at-work functioning, whereas employees stressed job satisfaction and work-home balance. The authors concluded that a single definition of RTW may not be sufficient to capture the complexity of the RTW-process.

### 2.2 Underlying models

The conceptual models differ primarily in the extent to which they consider the individual level and higher level (societal or institutional) factors. The second dimension in which the models differ is the degree to which
they are dynamic, i.e. consider the nature of the process and temporality of disability and RTW. In general, the models of RTW have evolved from individualistic to systemic and from static to dynamic approaches.

Schultz et al. (2007) traced the origins of the contemporary, integrative approach to RTW to the main sources (the biomedical, psychosocial and ecological or economic models of disability) as follows. The biomedical model has been the prevailing medical framework for disease and disability, focusing on the medical problem or its pathology and treatment. The central actors in this framework are the individual patient and the physician. This approach can be criticized as providing a limited individualistic view that ignores the social context of the actors. The forensic model has evolved from the individualistic approach to a broader representation that strives to explain the behavior of the individual in relation to the insurance system. In this model, the starting point is that patients are prone to be dishonest about their illness and misuse the compensation system. The psychosocial model takes a broader view of the behavior of the individual within a larger social environment taking into consideration the different spheres of life. The approach emphasizes cognitive-behavioral and organizational factors in explaining RTW behavior. According to this approach, the factors that originate both from the individual level and higher levels need to be targeted when planning the prevention and treatment of disability. The ecological and economic models are multifaceted systemic models of occupational disability. The rationale behind this approach is to relate RTW behavior to the higher levels of meso- and macrosystems. The former underlines early intervention in the workplace and the role of the employer, whereas the latter emphasizes the role of economic factors in disability.

The biopsychosocial models of disability (Feuerstein 1991; Turk 1996; Waddell and Burton 2005) integrate the medical and psychosocial perspectives and importantly emphasize that a medical condition or impairment does not necessarily entail incapacity. Instead, personal or psychological and social factors have an important role in the outcome.

The International Classification of Functioning, Disability and Health (ICF) (WHO 2001) can be considered as one of the biopsychosocial models of disability. It takes a broad view of health and disability and it differentiates the following components: body functions and structures, activity, participation, environmental factors, and personal factors. This
model views disability as a process that takes into account both the social and medical aspects of dysfunction. It is frequently argued that introducing this model has evoked an important shift of focus away from impairment to participation in thinking about and managing disability. Nonetheless, critics of the model point out that the ICF model does not incorporate the dynamic time perspective of disability or take into account the limited causality between functional capacity and the health condition (Anner et al. 2012). It has also been claimed that the model is conceptually underdeveloped and needs to be elaborated further in order to be useful as a basis for a sound disability policy (Imrie 2004; Dahl 2002).

The all-inclusive ecological model presented by Loisel et al. (2001) has been influential in shaping the contemporary understanding of disability management. This model has its roots in the biopsychosocial approach. It calls attention to the interplay between many different systems; the personal system (the individual), the workplace system, the health care system and the legislative and insurance systems. In the model, all these systems are portrayed in the larger societal context. The importance of this model is that it draws attention to the differences in the viewpoints and interests of different actors or stakeholders. As Young et al. (2005b) point out, even if the stakeholders seem to share the common goal of promoting the return to work of the employee, they all have other concerns that may in some situations outweigh their commitment to the RTW process.

The dynamics of the RTW process have been highlighted by some authors (Franchise and Krause 2002; Young et al. 2005a) following the somewhat earlier dynamic conceptualizations of disability (Krause and Ragland 1994; Verbugge and Jette 1994; Krause et al. 2001a). This theoretical approach emphasizes that the employee’s individual psychological processes, which initiate and sustain RTW, lie at the core of the process of RTW. The models also derive from earlier vocational (role performance and career) models and differentiate four phases in the RTW-process (as described above). Further, the models suggest that there are individual differences in optimal phase-specific timing of interventions (Franchise and Krause 2002).

A third dimension has been presented to characterize the approaches to disability management, namely interpersonal communication (Pransky et al. 2004). The authors argue that communication between the different actors involved in disability management is the key factor to successful
The authors identify four traditional models of disability management (the medical, physical rehabilitation, job-match and managed care models) and claim that in all of these approaches, communication is most often unidirectional i.e. flowing from the service provider to the patient. In addition, the communication is impersonal and authoritative. The authors conclude that this area of research and development presents yet unexplored possibilities in the investigation and practice of disability management.

2.3 Measures of work disability, return to work and work participation

The operationalization of these concepts depends naturally on how they have been defined and the nature of the available data (self-reported, clinical, register-based or other administrative data). The large body of conceptual approaches to work disability has given rise to several different measures or tools. The majority of the tools have been intended for clinical use. Durand and Hong (2013) argue that no one tool encompasses the full complexity of work disability.

The work ability index (WAI) has been a Finnish contribution to the assessment tools. The index (Ilmarinen et al. 1991; Tuomi et al. 2006) sums up self-reported information on demands of work, perceived work ability, health, and resources of the individual. In clinical practice, the WAI-measure has been found to correlate well with medical assessments and prognosis of work ability. The measure has also been used for research purposes.

The literature described in the previous chapter reveals that there is limited consensus about what are the optimal ways to operationalize and measure RTW and work participation. When defined as a work-related outcome, RTW (or work participation) is often operationalized as work status or compensation status at a single time point (e.g. at work – off work or receiving – not receiving compensation) (Amick et al. 2000; Elfering 2006; Vogel et al. 2011). In addition, it can be specified for instance, whether the individual is back at work with the previous or a new employer, or working in previous or modified duties. Other measures that have been used include duration of work disability (days on sick
leave, days receiving compensation, time loss from work), frequency of sickness absence, hours of paid work per week, partial or full return to duty, sustained return to duty (for instance for at least 4 weeks), return to work in good health, and return to work without restrictions (Vogel et al. 2011; Amick et al. 2000). Time until first RTW has been criticised as a measure, because of the recurrent nature of many health problems and the related work disability (Butler et al. 1995; Amick et al. 2000). Those in favour of a multifaceted or a multiphased process-view of RTW, have proposed another array of RTW measures. For instance, satisfaction with the RTW outcome, at work productivity and perceptions of future career development have been postulated (Vogel et al. 2011; Steenstra et al. 2012).

2.4 Societal context of work disability and work participation

Various features of the societal context (the national social, health, and employment policies, structures and administration of these institutional areas, as well as the structural and administrational characteristics of work organizations) contribute to work disability, sick leave and RTW (Høgelund 2001). The available care and rehabilitation, health related, employment related and other available benefits, job security, human resource policy and management, may all affect the decisions made by the individuals, professionals, and employers during the process described in the framework of this study. The main features of the national sickness benefit and disability pension schemes (with a focus in partial sickness and disability benefits) are described briefly below.

Finnish sickness benefit and disability pension schemes

The Finnish National Health Insurance consists of an earned income component and a medical care insurance component. The sickness benefits are included in the former part (along with parenthood and rehabilitation allowances and occupational health services) (Hallituksen esitys eduskunnalle n:o 68/2005 vp). In 2010, 65% of the expenses of the earned income component were financed by employers, employees contributed to 30%, and 5% was covered by the state. In Finland, all
non-retired citizens aged 16 to 67 are eligible for compensated sick leave in situations of work incapacity due to illness. Eligibility for the statutory sickness benefit can be based on previous earnings or previous benefits or the minimum sickness allowance can be granted (Toivonen 2012). In the case when employment has lasted for at least one month, the employer continues to pay salary on the day on which the illness begins plus the following nine weekdays (if employed for less than one month, 50% of the salary is compensated). According to collective agreements many employers continue to pay full salary for the first 1–2 months. After this period, the Social Insurance Institution of Finland (SII) starts to pay statutory full sickness benefit. Compensation for lost wage income during sickness absence is based on annual earnings of the individual. The compensation rate is progressive, ranging from 25% to 70% of salary. The maximum length of the compensation is 300 working days during two years (per disease). If one makes a Nordic comparison, the average compensation level in Finland is moderate.

**Partial sickness benefit and partial sick leave**

Partial sickness benefit was introduced in Finland in 2007. It can be granted to the employees or self-employed between the age of 16 and 67 who must be unable to work and thereby entitled to full sickness benefit. RTW is always voluntary and part-time and it must not compromise the recovery of the patient. The individuals receiving partial sickness benefit must have been working full-time before the onset of work incapacity. From year 2007 to 2010, a continuous period of regular full sickness benefit of at least 60 working days had to immediately precede the partial sickness benefit. In 2010, this condition was reduced to 10 days. Partial sick leave entails combining partial salary with a partial benefit while working part-time performing either one’s usual or modified work tasks. The working hours must be reduced by 40%–60% of the regular time. The amount of the partial sickness benefit is 50% of the preceding full benefit. The employee and employer sign a fixed-term work contract for the partial sick leave period. The minimum duration of partial sick leave is 12 weekdays and its maximum duration is 72 working days (120 working days from 1.1.2014) over a period of two years.
2 MAIN CONCEPTS AND FRAMEWORK OF THE STUDY

Partial disability pension

In case of long term work disability, a partial or full disability pension can be granted either indefinitely or for a specified period. The Finnish pension scheme consists of both an earnings-related pension and a national pension, which covers the minimum income. A partial disability pension can be granted on the basis of earnings-related pensions. Work ability has to be reduced by at least $\frac{3}{5}$ in order for an individual to be eligible for full disability pension and by $\frac{2}{5}$–$\frac{3}{5}$ for partial disability pension. The majority of the partial disability pensions has been granted due to MSDs. The age-standardized incidence has been decreasing in full disability pensions and increasing in partial disability pensions during the past decade. In 2009, out of all disability pensions less than 10% were partial. Of the earnings-related disability pensions awarded in 2011, 48% were temporary and 21% were partial (Pensioners and insured in Finland 2011). Of those receiving partial disability pension 64% were women and 70% working part-time, most often from 20 to 29 hours per week and working in the public sector (Gould and Kaliva 2010). It was reported that approximately 70% of those on partial disability pension had specifically applied for a partial pension instead of a full pension, and as many worked part-time, half of them for 20–29 hours per week. Most of those individuals who received a partial disability pension and worked part-time remained in the same occupation and workplace as before their illness (Gould et al. 2008; Gould et al. 2003).

2.5 Framework for the study

A model modified from that originally presented by Bloch and Prins (1997) for work incapacity and work retention serves as a suitable orientation basis for the present study. The framework is simplified while still including all the main elements needed. It was proposed by the authors that the framework can be viewed as an input-process-output approach to work reintegration. The characteristics of the individuals (sociodemographic and personal characteristics) and factors related to an individual’s work and other areas of life at the beginning of the disability comprise the input. Interventions aimed at work resumption correspond to process, and work participation or return to work represents the output.
The modified model (Figure 1) places this present study to the societal context and characterizes the different institutional areas (social security system, health care and labor market) that, in addition to the characteristics of individuals and work, contribute to work (dis)ability, return to work and work participation. Each of these areas is large and the interrelationships between them are complicated, thus all the possible pathways between them cannot be described in a simple figure. This framework can be characterized as a biopsychosocial approach to work disability. The starting point of the investigation was employees with impaired work ability. Some of them were prescribed full sick leave (“care as usual”) and the others chose (or were allocated to) partial sick leave (the intervention). The work participation of the employees was scrutinized before and after the event.

Figure 1. The research framework (modified from Bloch and Prins 1997) and the scope of the study.
3 OVERVIEW OF THE LITERATURE

Research findings on the determinants of RTW and work participation and related workplace-based interventions, as well as shortcomings and limitations of this body of research will be outlined briefly in the following section. Recently, the volume of research on disability management, work participation and return to work has grown extensively (Rollin and Gehanno 2012). As the original studies are numerous, this overview is restricted mainly to a core set of systematic reviews as well as reviews on qualitative studies. In all of the systematic reviews, quality of the original studies had been assessed and used as a criterion for study selection, as recommended by Khan et al. (2003). However, some variation in the quality of the presented review studies could be detected, e.g. in how well they summarized the evidence from the original research.

Methods for evaluating qualitative research and evidence are currently developing. Evidence from qualitative studies can bring additional value to systematic reviews for policy and practice, e.g. by providing information for defining the scope of the study and relevant study questions (Noyes et al. 2008). In addition, qualitative studies often offer important findings on various factors and aspects that cannot reasonably be quantified. So far, there are only a limited number of papers summarizing qualitative research conducted on the present topic.

3.1 Empirical evidence on the determinants of return to work and work participation

It is obvious from Table 1 that evidence on the determinants of RTW aggregated in the review studies is still limited, even though there have
been a vast number of original studies. High age, female gender, severity of the health problem and low expectations of recovery were repeatedly found to be predictive of the work outcome. In many of the published review papers, the conclusions were hampered by the heterogeneity of the predictors and outcomes. The heterogeneity of the studies probably explains why meta-analyses have not been undertaken.

For instance, Detaille et al. (2009) reviewed systematically the prognostic factors of work disability in some chronic somatic diseases (rheumatoid arthritis, COPD, asthma, diabetes mellitus, and ischemic heart disease). A total of 43 relevant longitudinal studies were reviewed and they encompassed a large amount of potential prognostic factors from various disease related factors to a wide range of individual and environmental factors. Perceived health complaints, limitation in daily physical activities, exposure to physically strenuous work, and female gender were found to be associated with reduced work disability in all the studied medical conditions. A limitation was that both the predictors and the outcomes varied across the studies.

A systematic review of the predictors of RTW in mental health problems was reported by Blank et al. in 2008. The review focused on 14 longitudinal studies or retrospective surveys targeting RTW or risk of job loss resulting from long-term absence due to mental illness. The authors stated that many and wide-ranging factors are associated with successful RTW. The results on demographic predictors were contradictory. The authors further concluded that the studies reviewed were based solely on the medical model of care and thus largely ignored the social determinants of mental health and their effects on work retention.
Table 1. Recent review studies on the determinants of return to work and work participation.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Topic</th>
<th>Method</th>
<th>Included studies</th>
<th>Quality assessment carried out</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crook et al. 2002</td>
<td>Determinants of occupational disability following low back injury</td>
<td>Systematic review</td>
<td>19 longitudinal studies</td>
<td>V</td>
<td>A wide range of outcomes and potential prognostic factors were identified. Evidence was found for demographic factors, time since onset, functional disability, psychological distress, reported pain, previous episodes, and work environment as prognostic factors. Underlined that the factors may differ and operate differently at different stages of the disability.</td>
</tr>
<tr>
<td>Steenstra et al. 2005</td>
<td>Predictive factors of RTW in acute LBP</td>
<td>Systematic review</td>
<td>14 longitudinal studies</td>
<td>V</td>
<td>A total of 79 prognostic factors were investigated. Evidence found for high age, female gender, severe disability, physically strenuous work, a specific diagnosis of back pain, social dysfunction, isolation, and receiving higher compensation as prognostic factors for longer time to RTW. Conclusions impeded by too few studies available for many of the reviewed factors.</td>
</tr>
<tr>
<td>Kuijer et al. 2006</td>
<td>Factors associated with absence and RTW thresholds</td>
<td>Systematic review</td>
<td>17 longitudinal studies and RCTS</td>
<td>V</td>
<td>Consistent evidence found for expectations of recovery as a predictor of RTW. No consistent evidence for predictors of the sickness absence threshold because of heterogeneity of the studies.</td>
</tr>
<tr>
<td>MacEachen et al. 2006</td>
<td>Dimensions, processes and practices of RTW in MSDs and other pain-related conditions</td>
<td>Systematic review</td>
<td>13 qualitative studies</td>
<td>V</td>
<td>Goodwill and trust important in RTW arrangements. Central role of the supervisors and the organizational environment in the RTW process.</td>
</tr>
</tbody>
</table>

Continues on next page...
<table>
<thead>
<tr>
<th>Authors</th>
<th>Topic</th>
<th>Method</th>
<th>Included studies</th>
<th>Quality assessment carried out</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iles et al. 2008</td>
<td>Psychosocial determinants of failure of RTW in non-chronic non-specific LBP</td>
<td>Systematic review</td>
<td>24 longitudinal studies</td>
<td>V</td>
<td>Strong evidence found for recovery expectations and fear avoidance beliefs of being predictive of and for psychological strain, depression and job satisfaction not being prognostic of work outcome.</td>
</tr>
<tr>
<td>Lagerveld et al. 2010</td>
<td>Factors predicting work participation</td>
<td>Systematic review</td>
<td>30 longitudinal and cross-sectional studies</td>
<td>V</td>
<td>Strong evidence for long duration of depression, moderate evidence for severity of the disorder, comorbidity, older age, history of previous sick leave, limited evidence for low education, low self-esteem, feelings of hopelessness, low social functioning, impaired previous work functioning, supervisory behavior, severe symptoms, previous depressive episodes, little clinical improvement. Modifiable work-related and personal factors should be addressed in the future.</td>
</tr>
<tr>
<td>Blank et al. 2008</td>
<td>Predictors of RTW in mental health problems</td>
<td>Systematic review</td>
<td>14 longitudinal studies or retrospective surveys</td>
<td>V</td>
<td>Many wide ranging factors associated with successful RTW. The results on demographic predictors were contradictory. Studies were based solely on the medical model of care and thus largely ignored the psychosocial determinants of mental health and their effects on work retention.</td>
</tr>
<tr>
<td>Study</td>
<td>Title</td>
<td>Study Type</td>
<td>Number of Studies</td>
<td>Findings</td>
<td></td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>------------------</td>
<td>-------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Heitz et al. 2009</td>
<td>Predictors of RTW in sub acute and chronic LBP</td>
<td>Systematic Review</td>
<td>39 longitudinal</td>
<td>A total of 100 biomedical and 122 psychosocial risk factors identified. A higher number of modifiable psychosocial factors found at the earlier stages compared to the later stages of back pain related work disability.</td>
<td></td>
</tr>
<tr>
<td>Detaille et al. 2009</td>
<td>Prognostic factors of work disability in chronic diseases</td>
<td>Systematic Review</td>
<td>43 longitudinal</td>
<td>Perceived health complaints, reduced daily physical activities, exposure to physically strenuous work, and female gender associated with work disability in all the diseases. Predictors and outcomes were found to vary across the studies.</td>
<td></td>
</tr>
<tr>
<td>Clay et al. 2010</td>
<td>Early prognostic factors of RTW after acute orthopedic trauma</td>
<td>Systematic Review</td>
<td>15 longitudinal</td>
<td>Younger age, high perceived self-efficacy, and not receiving compensation were predictive of shorter time off-work. Blue-collar work predicted lengthy work disability. Small number of factors investigated in more than one cohort limited the conclusions.</td>
<td></td>
</tr>
<tr>
<td>Cornelius et al. 2011</td>
<td>Prognostic factors of longterm disability and RTW in mental disorders</td>
<td>Systematic Review</td>
<td>7 longitudinal</td>
<td>Strong evidence for higher age and limited evidence for several individual, work related or other external factors. However, no apparent conclusions, other than those regarding age, could be drawn.</td>
<td></td>
</tr>
</tbody>
</table>
3.2 Empirical evidence on workplace-based interventions targeted at return to work or work participation

There is also an extensive literature on various interventions targeted at RTW and work participation. Table 2 summarizes the findings of selected recent reviews on workplace-based RTW-interventions. The overview is limited to workplace-based interventions since that is the most relevant type of intervention in relation to the present study. Workplace-based interventions have been defined for instance as “Interventions directed to the workplace, work organization, conditions and/or occupational (case) management strategies with active stakeholder involvement of (at least) worker and employer” (Franche et al. 2005a).

The literature on workplace-based interventions appears to be somewhat more consistent in terms of both findings and conclusions, although the outcome measures have varied in these studies as well. Several of the reviews claimed that workplace-based interventions were effective in supporting RTW. Thus early, multidisciplinary interventions that include active co-operation between the stakeholders were encouraged. In addition, it was suggested that simple interventions (for instance offering modified work) should be recommended during the early stages (first 8 weeks) of work absence. It was noted that studies should better describe the contents of the interventions and subgroup analyses would be needed in order to be able to identify those individuals who are most likely to benefit from this kind of intervention.

A good number of interventions have dealt with work disability related to musculoskeletal disorders and for instance mental disorders have received less attention, until very recently. Furlan et al. (2012) conducted a systematic review, examining interventions that could be recommended in managing depression in the workplace. The authors identified ten randomized trials and two other studies evaluating various workplace-based intervention practices on work outcomes, such as sickness absence, worker turnover, long term disability and work functioning. The evidence was graded as very low due to high risk of bias in all the studies and for the scarcity of studies.
Another recent systematic literature review (Hoefsmit et al. 2012) investigated the general characteristics of RTW interventions that have been claimed to be effective across different target populations and interventions. The authors note that there are no common standards with which to categorize RTW interventions. They presented the following list of characteristics by which interventions could be categorized: Timing of intervention, involvement of care professionals, time dependency (scheduled or not), target population, activities involved, intensity, and employee and employer role in the intervention. It was found that there were only few early (initiated during the first six weeks of sick leave) interventions that had been carried out. Together with multidisciplinary interventions, they were found to be effective in both physical and mental disorders. The authors conclude that early, multidisciplinary, and activating interventions should be utilized more, especially in mental disorders. The interventions should initiate and support co-operation between the different actors (employee, professionals and employer) in the RTW process.
Table 2. Overview of review studies on workplace-based interventions on RTW and work participation.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Topic</th>
<th>Method</th>
<th>Included studies</th>
<th>Quality assessment carried out</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Krause et al. 1998</td>
<td>Effectiveness of modified work on RTW</td>
<td>Systematic review</td>
<td>29 longitudinal and cross-sectional studies</td>
<td>V</td>
<td>Based on the analysis of the 13 higher quality studies, interventions were effective. Not possible to identify which element of the programs or which type of modified work was most effective.</td>
</tr>
<tr>
<td>Franche et al. 2005b</td>
<td>Effectiveness of RTW interventions targeted at employees on sick leave due to musculoskeletal or other pain related conditions</td>
<td>Systematic review</td>
<td>10 longitudinal and cross-sectional studies, RCTs, other trials</td>
<td>V</td>
<td>Strong evidence for the effectiveness of work accommodation and contact between healthcare provider and workplace in reducing work disability duration. The evidence for the other elements, except for supernumerary placements, was moderate. The evidence for the effects of the intervention on the quality of life of the employees was insufficient or mixed. Evidence for effects sustaining beyond one year limited.</td>
</tr>
<tr>
<td>Durand et al. 2007</td>
<td>Identifying the objectives and activities of different workplace interventions for employees with MSDs</td>
<td>Descriptive review</td>
<td>21 study reports</td>
<td></td>
<td>The workplace component of the interventions was often poorly documented. The interventions were very heterogeneous and it was not possible to identify a core set of characteristics in them.</td>
</tr>
<tr>
<td>Authors</td>
<td>Research Question</td>
<td>Methodology</td>
<td>Number of Studies</td>
<td>Rating</td>
<td>Conclusion</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>---------------------------------------</td>
<td>-------------------</td>
<td>--------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Van Oostrom et al. 2009a</td>
<td>Effectiveness of workplace-based RTW interventions compared to usual care or clinical interventions</td>
<td>Systematic Cochrane review</td>
<td>6 RCTs</td>
<td>V</td>
<td>Moderate-quality evidence on the effectiveness of workplace-based interventions to reduce sickness absence in musculoskeletal disorders. The lack of relevant studies in other health conditions impeded other conclusions.</td>
</tr>
<tr>
<td>Van Duijn et al. 2010</td>
<td>The effects of timing on the cost-effectiveness of the interventions</td>
<td>Literature review &amp; statistical analysis of studies on RTW of employees on sick leave due to LBP</td>
<td>4 longitudinal cohort studies</td>
<td></td>
<td>Complicated structured interventions not optimal until between 8 and 12 weeks of sick leave. Inexpensive workplace-based interventions (e.g., work accommodations) probably most cost-effective at the early stages of the work absence.</td>
</tr>
<tr>
<td>Carroll et al. 2010</td>
<td>Effectiveness of workplace-based RTW interventions compared to interventions not involving workplaces</td>
<td>Systematic review</td>
<td>8 RCTs</td>
<td>V</td>
<td>Interventions that involved active, structured cooperation and agreement on work modifications between the employee, employer and occupational health care personnel were more successful than the other interventions. Early interventions found more effective than others.</td>
</tr>
</tbody>
</table>

Continues on next page...
Table 2. Overview of review studies on workplace-based interventions on RTW and work participation (continued).

<table>
<thead>
<tr>
<th>Authors</th>
<th>Topic</th>
<th>Method</th>
<th>Included studies</th>
<th>Quality assessment carried out</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pomaki et al. 2012</td>
<td>Effects of workplace-based interventions on work absence and work functioning in common mental health conditions</td>
<td>Systematic review</td>
<td>8 RCTs and other trials</td>
<td>V</td>
<td>Moderate evidence on effectiveness of high-intensity psychological interventions on work functioning. Moderate evidence of facilitation of navigation through the disability management system on work absence duration.</td>
</tr>
<tr>
<td>Palmer et al. 2012</td>
<td>Effectiveness of community- and workplace-based interventions in reducing sickness absence in MSDs</td>
<td>Systematic review</td>
<td>42 RCTs and longitudinal studies</td>
<td>V</td>
<td>Effort-intensive interventions less effective than simple ones, expensive interventions should be accompanied by careful cost-benefit evaluation.</td>
</tr>
<tr>
<td>Hoefsmit et al. 2012</td>
<td>General characteristics of RTW interventions that are effective across different target populations and interventions</td>
<td>Systematic review</td>
<td>23 study reports</td>
<td>V</td>
<td>Early, multidisciplinary, and activating interventions should be utilized more, especially in mental disorders. Interventions should initiate and support co-operation between different actors.</td>
</tr>
</tbody>
</table>
### Overview of the Literature

Higgins *et al.* 2012

What is it about an intervention that works or is effective? In what circumstances does it work? For whom does it work?

“Realistic review”

269 study reports

Diversity and complexity of interventions and the contexts renders systematic reviews and meta-analysis problematic. Interaction of the intervention with its social context should be recognized in order to understand the outcomes. The following factors should be recognized: Support received from the management, the size and structure of the organization, level of investment in disability management, and the culture and climate of the organization.

---

Odeen *et al.* 2013

Effectiveness of active interventions (targeting change in behavior or cognitions)

Systematic review

17 RCTs

Moderate evidence on the effectiveness of graded activity programs and limited evidence on the success of the Sherbrook model (a multidisciplinary approach) and cognitive behavioral therapy in reducing sickness absence.

---

Furlan *et al.* 2012

Successful intervention approaches in managing depression in the workplace

Systematic review

10 RCTs, 2 non-randomized trials

Low evidence mainly due to high risk of bias in the studies and low number of studies for each outcome.
3.3 Literature on societal incentives and disincentives of return to work

The international research literature on the incentives and disincentives or barriers to return to work and the co-operation between different actors will be reviewed briefly in the following section.

Høgelund (2001) has summed up public policy studies, and stated that it is rather clear that such a formal feature as the compensation level affects the use of the benefits and RTW. The compensation level is also likely to interact with the level of job protection (legal protection of employment) in the country (Veerman and Palmer 2001). Weak job protection together with generous compensation from benefits is likely to discourage RTW. There are other characteristics of the schemes that may have an impact, e.g. the administration, and the financing of the schemes. According to Høgelund, these features may have an indirect effect on RTW. For instance, the way that the benefits are financed (public funds, employee or employer payments) is likely to create economic incentives and disincentives to the actors. Income loss during sickness absence, receiving no compensation for initial days of sickness absence, need for a medical certificate and strict conditions of eligibility for benefits have been noted as other possibly influential features (Anema et al. 2009). However, these effects are challenging to determine, and so far there is little research evidence available on these associations.

The concept of “flag” is used in the literature on disability and RTW to refer to various factors that either directly affect disability and RTW or interact with other factors and thus contribute indirectly to the recovery process (Gatchel 2004). “Objective” workplace conditions (the black flags) are relevant in relation to the structural context of disability and RTW. An international group of researchers (Shaw et al. 2009) has categorized black flags as follows: The availability and implementation of selected duties and gradual RTW, the workplace practices for disability management, employer attitudes, certain occupational groups which experience exposure to high physical load, shift work, and working unsociable hours. Franche et al. (2005a) also emphasized the impact of organizational context on the availability and implementation of RTW measures. Thus, certain features as company size, sector and flexibility...
of the work organization, task specialization, work requirements, and precarious employment have been suggested to be important.

Soklaridis et al. (2010) investigated the psychosocial factors that hinder RTW for individuals with LBP. The focus groups of the study consisted of various stakeholders (employees, employers, clinicians, and representatives of compensation board, unions, and health and safety associations). It was found that instead of focusing on individual psychosocial factors, the participants commented on factors related to the larger social or organizational context. The authors concluded that the perspective on psychosocial factors should be moved from simply the individual to broader sociopolitical and economic conceptualizations. Although proper individualized RTW management was seen as useful and important, RTW was mostly seen as “a social phenomenon that requires supportive social policy that will enable all the players to work together”. MacEachen et al. (2012) studied participants of a vocational retraining program and concluded, in line with Soklaridis et al., that contemporary disability management should focus on contextual factors (policy programs and their implementation).

A factor that is likely to affect the RTW process is the co-operation between different stakeholders. Young et al. (2005b) and Franche et al. (2005a) presented discussion papers that described the viewpoints of different actors (employees, employers, co-workers, supervisors, labor union representatives, healthcare providers, and insurers or payers). For instance, it was indicated that employers are likely to be concerned with the cost-effectiveness of the interventions while employees may, in addition to worries about earnings, also be concerned with perceived coping and satisfaction with work and private life. In the paper of Young et al. it was emphasized that regardless of differing motivations and interests in the RTW process, the stakeholders do share the common goal of RTW of the employee. Understanding the viewpoints and informing the actors about their probable gains during the implementation of the intervention will profit the goal of RTW. Franche et al. underlined that the optimal level of involvement of different stakeholders may vary from case to case for instance according to the phase of work disability.
3.4 Study designs, bias and confounding

As mentioned earlier, in this study a special consideration was placed on study designs and methods applied. In the following section, an overview of main study designs and possibilities to control systematic error within these designs, as well as a short presentation of propensity score (PS) and difference-in-differences (DID) methods, is presented.

**Bias and confounding**

As in most epidemiological studies, the present study deals with the estimation of effects. The extent that these estimates are produced without bias (systematic error) defines the validity of the association (or study). The causality of a valid association may be inferred with different criteria (Hill 1965; Rothman and Greenland 1998a).

The error in an epidemiological study can be random or systematic. The most important means to reduce random error (and increase precision) is to increase the total study size (or the relative size of the reference group). The systematic error in a study is induced by bias and confounding (Rothman and Greenland 1998b; Checkoway et al. 2004a). Selection bias and confounding, as sources of error, are especially one focus of this study, since the aim is to compare effects of interventions in two groups.

Selection bias (i.e. systematic differences in the baseline characteristics of the participants in the compared groups) originates from the procedures by which the study participants are selected. If the factors that contribute to non-comparability are observable (whether confounders or factors causing selection), the resulting error can be diminished by statistically adjusting for these variables. However, this may not possible, if these factors are unidentified (unobservable) or so complex that measuring them is difficult (for instance some contextual or upper level systemic factors). (Checkoway et al. 2004b; Rothman and Greenland 1998b; Savitz 2003a).

Confounding occurs when selection bias results in an imbalance in prognostic factors associated with the outcome (Reeves et al. 2008). Confounding is defined as a confusion of the effects of the exposure being studied with effects of other factors on the risk of the health outcome of interest. In order to be a confounder, a variable has to be predictive
of the outcome and associated with exposure in the source population at baseline and must not be an intermediate factor in the pathway between the exposure and outcome (Checkoway et al. 2004c; Rothman and Greenland 1998b).

Another way to define confounding is the counterfactual definition. This means that an ideal comparison group for the exposed would consist of the same group when they had not been exposed (a counterfactual condition). Since this comparison is not possible, another comparison group is needed. If the groups of exposed and unexposed are not comparable (or exchangeable), confounding of the studied effects is likely to occur. (Greenland and Robins 1986; Rothman and Greenland 1998c; Maldonado and Greenland 2002; Savitz 2003b).

**Study designs and methods to counter bias and confounding**

In order to tackle systematic error, attention has to be paid to the study design. In evaluating the effects of a treatment, conduct or intervention, a controlled trial with random assignment to the exposure (intervention) and control groups, is desirable. If the number of the participants in the experiment is sufficient, then the groups can be thought of as exchangeable (comparable in terms of both observed and unobserved characteristics of the participants) and no confounding in the studied effects is likely. Thus, in large and successfully implemented randomized trials, comparison of the groups is thought to approach the causal effect of exposure (Savitz 2003b). It is possible, however, that randomization will have failed, or there will be differential loss to follow-up or compliance between the groups. These conditions weaken the comparability between exposed and controls, but the shortcomings can be, at least to some extent, addressed with analytical means. Another shortcoming of randomized controlled trials (RCTs) is the use of selected samples often of small size, which limits the applicability of the results outside the study population.

When a true experiment is not feasible or ethical, a non-experimental (observational) study design is necessary. The internal validity (evidence on causality) of these studies is lower, but they can better represent real-world settings and produce more relevant information for policy-making than RCTs (Remler and Van Ryzin 2011). Observational studies that can
be utilized instead of RCTs, are called natural or quasi-experiments. The definitions of these terms vary and sometimes they are used as synonyms. A categorization of studies presented by Remler and Van Ryzin (2011) is adopted here. Term natural design is used in connection with naturally occurring or unplanned exogenous events. In the case of planned, intended events or interventions intended to influence the outcome, then the term quasi-experiment is used. The extent to which the intervention or treatment is endogenous or exogenous determines whether the study is called a weak or a strong quasi-experiment.

In a longitudinal observational study, a defined population (a group of people who share a common experience or condition) is followed prospectively or retrospectively. In order to draw inferences about the effects of exposures on outcomes, a comparison group is created. Since exposure is not randomly allocated between these groups, selection bias and confounding need to be tackled if one wishes to compare the two groups. If the determinants of the outcome are known and measurable, and the baseline differences between the groups in important determinants are not too large, the effects of confounding can be controlled for in the analysis (Savitz 2003b).

Case-crossover studies are of special interest in the context of this thesis. This type of study design was introduced rather recently (Maclure 1991). In a traditional crossover study, the effects of interventions are compared by allocating individuals to the interventions in a randomized sequence. In the case-crossover design, the case-control study is adapted so that an individual's case period is matched with his/her previous time periods. Thus, one or more previous time periods are selected as matched control periods for each case and the individuals serve as their own controls. The case-crossover study has benefits (mainly related to the feasibility of the design) over study designs with parallel groups. The design removes confounding due to time-invariant (observed or unobserved) factors, but imbalance between case and control periods is still possible due transient individual and environmental factors. As compared with group matching (randomized experiments), the approach reduces the costs related to the sample size. Some conditions exist: the time lag between exposure and outcome must be brief and exposures must have modest carry-over effects (Rothman and Greenland 1998d; Nitta et al. 2010; Redelmeier and Tisbhirani 1997).
3 OVERVIEW OF THE LITERATURE

Difference-in-differences (DID) and propensity score (PS) are two complementary methods that have been used to deal with selection bias and confounding (Ding 2009). Propensity score (PS) is a method that can be used in an observational study to compare groups and approximate a randomized trial. The propensity score is defined as conditional probability of assignment to a treatment given observed covariates. Thus it serves as a composite confounder and can be used to balance the observed covariates in two groups and reduce bias. In addition, the true treatment effect can be better approximated with the PS method. A number of methods can be used to apply the estimated propensity score. The importance of correct implementation of the methods has been emphasized in several publications (Pattanayak et al. 2011; D’Agostino 1998; Shah et al. 2005; Austin 2011).

DID is a quasi-experimental method that is not usually utilized in the epidemiological literature, but it has been popular in measuring the impacts of interventions in health and social sciences. In addition to some statistical methods (for instance instrumental variables) this approach can be used to tackle selection also due to unknown or unobservable factors. DID estimates pre-post differences in individuals within treatment and control groups. Thus, it can be thought of as a combination of two case-crossover studies. The impact of a treatment is derived from the difference in differences in these two groups (the difference between the changes in the outcome in the group receiving the treatment or exposed to the conduct and another group, not exposed to this factor over the same period). (Nguyen 2012; Ding 2009). Thus, panel data measuring the outcome before and after the intervention are needed. DID-methods can be used on their own or in combination with PS-matching.

3.5 Summary of the reviewed literature and implications for the present study

There is an extensive literature investigating work disability and RTW, and attention has been paid to the shortcomings of the existing body of research and targets for development. The conceptual and methodological difficulties and challenges in this area of research are apparent. The predominant contemporary research framework is complex. It is both
Overview of the literature

The constructs. Høgelund (2001) has emphasized that in order to understand reintegration of employees with work disability to work, one has to draw from several research disciplines (medicine, social sciences, public health and economics). Each of the disciplines offers different explanations for the phenomenon utilizing diverse sets of explanatory factors, but they should be viewed as being complementary to each other. Although it has also been proposed that all-inclusive models of disability would be necessary (Krause et al. 2001b), critics of such models have noted that these models are not theoretically well developed, but generic and unspecific and the concepts used are often diffuse and poorly defined (Schultz et al. 2007; Elfering 2006). Thus, these models are difficult to operationalize and investigate.

The multilevel structure and dynamic nature of the suggested models impose further demands. It has been appropriately noted that there is a need to include higher level (contextual) determinants of health-outcomes in epidemiology (Diez-Roux 1998). In line with this notion, the current models of disability and RTW emphasize the role of higher level contextual factors. The challenge is that a prerequisite for multilevel analysis is a theory of causation that extends across the levels and includes testable hypotheses of the mechanisms (with intermediary variables) explaining the relationships. Taking the temporal aspects of the constructs and processes into account would also require the use of advanced methodology. Krause et al. (2001b) noted a decade ago that complex analytical modeling might not be possible in the context of RTW-research as long as the theoretical basis remains underdeveloped. For the most part, this still seems to be the situation today.

In summary, there is a rather large discrepancy between the current multidimensional models of work disability and RTW and the available empirical evidence on the associations suggested in these models. There is limited evidence on the determinants of RTW and work participation aggregated in review studies. In many of the papers reviewed above, the conclusions were hampered by the heterogeneity of the predictors and outcomes. Qualitative studies provide important findings on factors and aspects that cannot reasonably be quantified, and they do not necessarily
suffer from the theoretical weaknesses of the research area. The literature on “black flags” (especially higher level structural factors) presented above introduces important factors that are likely to have an impact on RTW, but there is limited empirical evidence to support these effects. The diversity of the interventions and context limits to some extent the overall conclusions that can be drawn from the intervention studies. In addition, there is scarce evidence from larger scale interventions, namely programs and policies carried out at national levels.
4 AIMS OF THE PRESENT STUDY

The aim of this study was to investigate the effectiveness (studies I–IV) and efficacy (study V) of a workplace-based intervention, i.e. partial sick leave and the associated use of partial sickness benefit, on RTW, work retention and work participation. The effectiveness of the intervention was examined separately for the most common diagnostic categories among beneficiaries of partial sickness benefit: musculoskeletal diseases, mental disorders, traumas and tumors. The theoretical framework for the study and previous research findings provided a basis for investigating also whether the effects of partial sick leave would differ according to gender, age-group or socioeconomic position (SEP).

The specific study questions were as follows:

1. What is the scientific knowledge about the effects of partial sick leave in the Nordic countries? (Study I)

2. What are the effects of partial or full sick leave on RTW, work retention and work participation in a working population with prolonged sickness absence? (Studies II, III, IV)

3. What are the effects of partial sick leave on sustained RTW and subsequent sickness absence at an early phase of work disability due to musculoskeletal disorders? (Study V)

4. Do the effects of partial sick leave on RTW and work participation differ by gender, age, socioeconomic position or diagnostic category? (Studies III, IV)
5 MATERIALS AND METHODS

5.1 General description of the analytical approach

The study questions were investigated in different study samples, with different study designs and methodological approaches in order to be able to control for the large array of possible intervening factors (observed and unobserved, summarized in chapters two and three).

First, a literature review was carried out including a systematic search of literature on the use and the effects of partial sick leave (study I). Second, a register-based sample of a working population with prolonged sickness absence was constituted collecting prospective and retrospective register data from national registers (studies II and III). Third, a study with a case-crossover design was carried out in another large register-based sample with prolonged sickness absence (study IV). Finally, an individually randomized controlled trial (RCT) among employees was implemented in an earlier phase of work disability (study V).

5.2 Data sources

The literature review was restricted to the Nordic countries (with the exception of Iceland), since these countries are relatively similar with regard to their the social security systems and statistics on sickness absence and available benefits. Systematic electronic literature searches were performed in the following databases: Google Scholar, PubMed, Embase, PsycINFO, Business Source Premier, EconPapers, ProQuest and Social Services Abstracts. The first literature search included studies until April
2008. The search was replicated from May 2008 until December 2012 in order to update the findings.

Studies II, III and IV utilized population-based data from the national sickness insurance registers of the Social Insurance Institution of Finland (SII) and the registers of the Finnish Centre for Pensions. The sickness insurance registers are maintained by the SII mainly for administrative purposes, but register data can also be accessed for research use. The registers include information on medically certified and compensated sickness absences, temporary and permanent national disability pensions, and old age pensions in Finland. The registers of the Finnish Centre for Pensions contained corresponding information on employee pensions, and compensated unsalaried periods due to disability, rehabilitation or unemployment.

Studies II and III utilized register data obtained from the SII. In study IV, data from sickness insurance registers were linked to the data from the Finnish Centre for Pensions on the basis of identity numbers of the individuals.

In the randomized controlled trial (study V), data from a questionnaire survey and a clinical examination and interview were linked to data on sickness absence days and earning periods obtained from the occupational health service and the employers’ registers. Survey data was collected by questionnaires filled in by the participants at baseline and on weeks 1, 3, 8, 12, and 52. A few individuals who did not use email were interviewed over the phone. An occupational physician carried out a symptom interview and performed a physical examination according to a standardized protocol (Viikari-Juntura et al. 1998, 2000) at baseline. Informed consent was obtained from the participants to collect information on sickness absence days with main diagnoses and earning periods from the occupational health service and the employers’ registers one year preceding and one year after recruitment into the trial.

5.3 Study designs and procedures

Study I was a literature review with a systematic data search in the electronic databases. The keywords, MESH terms, and keyword strings that were used to identify the relevant articles were: Partial sick leave, part
Figure 2 presents schematically the timing of data collection in studies II–IV and the design used in study IV. Studies II and III were longitudinal register-based studies that included both prospective and retrospective panel data. The individuals were followed from the end of the partial or full sick leave in 2007 until turning 68, death or the end of the follow-up on 31 May 2009. In study IV, the impact of the partial sick leave was derived from the difference-in-differences between partial sick leave and full sick leave groups (the difference between the changes in the outcome in the group of individuals on partial sick leave and the other group, not on partial sick leave during the same time period). Longitudinal register data on work participation was drawn during one year before (PRE-period) and one year after (POST-period) the treatment period (partial or full sick leave) in 2008. A wash-out-period of a year was set in between the treatment period and PRE- and POST-periods. These two time-windows were allowed to move according to the timing of the treatment period.
Study V was designed as an individually randomized controlled trial (RCT) and it was carried out in six occupational health care units of large- and medium-sized private or public organizations. Occupational health physicians recruited participants to the study. The procedures of enrollment and allocation of individuals into the intervention and control conditions are illustrated in the flowchart shown in Figure 3.
Employees who sought medical care because of musculoskeletal pain were eligible to participate in the trial. During the consultation, the occupational health physician informed the patient about the study and its aims, and asked for permission to contact the employee’s supervisor, since arrangements for part-time sick leave (and part-time work) required negotiations with the workplace. The length of the subsequent sick leave was determined before randomizing the patient either to the part- or full-time sick leave group.

In the part-time sick leave (intervention) group, in 70% of the cases work time was reduced by about a half. When it was difficult to arrange a half work day, individuals worked shorter hours on 3–4 days a week (30% of the participants). In addition, if necessary, the remaining work tasks were modified in order to prevent exacerbation of activity-related symptoms. The physician provided the patient with a note which de-
tailed the duration of partial work disability, whether certain physical loads should be reduced, and whether any additional work modifications were necessary. If the employee was unable to return to ordinary work tasks after the initial part-time sick leave, part-time sick leave could be continued or full-time sick leave could be prescribed based on medical assessment. Part-time sick leave could be extended for up to two months, if necessary. If the worker was unable to perform part-time work duties, the part-time sick leave could be changed to full-time leave on the basis of the medical assessment. Full-time sick leave was prescribed for the control group.

5.4 Study populations

In study II, all recipients of partial sickness benefit during the latter half of 2007 (those whose partial sick leave had ended between 1 May and December 31) \((n = 1\,048)\) were included into the sample from the sickness insurance registers. Those diagnostic entities where the use of the benefit had been most common (mental disorders, musculoskeletal diseases, traumas and tumors) \((F, M, S\) and \(T,\) and \(C\) and \(D\)-categories in ICD-10) were included. The comparison group consisted of all individuals whose compensated full sick leave (with the above-mentioned diagnoses) had ended within the same time period with an uninterrupted phase of at least 60 days of payment at the end of that particular sick leave \((n = 37\,817)\). After excluding those who had turned 68 years of age or had died before the end of the sick leave or were granted disability pension immediately following the sick leave, the sample consisted of 1,047 individuals on partial sick leave and a comparison group of 28,380.

Study III utilized data collected in study II. After removing individuals with lower than the minimum income or an unclear occupational group, and those whose sickness benefit was based on other than work income or who had missing information on diagnosis or previous sickness absence, there were 1,017 individuals in the partial sick leave group and 25,249 individuals in the control group.

A total sample of individuals who had received either partial sickness benefit \((n = 1,838)\) or full sickness benefit \((n = 67,086)\) in 2007–2008 and whose compensated sick leave had ended between 1 January and 31
December 2008 was drawn from the national sickness insurance register in study IV. In the full sickness benefit group, the sick leave had to end with a continuous period of 60 payment days in order to make the two groups comparable regarding the severity of the underlying disease. Those who had died (n = 24 in the partial sickness benefit group and n = 2 600 in the full sick leave group) or moved to old age pension (n = 1 and n = 354, respectively) before the end of the data collection period were excluded from the analyses. Similarly those who were not employed (n = 2 and n = 4 923) during the entire study period, had not turned 16 at the time of the first data collection period (n = 3 in the full sick leave group) or whose sickness absence periods (ending in 2008) extended beyond the time-frame of data collection (n = 66 and n = 1 024) were excluded. The final study sample consisted of 1 738 participants in the partial sickness benefit group and 56 754 participants in the full sickness benefit group. The analyses were focused to the diagnostic categories F, M, S and T, and C and D in ICD-10.

The eligibility of the individuals to participate in the randomized controlled trial (study V) was assessed by an occupational health physician based on beforehand set criteria. Individuals could be considered for participation if the following inclusion criteria were met:

- Musculoskeletal pain of the neck or shoulder, back or upper or lower extremities
- Full-time sick leave could be prescribed, but the medical condition allowed working reduced work hours without risk of deterioration
- From 18 to 60 years of age
- Permanent or long term working contract
- At least 30 work hours per week
- No more than 2 weeks of sickness absence due to the musculoskeletal health problem during the preceding month and no more than 30 days of sickness absence (for any cause) during the preceding 3 months.
- No upcoming surgery requiring more than 1 week of sickness absence
- No plans for other longer absence during 12 months after enrollment.
Individuals were excluded if they presented with any of the following:

- Acute infections
- Symptoms due to accidental injury
- Suspected occupational injury or disease
- Active inflammatory arthritis
- Malignant tumor diagnosed or treated during the previous year
- Severe mental disorder
- Pregnancy
- Severe pain or pain interfering severely with sleep (> 7 on a scale from 0 to 10).

Out of 120 assessed individuals, 71 were eligible to participate in the trial but two individuals declined and six were excluded for other or unknown reasons leaving a total of 63 participants randomized to the intervention and control conditions.

5.5 Outcomes and covariates

The nature of the available data (national registers and employer registers) determined how the key concepts of RTW, work retention and work participation were defined and operationalized. Return to work (RTW) was defined as time-oriented outcome and operationalized as time to the first recurrent sickness absence (a proxy for failure of RTW) or time to sustained RTW. Work retention was conceptualized either as work or compensation related status at a single time point (on disability pension or not) or as the total or cumulative number of compensated sickness absence periods or sick leave spells during the follow-up period. A status-based definition was used in connection with work participation. Work absences were defined as absences for health-related reasons, either part time or full time.

Outcomes

In study II, the recurrence of medically certified sick leaves and the occurrence of partial or full disability pension served as a proxy for failure
of RTW or work retention. Information on the employment status of the participants was not available in studies II and III. The registers provided data on whether an individual received (yes/no) disability pension and the type of the pension (full or partial, temporary or permanent) (studies II and III).

Three outcome variables were computed in study II: Time to first recurrent sick leave (any cause), number of sickness absence episodes, and occurrence of disability pension (1 = no disability pension, 2 = partial disability pension, 3 = full disability pension). In study III, occurrence of disability pension was measured as in study II. In addition, a binary measure (1 = no disability pension, 2 = any disability pension) was computed. The propensity score was estimated with treatment assignment (0 = partial sick leave, 1 = full sick leave) as a dependent variable.

In study IV, the outcome, work participation, was calculated as the proportion (%) of time not receiving either partial or full ill-health-related benefits or unemployment benefits (numerator) out of follow-up time (365 days) (denominator). All ill health-related unsalaried periods (compensated sickness absences, rehabilitation periods and days on disability pension), part-time and full-time, were taken into account. Work time while receiving partial subsidies was approximated with 50% of the regular.

The primary outcome in the RCT (study V) was time from recruitment to return to regular work activities. This was further specified as “sustained RTW for ≥ 2 weeks” (i.e. the worker continued to work without recurrent sick leave ≥ 2 weeks after the end of part- or full-time sickness absence) and “sustained RTW for ≥ 4 weeks”. Numbers of sickness absence days (part-time and full-time) and their proportion of potential work time were calculated during the follow-up period of one year. The recurrence of sick leaves (for any cause) after the initial sick leave period and the time to the first recurrence were also examined.

Covariates

In studies II, III and IV, sociodemographic and other background factors were retrieved from the sickness insurance registers. They included gender, dates of birth and death, occupational branch, area of residence (insurance district), annual gross income in 2006 and 2007, type (partial...
or full), cause (ICD-10 diagnoses) and length (days) of compensated sick leaves, length of the previous sickness absence (total number of compensated full sickness benefit days in two preceding years), length of the sickness absence in connection with partial or full sick leave, and accrual basis of full sickness benefit at the start of the follow-up.

SEP was approximated by combining information on occupational branch and gross income (study IV). The occupational categories of social and healthcare, administrative work and industrial work were split into two subgroups (low and high income) according to the median of the annual gross income.

In study V, background characteristics of the participants included gender, age, educational level, work characteristics (years in present job, awkward trunk posture for > 1 minute at a time, lifting, carrying or pushing loads (16–25 kg) > 5 times per working day, working with hands above shoulder level for > 1 minute at a time, work requiring high hand grip force, mental load at work), and health-related characteristics (body-mass index, current smoking, frequency of brisk exercise, use of alcoholic beverages, intensity of musculoskeletal pain and pain interference with work and sleep, time to the onset of current problem, primary location of musculoskeletal pain, multisite pain, number of sickness absence days during the previous 30 and 90 days).

### 5.6 Statistical methods

In study II, the occurrence and incidence of compensated sickness absence and the hazard ratios with 95% CIs for the first recurrent sick leave were calculated using survival analysis (Kaplan-Meier with Log Rank-test, and Cox proportional hazards regression analysis). Repeated measures survival analysis was applied in order to explore the total number of sick leaves and to take into account the possible within-individual dependency of sick leaves. Multinomial regression analysis was run to calculate the odds ratios for partial and full disability pensions.

In study III, the propensity score was estimated with hierarchical logistic regression with treatment assignment (0 = partial sick leave, 1 = full sick leave) as the dependent variable. The sickness insurance registers provided information on the occupational branch for all individuals in
the partial sick leave and for a random sample (of 5% in studies II and III and 8% in study IV) in the full sick leave group. Multiple imputations were carried out to predict the missing data. In order to maximize the comparability of the sick leave groups, the logistic model was revised several times by including theoretically reasonable interaction and nonlinear terms. The fitness of the model was assessed. The PS model was validated following the recommendations from a systematic review for logistic model development and assessment in connection with PS analyses (Weitzen et al. 2004). Covariate balance was assessed as recommended in the literature (Pattanayak et al. 2011; Austin 2011; Oakes and Johnson 2006) (see the original publication).

Covariate adjustment with linear PS, in addition to traditional covariance adjustment, was used to estimate the effects of partial sick leave on transition to disability pension among all individuals eligible for the treatment. PS stratification could not be applied because there were too few observations in the strata of the partial sick leave group. PS matching was used as a method in order to estimate the effects among the subpopulation of those who either had been granted partial sickness benefit or were comparable to them on the measured covariates.

A set of multinomial regression analyses was carried out: crude analysis, direct regression adjustment (adjusted for the measured covariates) and adjustment for PS (linear term) and the variables with residual imbalance. Generalized estimating equation (GEE) was used in computing the treatment effect with PS matching in order to be able to take into account properly the matching pairs design. The results were reported for the main diagnostic groups of mental and musculoskeletal disorders.

Absolute and relative risk reduction (ARR and RRR) of transition to disability pension and the number needed to treat (NNT) to prevent transition to disability pension were computed in the matched sample. ARR refers to the difference in the event rates (%) between the sick leave groups, i.e. the effectiveness of the treatment. RRR is a proportional measure (%) of efficacy referring to the extent to which the treatment decreases the risk of future events among treated individuals as compared to the untreated individuals. RRR does not discriminate between small (in the case of a rare outcome) and large (in the case of a common outcome) treatment effects. NNT is defined as the number of individuals needed to be treated in order to prevent one additional event, i.e. it
reflects the likelihood that an individual will benefit from the treatment. The smaller the NNT is, the more effective is the treatment.

The parameters were computed as follows (Barratt et al. 2004):

\[
\text{ARR} = p_{\text{control}} - p_{\text{treatment}} \\
\text{RRR} = (p_{\text{control}} - p_{\text{treatment}}) / p_{\text{control}} \\
\text{NNT} = 1 / \text{ARR}
\]

where \( p_{\text{treatment}} \) and \( p_{\text{control}} \) denote the prevalence of the outcome in the treatment and control groups. Positive values indicate a reduction in risk and negative values an increase in risk.

In study IV, the difference-in-differences method was applied to estimate the effect of partial sick leave on work participation. General linear model with repeated measures analysis and F-statistics for the interaction term between the sick leave group assignment and the change of work participation in time were applied.

In the RCT (study V), block randomization was carried out to obtain equal sized sick leave groups for each occupational health physician. Blinding was not feasible in the context of the study. To assess the success of the randomization, the baseline characteristics of the participants were assessed. Survival analysis (Kaplan-Meier and Cox proportional hazards regression analysis) was carried out to estimate time to sustained return to work. The assumption of a constant HR over time for this model was confirmed and the goodness-of-fit using the Grønnesby and Borgan test was assessed (May et al. 2004). Separate models were run to control for variables that differed between the intervention and control group at baseline. Variables that affected the HR estimate \( \geq 10\% \) were included in the final model (Varkevisser et al. 2003). Sensitivity analyses were performed excluding those individuals who were originally included by the examining physicians, but were found not to have fulfilled inclusion criteria based on register information (previous sickness absence \( \geq 2 \) weeks during the preceding month or \( \geq 30 \) days during the preceding 90 days; \( n = 3 \)), initial clinical examination findings (pain intensity \( \geq 8 \); \( n = 8 \)) or both (\( n = 1 \)) scrutinized at the end of follow-up.

Data analyses were carried out in the statistical software programme SPSS, versions 15–20, SAS version 9.1 and Stata, version 11.0.
5.7 Ethical considerations

The study protocol of the randomized trial was approved by the Ethics Committee of the Helsinki and Uusimaa Hospital District. The trial was registered under Current Controlled Trials (ISRCTN 3091179). In the register-based studies, ethical approval was not necessary as the researchers handled only encrypted register data with unidentifiable study participants.
### Table 3. Description of the substudies.

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study design</strong></td>
<td>Literature review</td>
<td>Longitudinal register-based study</td>
<td>Longitudinal register-based study</td>
<td>Register-based cohort study with case-crossover-design</td>
<td>RCT</td>
</tr>
<tr>
<td><strong>Data source</strong></td>
<td>Data bases, Grey literature</td>
<td>National sickness insurance registers</td>
<td>National sickness insurance registers</td>
<td>National sickness insurance registers and the registers of the Finnish Centre for Pensions</td>
<td>Patients visiting occupational health physicians due to MSDs</td>
</tr>
<tr>
<td><strong>Study population</strong></td>
<td>Individuals on long term sick leave due to MSDs, mental disorders, traumas or tumors, sick leave ended 1.5.–31.12.2007</td>
<td>Total sample as in study II, subsample of those with PS (below)</td>
<td>Individuals on long term sick leave (all diagnostic entities), sick leave ended 1.1.–31.12.2008</td>
<td>Individuals on sick leave due to MSDs (early stage of disability)</td>
<td></td>
</tr>
<tr>
<td><strong>Main outcomes</strong></td>
<td>Evidence on the effect of partial sick leave on RTW and work retention</td>
<td>Time to first recurrence and number of sickness absence periods (study II), occurrence of disability pension (studies II, III)</td>
<td>The proportion of days at work out of follow-up time (calendar days)</td>
<td>Time to sustained RTW, proportion of sickness absence days of potential work time</td>
<td></td>
</tr>
</tbody>
</table>
### Material and Methods

#### Covariates

<table>
<thead>
<tr>
<th>Gender, age, gross income, occupational category, insurance district, diagnostic category, previous sickness absence, length of sick leave in connection with partial or full sick leave</th>
</tr>
</thead>
</table>

#### Statistical approach

<table>
<thead>
<tr>
<th>Descriptive</th>
<th>Survival analysis</th>
<th>Propensity score (PS) analysis</th>
<th>Repeated measures GLM DID-analysis</th>
<th>Survival analysis</th>
</tr>
</thead>
</table>

#### Analysed sample

<table>
<thead>
<tr>
<th>n (total)</th>
<th>29 427</th>
<th>25 823</th>
<th>58 492</th>
<th>62</th>
</tr>
</thead>
<tbody>
<tr>
<td>n (Partial sick leave)</td>
<td>1 047</td>
<td>997</td>
<td>1 738</td>
<td>31</td>
</tr>
<tr>
<td>n (Full sick leave)</td>
<td>28 380</td>
<td>24 826</td>
<td>56 754</td>
<td>31</td>
</tr>
<tr>
<td>Men (%)</td>
<td>45</td>
<td>46</td>
<td>46</td>
<td>3</td>
</tr>
<tr>
<td>Women (%)</td>
<td>55</td>
<td>54</td>
<td>54</td>
<td>97</td>
</tr>
</tbody>
</table>
6 RESULTS

6.1 Effects of partial sick leave on return to work and work retention – scientific knowledge from other countries

During the first literature search, it became obvious that rather few peer-reviewed studies had been published on the topic. Thus, non-peer-reviewed study reports and textbook chapters were also included in the search. Altogether, the literature search located over a thousand titles. All the abstracts were reviewed. Those studies that addressed any effects of partial sick leave were considered as relevant.

Six prospective studies reporting original data from Sweden and Norway were identified (Bergendorff et al. 1997; Marnetoft et al. 2001; Scheel et al. 2002; Eklund et al. 2004; Lidwall 2006; Kann and Brage 2007). Three Swedish studies were congruent in reporting either that the odds for returning to work were lower for those who had been on partial sick leave from the beginning of the sickness absence benefit period compared to those on full sick leave or that patients on full sick leave generally returned to work sooner than those who shifted from full to partial sick leave at some point of the sickness absence. It is notable that the problem of selection bias had not been addressed in these studies. A Norwegian cluster-randomized controlled trial (Scheel et al. 2002), the only peer-reviewed study, tackled this possible source of bias (Table 4). It was found that increased use of active sick leave (return to work to modified duties) in municipalities did not affect the average number of days on sick leave or long term disability or quality of life of the respondents. The results may however in part be explained by the relatively infrequent use of the active sick leave at the time.
The systematic literature search was updated in December 2012. The search yielded around 500 publications, out of which twelve were considered as relevant. Out of these four were peer-reviewed journal articles (Høgelund et al. 2010; Andrén and Svensson 2012; Høgelund et al. 2012; Markussen et al. 2012) and the rest were unpublished, non-peer-reviewed reports. The features and results of the peer-reviewed studies on the topic are shown in Table 4. Studies originating from Denmark (Høgelund et al. 2010) and Sweden (Andrén and Svensson 2012) were congruent in reporting that part-time sick leave increased the probability of returning to regular working hours (approximated as the termination of the payment of the sickness benefit). Høgelund et al. 2012 studied the effects of partial sick leave on the time until the return to regular duties among Danish employees long term sick-listed due to mental disorders. They controlled, as well, for the possible effects of unobserved differences between the compared groups. Their results indicated that partial sick leave was not effective. The Norwegian researchers, Markussen et al. (2012), investigated total register-based data on all citizens and their physician from 2001 onwards. The data included information on sickness absence, use of social security benefits and employment. In that study, the possible selection effects were also controlled for in the analyses. Use of partial sick leave was found to be associated with reduced sickness absence and social security claims, and increased employment. In the analyses of these studies in the other Nordic countries, the models had been for the most part adjusted for gender, and gender differences in the outcomes were not examined.
Table 4. Peer-reviewed studies reporting original data on the effects of partial sick leave.

<table>
<thead>
<tr>
<th>Authors</th>
<th>Country</th>
<th>Study population</th>
<th>Study design, methods</th>
<th>Outcomes</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scheel et al. 2002</td>
<td>Norway</td>
<td>65 municipalities</td>
<td>Cluster-randomized controlled trial, follow-up of 1 year</td>
<td>Average number of days on sick leave, long-term disability, quality of life</td>
<td>Increased use of active sick leave in municipalities had no effect on the average number of sick leave days, long-term disability or quality of life</td>
</tr>
<tr>
<td></td>
<td></td>
<td>663 individuals on active sick leave, 1995 individuals on conventional sick leave for &gt; 12 weeks</td>
<td>Non-randomized register-based comparison of the groups, follow-up of 1 year</td>
<td>Days off work</td>
<td>Individuals on active sick leave returned to work before 50 weeks more often than those on conventional sick leave</td>
</tr>
<tr>
<td>Høgelund, Holm &amp; McIntosh 2010</td>
<td>Denmark</td>
<td>265 individuals participating in the graded-RTW-program, 669 non-participants, all sick-listed &gt; 8 weeks at base-line</td>
<td>Register- and survey-based comparison of two groups</td>
<td>Time until first return to regular working hours (termination of the payment of the sickness benefit)</td>
<td>The program increased significantly the probability of returning to regular working hours</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year</td>
<td>Country</td>
<td>Methodology</td>
<td>Results</td>
<td></td>
</tr>
<tr>
<td>--------------------------------</td>
<td>--------</td>
<td>-------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Andrén &amp; Svensson 2012</td>
<td></td>
<td>Sweden</td>
<td>Register-based study with follow-up of 330 days</td>
<td>Assigning individuals to part-time sick leave was associated with higher likelihood of full recovery</td>
<td></td>
</tr>
<tr>
<td>Høgelund, Holm &amp; Falgaard Eplov 2012</td>
<td></td>
<td>Denmark</td>
<td>Survey- and register-based comparison of the two sick leave groups</td>
<td>In contrast to other conditions, part-time sick leave had no effect on time until return to work in patients with mental disorders.</td>
<td></td>
</tr>
<tr>
<td>Markussen, Mykletun &amp; Reed 2012</td>
<td></td>
<td>Norway</td>
<td>Longitudinal register-based data</td>
<td>Those on partial sick leave had shorter absences and higher subsequent employment rate than they would have had on regular sick leave</td>
<td></td>
</tr>
</tbody>
</table>
6.2 Effects of partial sick leave on return to work, work retention and work participation in the Finnish working population with prolonged sickness absence

6.2.1 Characteristics of the individuals in the studied sick leave groups

In the samples of studies II–IV, women constituted roughly 70% of the receivers of partial sickness benefit and 50% of the receivers of full sickness benefit. The age-distribution differed somewhat in these groups, with the proportion of those aged 45 to 54 being higher and of those over 55 lower in the partial compared to full sick leave group. The income level of individuals on partial sick leave was higher than that of those on full sick leave. Mental disorders were more often whereas musculoskeletal disorders more infrequently the cause for partial sick leave than for full sick leave. Partial sick leave was most frequently used among those who worked in social and healthcare, followed by administration and office work and industrial work. There were no large differences in the use of partial and full sickness benefits in different insurance districts of the SII referring to the absence of regional differences.

6.2.2 Occurrence and risk of medically certified recurrent sick leaves

In study II, the mean of follow-up time was 18 months, ranging from 0 to 25 months. Of those on partial sick leave 58% (611 individuals) and of those on full sick leave 32% (9108 individuals), had at least one medically certified sickness absence (for any cause) lasting more than ten days during the follow-up. Among men, the mean time (95% confidence interval (CI)) for the first recurrent sick leave (for any cause) was 14.5 (13.3–15.7) months in the partial sick leave group and 19.3 (19.1–19.5) in the full sick leave group (p Log Rank=0.001). Among women, 13.5 (12.8–14.2) months and 18.5 (18.3–18.6) months (p Log Rank=0.001), respectively. In the partial sick leave and full sick leave groups, 16% and 1% of the individuals respectively, experienced their
first recurrent episode of sick leave during the first 30 days of follow-up. In most cases the recurrent sick leave followed immediately.

Both men (OR 1.8; 95% CI 1.4–2.3) and women (OR 1.7; 95% CI 1.4–2.0) in the partial sick leave group had an increased risk of first recurrent sick leave, when compared to the full sick leave group (adjusted for age, diagnostic group, insurance district, gross income, length of sickness absence prior to and in connection with partial or full sick leave). In addition, the risks of the cumulative number of recurrences were increased in the partial sick leave group.

The incidence of recurrent sick leaves was also investigated in a subsample of individuals with no recurrences during the first 30 days of follow-up. The differences between the partial sick leave and comparison groups were diminished. Among men, the mean times (months) to the first recurrent sick leave (95% CI) in these two groups were 17.8 (16.7–19.0) and 19.5 (19.3–19.7), respectively. In women, the corresponding values were 16.0 (15.2–16.7) and 18.8 (18.6–18.9).

In the above described subsample, the crude risk of first recurrent sick leave was higher in the partial sick leave group compared with the full sick leave group. When adjusted for background factors, there was no significant difference between sick leave groups, either among men or women. The risks of the cumulative number of recurrences did not change when the analyses were carried out in this subsample.

6.2.3 Occurrence of disability pensions

Full disability pension was more prevalent in the full sick leave group, whereas partial disability pension was more prevalent in the partial sick leave group, in both men and women (study II) (Figure 4). In the partial sick leave group, 48% of all the pensions were permanent. The respective share in the full sick leave group was 66%. In all, among those on partial sick leave, more than 90% and among those on full sick leave, 77% of the individuals were available to the labor market (on full or part-time basis) at the end of 2008.
6.2.4 Association between type of sick leave and disability pensions

In study II, the crude risk for partial disability pension was 3.5-fold (95% CI 2.3–5.3) for men and 2.5-fold (95% CI 2.0–3.1) for women on partial sick leave compared to those on full sick leave. When adjusted for age, diagnostic group, annual gross income, insurance district and sickness absence (total number of compensated full sickness benefit days in two preceding years and in connection with partial or full sick leave) the risks were attenuated to 2.0 (95% CI 1.2–3.2) and 1.9 (95% CI 1.5–2.4), respectively. The crude risk for full disability pension was 0.4-fold (95% CI 0.3–0.6) in men and 0.3-fold (95% CI 0.2–0.4) in women on partial sick leave as compared to those on full sick leave. When adjusted for the above mentioned covariates, the risk for full disability pension decreased to 0.2-fold for both men and women on partial sick leave.

Associations between type of sick leave and disability pensions using conventional multivariate regression, PS regression and generalized estimating equation (GEE) (in PS-matched subsample) are shown in Figure 5 (study III). The risk for full disability pension was around 0.5-fold in the partial sick leave group compared to the control group in
both men and women. The use of the two different PS-methods did not affect the estimates. As compared to the full sick leave group, both men and women on partial sick leave had a roughly two-fold risk for partial disability pension when adjusted for the covariates or PS and covariates with residual imbalance. In the PS-matched subsample, the risk was somewhat reduced in men and increased to three-fold in women.

Model 1 Crude
Model 2 Multinomial regression adjusted for: Covariates, reference = no disability pension
Model 3 Multinomial regression adjusted for: Propensity score and variables with residual imbalance, reference = no disability pension
Model 4 GEE-analysis in the PS-matched subsample

Figure 5. Odds ratios, ORs (95% CI) for associations between partial sick leave and disability pensions (OR for full sick leave = 1.0) by gender.
**Absolute and relative effects of partial sick leave on transition to disability pension**

In the matched subsample (study III), 78 individuals in the partial sick leave group (8%) and 144 individuals in the full sick leave group (14%) were on full disability pension at the end of year 2008. The respective proportions among those on partial disability pension were 12% and 4%. The prevalence of partial disability pension was roughly 1.5-fold in women compared with men.

The estimated absolute and relative risk differences of full and partial disability pensions are shown in Figure 6. In the partial sickness benefit group, the absolute and relative risks of full disability pension were reduced statistically significantly by 6% (95% CI 3% to 9%) and 41% (95% CI 24% to 55%), respectively. Both effects were slightly more pronounced in men than in women. The absolute and relative risks of partial disability pension increased among those who had been on partial sick leave compared with those who had been on full sick leave by 8% (95% CI 5% to 10%) and 159% (95% CI 84% to 264%), respectively. The effect was stronger in women than in men. Partial sick leave had neither an absolute nor a relative effect on risk reduction in transition

![Figure 6. Absolute and relative risk reduction (a risk difference between partial and full sick leave groups, ARR and RRR) of the use of partial and full disability pension with 95% CIs in the matched subsample.](image)

† Negative values indicate an increase in risk.
to any disability pension (partial and full disability pension combined, data not shown). A 5% reduction in absolute risk and a 21% reduction in relative risk of any type of disability pension was found among men. However, these effects were not statistically significant.

6.2.5 Association between type of sick leave and work participation

Work participation was found to decline in both sick leave groups during the follow-up. In the partial sick leave group, the absolute reduction (-21.2%, 95% CI -23.4% to -19.1%) was smaller than in the comparison group (-26.5%, 95% CI -26.9% to -26.2%). The overall difference-in-differences in work participation between these groups was 5.3% (95% CI 3.1% to 7.5%) (F = 22.8, p = 0.001). In men, the difference-in-differences tended to be larger than in women (6.3%, 95% CI 2.3% to 10.3% and 4.9%, 95% CI 2.4% to 7.5%, respectively) (Kausto et al., unpublished results).

6.3 Effects of partial sick leave on return to work and subsequent sickness absence at an early phase of disability in a sample of Finnish employees

In the randomized controlled trial (study V), there was no large difference in time to sustained return to work for at least 2 weeks between the intervention (part-time sick leave) and control (full sick leave) groups (median time 9 days in both groups). Time to sustained return to work for at least 4 weeks tended to be shorter in the intervention group (median 12 vs. 20 days, p = 0.10) (Figure 7).

Participants in the part-time sick leave group returned to work earlier than those in the control group throughout the follow-up period (Figure 8). Age-adjusted hazard ratio for return to work for at least 4 weeks was 1.6 (95% CI 1.0–2.6). Controlling for age, pain interference with sleep, previous sickness absence, and pain interference with work increased the hazard ratio to 1.8 (95% CI 1.2–2.8). Adjusting for the other factors that
were unequally distributed between the intervention and control group at baseline did not affect the hazard ratio of return to work.

The proportion of sickness absence days of the follow-up time decreased in both study groups during the first three months of the follow-up period and increased slightly after that time (Figure 9). The proportion was lower in the intervention than in the control group throughout the follow-up. Overall, during the entire follow-up period of one year, the relative difference in the total number of sickness absence days between the groups was about 20%, being lower in the intervention group than in the control group.

*Follow-up time calculated from the end of the initial sick leave spell until one year or termination of employment.

Figure 7. Time to return to work and time to first recurrent sick leave during the follow-up in the intervention and control group.
Figure 8. Return to regular work for at least 4 weeks in the part-time and full-time sick leave groups, unadjusted. (Reproduced with the permission of Scandinavian Journal of Work, Environment and Health).

Figure 9. Proportion of partial and full sick leave days (all-cause) of follow-up time in the two study groups.

* One censored case
** Four censored cases
6.4 Results by main diagnostic categories

The register-based analyses in studies II–IV were focused on the four major diagnostic categories (ICD-10) in which partial sickness benefit has been most frequently used: mental disorders, musculoskeletal diseases, traumas and tumors. In study II, the differences in the mean time to the first sick leave between the partial sick leave and full sick leave groups did not change significantly when subdivided according to diagnostic group, taking all the cases into account. The analysis was also carried out in the subsample of the individuals with no recurrences during the first 30 days of follow-up. Among men with a mental disorder, in contrast to women, there was no significant difference in the mean time to the first sick leave between the partial sick leave (mean 18.6 months, 95% CI 16.8–20.3) and the full sick leave group (mean 19.5 months, 95% CI 19.2–19.9).

The analyses were then carried in the partial sick leave group in order to determine whether the time to first sick leave differed between the diagnostic categories. There were no significant differences between the diagnostic groups, either when all the cases were looked into or when the analysis was run in the subsample of individuals with no recurrences during the first 30 days of follow-up.

In study III, in both musculoskeletal and mental disorders those on partial sick leave had an increased risk of moving to partial disability pension when compared to full sick leave group (Figure 10). The effect was stronger in the PS matched subsample than in the total study sample. The risk of full disability pension was decreased for partial sick leave as well in both diagnostic categories. The way of applying PS method did not have any effect on the results. There was no association between the sick leave group assignment and the disability pensions among traumas and tumors.
6 RESULTS

Figure 10. Odds ratios, ORs (95% CI) for associations between partial sick leave and disability pensions (OR for full sick leave = 1.0) in the different diagnostic categories.
Figure 11 shows the associations between the use of partial sick leave and disability pensions in the total sample and different diagnostic categories in terms of absolute and relative risk differences. The absolute effects of the use of partial sick leave on both partial and full disability pension were larger in mental than in musculoskeletal disorders. No effects were seen in the group of traumas and tumors.

Difference-in-differences in work participation between pre- and post-intervention periods in the sick leave groups was larger and statistically significant in mental disorders (12.8%, 95% CI 9.0%–16.5%), while in the rest of diagnostic categories the effect was nonsignificant.
6.5 Results by age and socioeconomic position

Work participation declined more in the full than partial sick leave group in all age-categories. Statistically significant difference in the pre-post differences between partial and full sick leave groups were found in age-categories 45 to 54 and 55 to 65 (respective differences 4.7%, 95% CI 1.4%–8.0% and 5.7%, 95% CI 0.5%–10.8%). No effect was found in those aged from 35 to 44. In the youngest age-group, DID was large though not statistically significant.

A larger reduction in work participation was found in the partial sick leave group in comparison with the full sick leave group among those with higher annual income in administration or office work (DID 15.2%, 95% CI 6.9%–23.6%), whereas among those participants with lower income in the same branch, no differences were detected (Figure 12). The trend in the DID was similar in the social and healthcare sector, but not in the industrial branch (study IV).

Figure 12. Differences in work participation between partial and full sick leave groups by SEP of the participants (participants working in administrative or office branch).
7 DISCUSSION

This study principally sought to examine the efficacy and effectiveness of partial sick leave on RTW, work retention and work participation both among employees with a long-standing health problem and among those in an earlier phase of work disability. On the basis of the literature it was assumed that the effects of partial sick leave could differ somewhat between men and women, as well as by age- and socioeconomic group and diagnostic category. The research frame of the study is complex involving a large number of observed and unobserved factors that possibly intervene with the studied associations. For this reason, the scope of the study was intentionally limited and similar (although slightly modified) study questions were examined with different study designs and in different populations. This was done in order to ensure the validity of the results.

7.1 Primary findings of the study

The results were rather consistent across the register-based studies and the RCT irrespective of the methodological differences and varying outcomes. Partial sick leave proved to be both an effective and efficient measure for enhancing RTW, work retention and work participation.

Evidence on the benefits of partial sick leave on RTW and work participation has been accumulating very recently in the Nordic countries. A total of five, methodologically rigorous, studies were detected in the literature. The findings in the last four of these reports refer to that, overall, partial sick leave has beneficial effects on RTW and work retention. However, the evidence was still partly limited by incomplete operationalization and measurement of the work outcome, as well as the use of selected samples and self-reported data on outcomes. Possible dif-
ferences in the effects between men and women had not been examined consistently in these studies. No individually randomized controlled trials had been carried out on the topic.

Among employees with prolonged sickness absence in Finland, both men and women on partial sick leave when compared with individuals on full sick leave, had their first recurrent sick leave sooner and they also had more sick leaves in total during the follow-up. In the partial sick leave group, the absolute risk of full disability pension was lower (especially among men) and the absolute risk of partial disability pension higher (especially among women) than among individuals on full sick leave. No effect on the total rate of disability pensions was found.

During a follow-up period of five years, the decline in work participation was smaller among those on partial sick leave than in the comparison group. The favorable effect of partial sick leave on work participation was found in those aged from 45 to 65 years, in those with mental disorders and among those with a higher socioeconomic position. No major difference in the effect was detected between men and women.

In an earlier stage of work disability related to musculoskeletal disorders, time to return to work sustained for at least 4 weeks was shorter and the adjusted hazard ratio of return to work was higher in the part-time sick leave group than in the full sick leave group.

### 7.2 Interpretation of the findings

#### 7.2.1 Selection into partial sick leave

The results indicate that in Finland similarly as in the other Nordic countries there is selection into partial sick leave. Middle-aged women, those working in the social and health care sector and those doing administrative work, those with somewhat higher income level and those on sick leave due to mental disorders seem to be overrepresented in the individuals on partial sick leave in comparison with those on full sick leave in Finland. These characteristics also describe rather well the beneficiaries of the partial sickness benefit in the other Nordic countries. It is probable, however, that there are other factors related to the societal context of each country that also are responsible for country-specific se-
lection. To the extent that the differences in the receipt of partial sickness benefit originate from possibilities to utilize partial sick leave (either due to differences in prescribing partial sick leave by the physicians, regional differences or due to circumstances at the workplace) then it is important that these inequalities should be intervened.

7.2.2 Effects of partial sick leave on work participation

The result that those on partial sick leave had a higher risk for recurrent sick leaves is to a certain extent different from the findings on partial sick leave from other Nordic countries. In two recent studies from Denmark and Sweden (Høgelund et al. 2010; Andrén and Svensson 2012) it was found that partial sick leave (gradually increasing work hours or adjustment of work hours and demands of work) increased the likelihood of return to regular work. In these studies, individuals on partial or full sick leave at baseline were followed until their return to full working hours (or the end of the follow-up period, approximately after one year). The discrepancy in the results is possibly explained by differences in outcomes. In our register-based study, the main outcomes were the time until first recurrent sick leave and the cumulative number of sick leave days. Our results might be also explained by the fact that during this preliminary stage of use of the new benefit in Finland perhaps expectations of return to work had been too optimistic, the time needed for full recovery had been underestimated, or appropriate work arrangements were not carried out at the workplaces.

In terms of changes in absolute risks, i.e. true effects in the population, partial sickness benefit reduced the risk of full disability pension and increased the risk of partial disability pension. The total rate of disability pensions was not affected. Although the absolute increase in partial disability pensions was slightly higher than the absolute decrease in full disability pensions, the fact that the majority of those on partial disability pension work part-time suggests that the use of partial sick leave is likely to increase work retention. A beneficial effect of partial sick leave on work participation was found as well, i.e. the decline in work participation during a follow-up of five years was smaller among those on partial sick leave. No results have been previously reported on
the associations between partial sick leave and disability pensions. The conclusions that can be inferred from the present findings on the beneficial effects of partial sick leave on work retention and work participation are more in accordance with results from other countries. Cross-country comparisons of reported findings are nonetheless not entirely straightforward due to differences in study designs and features of the labor markets and benefit systems (which result in diversity of the study cohorts and differences in the assignment and exposure to the treatment, i.e. partial sick leave). Furthermore, many of the studies originating from the other Nordic countries have been carried out in an econometric framework or published as non-peer-reviewed reports. This obviously does not entirely rule out comparisons between them and this present study, but renders them more difficult.

A distinction should be made between earlier and later stages of work disability when investigating the determinants of or the effects of interventions on work disability and RTW (van Duijn et al. 2010). It seems reasonable to claim that interventions should take place before the health and consequent other (functional, social and financial) problems experienced become either permanent or too severe. The present results support this contention, indicating that a rather prompt RTW after short term musculoskeletal problems or continuing to work part-time in spite of the condition was beneficial to the participants. It was found that early part-time sick leave shortened the time to successful (sustained) RTW and increased work participation during one year of follow-up. The results also indicated that early part-time sick leave did not increase pain-related symptoms or functional disability, and actually positively affected self-rated general-health and perceived health-related quality of life of the participants (Shiri et al. 2013). No comparison between men and women was possible, as almost all the participants in the trial were female.

Direct points of comparison for these findings are also rather difficult to locate in the literature. Until this present study, early partial sick leave had not been studied elsewhere. Overall, there are only few previous randomized trials on the effects of sick leave on health-outcomes and work participation (Axelsson and Marnetoft 2010). The present trial is so far the only one carried out on this topic. In the other Nordic countries, partial sickness benefit is available from the first sickness benefit day. However, the benefit has mostly been used only after a period of
full sickness benefit. In Sweden, the proportion of early partial sick leave out of all sick leaves has been increasing slowly.

The literature on other workplace-based interventions is not directly comparable with the current study. As noted by Høgelund et al. (2010), these interventions are typically complex and tailor-made for different target groups or contexts and, as such, may not be truly generalizable. However, some associations can be detected. For example, Franche et al. (2005b) and Hoefsmit et al. (2012) found some support for early workplace-based interventions in their reviews. Van Duijn et al. (2010) concluded that early interventions should be kept very simple in order to ensure their cost-effectiveness. The present intervention can be characterized as a simple intervention in which the main element was the arrangement of work hours and sometimes also work tasks to match the work ability of the participants.

### 7.2.3 Potential mechanisms behind the associations

There are some mechanisms that potentially explain the associations. It is known that remaining active has beneficial effects on health in many conditions and lengthy periods of sickness absence are associated with an increased risk of permanent work disability (Kivimäki et al. 2004; Karlsson et al. 2008; Lund et al. 2008). Thus, it is possible that utilizing the remaining work ability (i.e. staying active) while on partial sick leave positively affects future work participation.

Another possible explanation for the association between partial sick leave and future work participation could be that a successful experience of combining modified work with part-time sick leave will have a positive effect on the illness perceptions (mental models of illness) and the subsequent behavior of the exposed individuals (e.g. seeking medical care). Illness perceptions probably play an important role in work participation (e.g., through RTW expectations) (Hoving et al. 2010; Løvvik et al. 2013).

Another concept that may be useful in explaining the association is self-efficacy, which refers to people’s beliefs about their capabilities to exert control over their own level of functioning and over events that affect their lives (Bandura 1977, 1993). RTW-self-efficacy (Franche and Krause 2002; Shaw et al. 2011) is a recent, independent, multidi-
mensional construct that has been found to be associated with RTW. The ability to change or modify one’s work or request changes in work is one of the dimensions of RTW-self-efficacy. Thus, it is possible that the experience of a successful partial sick leave enhances one’s RTW-self-efficacy and future work participation. It is also clear that people differ in their perceived self-efficacy, as in their illness perceptions, and these affect how people cope with adversity e.g. in facing partial work disability. Thus the relationship between the experience of partial sick leave and perceived self-efficacy may also be reciprocal.

The sustainability of the effects is likely to be related to the mechanisms explaining them. Sustainability of a behavior change is a rather complex topic that can be elaborated in different theoretical frameworks; a topic that extends beyond the scope of the present study. The follow-up time in substudies II and III was rather short. These questions could be studied further with a somewhat longer follow-up and with different theoretical approaches.

7.2.4 Gender and age differences

Some gender differences were detected in the present study. Partial sickness benefit was mostly used by women working in the female-dominated, physically demanding social and health care sector. This observation may be set against the discussion on gender differences in sickness absence in general.

In most Western countries, women account for a large part of sickness absence from work. In Finland in 2011, women accounted for 59% of all incident compensated (i.e. lasting more than 10 days) full sickness benefit periods (Kela 2011). The gender difference has been found to be largest in short, self-certified sickness absences. In a study carried out among municipal employees in Finland, women had a 1.5-fold risk for self-certified sickness absence as compared to men (Laaksonen et al. 2008).

In addition to differences in morbidity between men and women, several explanations have been suggested for the female excess in sickness absence. One possible explanation is that work conditions differ between the genders (Bekker et al. 2009). In Finland, the labor market is strongly segregated into male and female employment sectors, as well as gender-predominant tasks in the workplaces, even when compared to
most other EU-countries (Bettio and Verashchagina 2009). It has been suggested that the adverse working conditions of women (e.g. in the municipal sector in Finland) explain a large part of the gender difference in sickness absence, especially in terms of mental and musculoskeletal disorders (Laaksonen et al. 2010a).

The observed difference in sickness absence may also result from men and women facing different norms and social expectations in the workplaces (Patton and Johns 2007). Sickness absence may be socially more acceptable for women than men, who face gender stereotypes of being more career oriented, committed to work and stress-resistant. Evidence has been presented for local absence cultures (Patton and Johns 2007; Virtanen et al. 2008). Laaksonen et al. (2012) suggested that the absence culture (or illness behavior) in female-dominated workplaces may be associated with higher short term sickness absence both in women and men. Similarly, Bryngelson et al. (2011) and Hensing and Alexanderson (2004) reported that there was an increased risk of (long term) sickness absence of women in female-dominated workplaces. These authors have postulated that the results support theories that the experiences of being in a minority or majority depend on the power relations and social norms within the workplace and thus are different for men and women (Bryngelson et al. 2011).

It seems conceivable that in female-dominated workplaces in the social and health care sector there are distinct social norms and expectations (that may be called a culture), which may favor flexible attitudes towards sickness absence. Thus, it may be that in these workplaces it is more easily recognized and accepted that work (dis)ability is relative and not a dichotomous factor. Thus in most cases it is beneficial to all parties to exploit the remaining work ability. This may result not simply from the fact that the majority of the employees in these workplaces are female, but also from the social and health care background of the employees. Extensive use of partial sickness benefit is found in this sector, despite the fact that work in the social and health care is most often shift work and rather strictly guided by laws and norms. Thus flexible work arrangements are not often easy to implement in this employment sector (Kausto et al. 2009; Viikari-Juntura et al. 2011; Ryynänen et al. 2013).

The use of partial sick leave was more strongly associated with subsequent transition to partial disability pension in women than in men,
while an opposite gender difference was seen in full disability pensions. It is possible that collective attitudes and expectations contribute somewhat to this phenomenon as well to the extensive use of partial disability pension by women, which obviously would not support the causality of the associations. However, it is likely that the picture is more complicated. After the year 2005 when financial incentives for the use of partial disability pension were introduced for the employers in the municipalities in Finland the use of the benefit has been explicitly supported in that sector (Lehto 2011). In addition, it has to be noted that the process of treatment assignment differs in partial sickness benefit and partial disability pension. The use of partial sickness benefit is entirely voluntary in Finland, i.e. the users are selected and partial sickness benefit and related partial sick leave can be considered to be in major part endogenous as interventions or treatments. With respect to partial disability pension, 30% of the receivers originally had applied for a full disability pension, but were only granted a partial pension instead. These individuals do not usually work (Gould et al. 2003).

The beneficial effect of partial sick leave on work participation was seen in employees aged from 45 to 65 years. It may be that work arrangements in connection with partial sick leave may be easier to organize for employees with an established work position. However, again, if this affects the future work participation, the association would not be causal. It is moreover possible that there are age differences in the perception of RTW-self-efficacy or that the age modifies the effect of self-efficacy perceptions on behavior.

### 7.2.5 Differences between diagnostic categories

It has been suggested that in somatic diseases the prognostic factors for work disability are generic (Detaille et al. 2009). In contrast, it can be expected that the challenges in RTW and work retention would differ at least to some extent between mental and somatic (e.g. musculoskeletal) disorders. In both mental and musculoskeletal disorders, a complex set of factors impacts on the work disability. It has been suggested that in particular the work environment will play a crucial part in sickness absence in common mental health problems (Briand et al. 2007). Mental health problems are much more sensitive in their nature than musculoskeletal
problems and their relation to the work environment and workload may not be easily discussed (van Oostrom et al. 2007). Prejudices and lack of knowledge may result in stigmatization and discrimination even in the case of common mental illnesses (Thornicroft et al. 2008; Briand et al. 2007). RTW in MSDs has been more thoroughly investigated and better recognized at the level of practices and policies than the corresponding situation for mental disorders. In addition, the outflow from the disability benefits due to recovery has been found to be lower in mental than in musculoskeletal disorders (Briand et al. 2007; van Oostrom et al. 2007; OECD 2012).

The present study examined whether the effects of a rather simple intervention differed in the main diagnostic entities of MSDs, mental disorders, traumas and tumors. The facts mentioned above suggest that there might be differences in the effects of partial sick leave across the diagnostic groups. It could be predicted that work arrangements as the sole intervention would not result in as large effects in mental disorders as in other health problems. However, the results showed that there were no major differences in the initial RTW or incidence of recurrent sick leaves between these groups. A beneficial effect of partial sick leave on transition to disability pension and work participation was also found in mental disorders. Thus, regardless of the challenges of RTW in mental disorders, partial sick leave seems to be beneficial in this diagnostic group. This finding is in line with Finnish results on the effects of vocational rehabilitation on RTW (Kivekäs et al. 2008), which showed that those recovering from mood disorders returned to work just as often as individuals with other health problems. Discrepant findings have been presented in a Danish study in which no effects were found for partial sick leave in subjects with mental disorders (Høgelund et al. 2012).

In the present study we did not detect any effects of partial sick leave on transition to disability pension in those recovering from traumas or tumors. This is not so surprising, as these conditions do not as often lead to permanent disability. Furthermore, no effect of partial sick leave on work participation was observed in MSDs. The heterogeneity of this diagnostic category is likely to dilute the effect of partial sick leave on work participation. The comparability of partial and full sick leave groups as regards the background characteristics, severity of the health problem, number of sickness absences and transition to rehabilitation
and unemployment during the follow up was lower in the category of MSDs when compared with the category of mental disorders.

More than two out of every three partial disability pensions in Finland are granted for musculoskeletal disorders, while the share of mental disorders is lower. Unfortunately, it was not possible to estimate the cause-specific associations between sick leaves and disability pensions. Somatic disorders or pain and mental disorders tend to co-occur in the general population, especially among women. In Finland, 10% of working men and 19% of working women report musculoskeletal pain and depressive symptoms simultaneously. This kind of co-occurrence is known to affect work disability (Bair et al. 2003; Buist-Bouwman et al. 2005; Miranda et al. 2011) and may have affected the results of this study regarding partial disability pensions.

7.2.6 Socioeconomic differences

Sickness absence has consistently been shown to be higher in lower socioeconomic groups in different countries (North et al. 1993; Feeney et al. 1998; Niedhammer et al. 2008; Christensen et al. 2008; Laaksonen et al. 2010b). In addition, the risk of transition to disability pension has been shown to differ according to the socioeconomic position (SEP), those with a lower position being at higher risk (Krokstad and Westin 2004; Karlsson et al. 2008; Haukenes et al. 2011; Schuring et al. 2013). Findings from Finnish and Swedish cohort studies (Laaksonen et al. 2010b; Löve et al. 2012) suggest that exposure to physical work load and decreased level of physical work ability mainly account for the differences. These results are in line with findings from a population based survey (Health 2000) which showed that in the Finnish working population, lower SEP, especially among men, was related to high physical work load. Lower SEP, in both genders, was also found to be associated with an increased risk of being exposed to several co-occurring physical or psychosocial work load factors (Kausto et al. 2011). Another study (Polvinen et al. 2013) carried out in the same population data showed that among older manual workers adverse physical work conditions explained the majority of the SEP-differences in disability retirement, while in younger manual workers, job control and job demands also contributed to the differences.
The findings of the present study indicate that in working populations with prolonged sickness absence, higher socioeconomic position tends to protect individuals from a larger decline of work participation. This effect was seen in the branches of administrative and office work and social and health care. Again, several potential explanations for these findings can be presented. There may be differences in the RTW-self-efficacy between employees with different SEP, i.e. a high SEP being related to more profitable perceptions of self-efficacy. In addition, partial sick leave may be more feasible in higher status jobs, which typically represent lower exposure to physical work load and higher decision latitude. It has also been suggested that the sickness absence culture may vary across the occupational status levels (Nicholson and Johns 1985). The psychological contract between employer and employees (i.e. assumptions about employment rights and obligations) may be different or viewed differently by blue and white collar workers and this may result in differences in sickness absence behavior between these occupational status groups. However, to the extent that these features of the work environment also contribute the work participation in the future, causality of the association between partial sick leave and work participation would not be supported. No differences in the effects between SEPs were detected in the industrial sector. It is possible that this sector is more homogeneous as regards the SEPs than the other two employment sectors.

SEP is a multidimensional construct, which is usually measured with complementary and interrelated indicators of education, occupational class and income (Lahelma et al. 2004). It has been proposed that especially education and occupational class are strongly associated with sickness absence (Piha et al. 2010). In the present study, SEP was approximated with information available in registers: occupational branch and income. Even though this measure may not have been optimal, it does combine information on differential occupational environments (exposures and resources) with financial resources available to the individual. The results obtained on the variation of the effects of partial sick leave across the SEP-groups suggest that the measure used may well have tackled at least part of the inequalities between these groups. The findings should, nonetheless, be confirmed with a better established indicator.
7 DISCUSSION

7.2.7 Feasibility of partial sick leave

Feasibility of partial sick leave, as any other intervention aimed at work retention, is obviously crucial. In a survey targeting those individuals who had received partial sickness benefit during the latter half of 2007 (n=1,016), the first year that the benefit was available in Finland, it was found that the experiences with the benefit were mainly positive (Kausto et al. 2009). The majority of the respondents found that it was rather easy to make the necessary arrangements in their workplace. There were, however, also those respondents who reported that while the number of work hours had been reduced, the amount of work required was not correspondingly decreased. Shortcomings were found in the application process. In addition, those respondents who belonged to the lower income classes were not satisfied with their income level while on partial sickness benefit.

The maximum length of a partial sickness benefit period, 72 weekdays, was not found to be sufficient when respondents returned to a very demanding work after long term sick leave. This might in part explain the excess sickness absence in the partial sick leave group during the initial follow-up period in the register-based study. However, this condition of the benefit is currently being altered in Finland so that in the future partial sick leave can be awarded for 120 days.

We also interviewed the participants and their superiors in connection with the randomized trial. In general, work arrangements at the workplaces had succeeded well and both parties’ experiences of the early part-time sick leave were positive. Difficulties in finding substitutes for only half days were reported. In addition, the superiors found that cooperation between them and the occupational health service was not satisfactory (Ryynänen et al. 2013).

In order to obtain a large enough study base in the trial, the researchers contacted 22 diverse organizations. Only six of them were willing to commit themselves to the trial. Deficient resources at the occupational health services, difficulties in work arrangements and objection of employees were among the reasons for not being able to participate in the intervention. It was also hypothesized that in some companies, high demands of performance and profit may have affected the reluctance of employers and employees to participate (Viikari-Juntura et al. 2011).
The results on the feasibility of partial sick leave in Finland are congruent with findings from other Nordic countries. The results of the literature review indicated that the different stakeholders (patients, other employees, employers, physicians and local authorities) found partial sick leave beneficial in enhancing return to work. Barriers to the use of the benefit have also been reported. In a Norwegian study (Scheel et al. 2002) it was shown that lack of information and time and poor communication and collaboration between the stakeholders, were the main hindrances to implementing active sick leave. In Denmark, it was found that physicians hoped for better collaboration with the municipalities. They considered the employers sometimes reluctant towards employees’ return to part-time work, while employers reported that physicians did not use partial sick leave often enough and their instructions on how to best modify the work tasks were deficient.

These findings can be reflected against the existing knowledge on the implementation of evidence gathered in interventions and health research in general. Loisel et al. (2005) described the challenges related to the implementation of new evidence in health care. As discussed above in chapters 2 and 3, the framework of work disability and RTW is extremely complex and there are many factors and actors potentially influencing the feasibility and effectiveness of partial sick leave. It has been found that there is often a dissonance between expressed attitudes towards RTW and behavior of the different actors (Loisel et al. 2005; Scheel et al. 2002). In addition, the factors that determine the success of implementation of new evidence are not known, and interventions used and recommendations for RTW have often been found to be impractical (Loisel et al. 2005). In general, theoretical understanding of implementing evidence-based practice in health-care has been insufficient (Grimshaw and Eccles, 2004).

Partial sick leave is a rather simple form of intervention, and the use of partial sickness benefit as an existing benefit in the national sickness insurance scheme is linked to the law. However, implementing work modifications at the workplace in connection with partial sick leave can be a challenge and a source of uncertainty. It is also important to note that involvement of all the parties might not be needed always in order for an intervention to be effective (Franche et al. 2005a). For example, during the early phase of work disability, it may be that the focus should
be placed on the involvement of the workplace and superiors and the role of the healthcare providers should be stressed only at later stages of the disability.

7.3 Methodological aspects

7.3.1 Validity of the study

Several different types of validity can be distinguished when considering the value and importance of research. Internal and external validity are important in discussing results on the effects of a certain treatment. Internal validity refers usually to the credence of causal evidence provided by the study (Remler and Van Ryzin 2011).

RCTs are generally regarded as the golden standard for internal validity, for example presenting high quality evidence on the efficacy of a certain intervention or treatment. However, even if the assignment to the treatment is successfully randomized, there are some additional factors that may reduce the internal validity of a trial. Participants may refuse to undergo treatment or turn to alternative treatments (low treatment adherence) (West et al. 2008). In the present RCT, only one individual declined participation after randomization. The term attrition is often used to refer to the drop out of participants (for whatever reason) or the incompleteness of the follow-up data. In the present trial, none of the participants dropped out of the study and medical records were obtained for all the participants. Altogether, six individuals either received partial disability pension or changed their employer during the follow-up year and were excluded from the analyses thereafter. The follow-up data was complete up to five months for all individuals. After one year of follow-up, the sickness absence records were obtained for 94% of the participants in the partial sick leave group and for 84% in the control group. In RCTs, it is also assumed that the treatment provided to one individual does not affect the other individuals (stable unit treatment value assumption, SUTVA) (Oakes 2013). The so-called spillover, i.e. individuals in the control group being affected by the treatment, may have taken place to some extent in our trial, since the entire personnel in the participant organizations had to be informed about the study, its
goals and purposes. However, in summary, it can be concluded that the terms for internal validity seem to be met fulfilled quite well in the RCT carried out in the present study.

The internal validity of observational studies is considered to be lower than that of RCTs. The factors that affect treatment assignment are usually at least partially unknown. Except for naturally (randomly) occurring, unplanned events, observational studies concern often events (or treatments) that are more or less self-selected (voluntary) or administered in a way where a bias is possible (Remler and Van Ryzin 2011; Craig et al. 2012). In that case, an approach called potential outcomes or counterfactual framework (Rubin Causal Model) can be utilized. This analytical approach with propensity score analysis and the difference-in-differences method was adopted as an alternative to RCT. Thus, it is reasonable to expect that it would be possible to target both observed and unobserved factors potentially causing selection to treatment. In addition, the sample size was large, which tends to reduce the impact of potential residual confounding. Violation of assumptions that were made in these analyses (composition of the groups remain constant during the follow-up and external influences affect the treatment groups similarly) may somewhat limit the internal validity (Craig et al. 2012). To conclude, internal validity of the observational studies was enhanced by carrying out the study in different study samples with different methodological approaches. Thus, the internal validity of the whole study can be regarded as rather good. This is partially in contrast to the other published studies on the topic that have suffered at least to some extent from inadequate measurement of work participation, use of selected samples and self-reported data.

External validity refers usually to the generalizability of the findings. In RCTs, the study population is often limited in number, reducing the trial’s generalizability. Observational studies with a quasi-experimental design entail often large-scale real-world interventions. These studies provide information not only on a larger population but also on authentic contexts and restrictions that are likely to affect the implementation of the intervention (Remler and Van Ryzin 2011). The generalizability of the findings in the present study is somewhat limited, because the number of beneficiaries of the partial sickness benefit in Finland was rather small at the time of the study and there were rather few participants in
the trial. The register-based data that was utilized in the present study represented, nonetheless, a total sample of beneficiaries of the benefit at that time. In addition, the randomized trial, even though low in the number of participants, represented different employment branches from both private and public sectors.

### 7.3.2 Other aspects

In addition to the factors that either increase or decrease the internal or external validity of the study, there are some other matters that need to be discussed.

The rarity of RCTs in the sickness absence research was emphasized in a recent review (Axelsson and Marnetoft 2010). Here it was possible to carry out a carefully planned randomized intervention study with rather strict inclusion and exclusion criteria for the participants. The statistical power of the trial was limited due to a small sample size. Blinding of either the physician or the participant was not possible in the intervention.

Findings on the agreement of self-reported and register-based sickness absence data suggest that although people report information on the occurrence of sickness absence reliably (Grøvle et al. 2012) register data is preferred especially in detailing the duration of long term sickness absence (Svedberg et al. 2010). The present study did not need to rely on self-reported data. Prospective national register data from several source registers was obtained with comprehensive access to the total population of individuals with long term sickness absence. In the intervention study, information on sickness absence and work participation was collected from the occupational health service and employers’ registers.

Overall, secondary use of administrative registers in health research has been found feasible (Gissler et al. 2000; Gissler and Haukka 2004; Gissler et al. 2013). The register data used in the present study were reliable as regards to the rate of awarded benefits. The range of explanatory factors provided was, however, rather small. Nonetheless, the factors that were covered have previously been shown to be important predictors of the use of health-related benefits and they are among the studied predictors of work disability and RTW. At the time of the study, the prevalence of partial sick leave was low and as a result, the difference in the sample size between the treatment groups was large. Several statistical methods
(e.g. regression analysis) are sensitive to this kind of discrepancy. In some of the substudies, the follow-up time was rather short. However, since the register data concerned people with long term health problems, an outcome such as transition to disability pensions could be studied. In the present study, co-morbidity of diseases could not be examined. For example it is known that musculoskeletal and mental health problems occur often simultaneously.

To sum up, the present study can be assessed against the criteria presented for evaluating evidence on public health interventions (summarized e.g. in Rychetnik et al. 2002). The primary determinant of level of evidence is commonly the study design. The present study paid special attention to the quality of the designs of the substudies applying both RCT and quasi-experiments. The obtained results were relatively consistent across the five substudies, irrespective of the differences in the study designs, analytical methods, outcomes and follow-up times between these studies. A rather strong association between partial sick leave and transition to disability pensions was detected. The association between partial sick leave and subsequent work participation was weaker, because of the nature of the outcome measure applied. The findings were also reasonably coherent with the results from other countries and the current general knowledge on work disability and RTW. The inconsistencies observed between the countries probably result from contextual differences. The credibility of the present findings was assessed by considering some possible biological or theoretical (psychological) explanations to account for the detected associations.
8 CONCLUSIONS AND IMPLICATIONS OF THE STUDY

When partial sickness benefit was introduced in Finland in 2007, the Finnish Institute of Occupational Health and the Social Insurance Institution of Finland were given the task to follow the implementation and effectiveness of the measure. This kind of approach in social and health politics is both positive and rare, as it is known that there is rarely an adequate follow-up of launched measures. At the beginning of this study, the literature review revealed that rigorous scientific evidence on the effects and use of partial sick leave from other countries was scarce, although the measure had been used in these countries for decades. Currently, evidence is accumulating from several Nordic countries. The findings, even if not directly comparable, are congruent with the proposal that utilizing remaining work ability by combining partial sick leave with part-time work, possibly in customized duties, is beneficial for the individual. In an international comparison, the present study provides novel evidence on the efficacy of partial sick leave on sustained RTW. Furthermore, the effectiveness of the measure had not been studied previously in Finland. The results imply that as a measure, partial sick leave is an efficient and effective means to increase work participation. When enough time has elapsed from the introduction of the early partial sickness benefit (applicable after ten full sickness absence days), the effectiveness of the benefit during the earlier phases of work disability will also be examined.

The findings of this study suggest that, even if the benefit so far has been used mainly by women, its provision can be recommended also for men. The results further indicate that partial sick leave is a relevant measure in mental disorders, at least in the context of the Finnish soci-
Conclusions and implications of the study

...etal system. Older individuals and those with a higher socioeconomic position appear to benefit more from the use of the benefit in terms of work participation when compared to their younger and less privileged counterparts. This indicates that more attention needs to be paid to the implementation of this measure among young workers and individuals working in (physically) strenuous, low paid jobs.

The overall results suggest that partial sickness benefit – if applied in a larger scale in the future – may prove to be an effective tool in increasing work participation of working populations with long term sickness absence. Especially, beneficial effects may be expected on the withdrawal of older employees from the labor market.
ACKNOWLEDGEMENTS

The present study was carried out at the Finnish Institute of Occupational Health (FIOH). The study received financial support from the Finnish Work Environment Fund (grant number 106304), the Academy of Finland (grant number 129364), the Ministry of Social Affairs and Health, and The Social Insurance Institution of Finland (grant number 67/26/2011). I would like to thank the Institute for providing the facilities and other resources for the study.

I wish to thank sincerely my supervisors Professor Eira Viikari-Juntura and Docent Svetlana Solovieva for their expert guidance and support throughout this project. I am grateful to all the co-authors of the original publications: Lauri Virta in Kela, Kari-Pekka Martimo, Helena Miranda, Aki Koskinen, Rahman Shiri, Leena Kaila-Kangas, Ritva Luukkonen, Esa-Pekka Takala, and Jaro Karppinen at FIOH, and Raija Gould at the Finnish Centre for Pensions. In addition to co-authoring, many of you have shared with me your expertise, knowledge, and working companionship during the past years. Thank you for that! Warmest thanks go also to my colleagues Tea Lallukka and Tiina Pensola for their perceptive remarks on the manuscript and the social support provided in the final stages of this process.

The official reviewers of this thesis, Docent Pekka Virtanen and Professor Ute Bültmann, as well as Dr. Ewen MacDonald are thanked for their valuable comments on the content and the English language of this summary.

Last but not least, I want to thank my family and other people near and dear to me. Thank you for your patience and for being in my corner.

Vihti, November 2013
Johanna Kausto
REFERENCES


REFERENCES


REFERENCES


Kela (The Social Insurance Institution of Finland), 2011, Kelasto.


REFERENCES


REFERENCES


Oakes M. Effect Identification in Comparative Effectiveness Research. eGEMs (Generating Evidence & Methods to improve patient outcomes) 2013: Vol. 1: Iss. 1, Article 4. Available at: http://repository.academyhealth.org/egems/vol1/iss1/4. [Cited 3 August 2013].


REFERENCES


Varkevisser CM, Pathmanathan I, Brownlee AT. Designing and conducting health systems research projects. Amsterdam, 2003, KIT.


Vogel AP, Barker SJ, Young AE, Ruseckaite R, Collie A. What is return to work? An investigation into the quantification of return to work. Int Arch Occup Environ Health 2011;84:675–682.


Reduced work participation of working age population with health problems is a key societal concern in many Western countries, including Finland. Thus, activating people with partial work ability and keeping them in the workforce has been a common objective of many social and health policies. Scientific evaluation of the effectiveness of the policy measures has, however, been limited. This study examined the effectiveness and efficacy of partial sickness benefit and related partial sick leave on return to work, work retention and work participation in Finland when compared to regular full sick leave. Different study designs and methods were adopted to overcome the methodological challenges encountered in the study.