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CHIOMA ADANMA NWARU

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ACADEMIC DISSERTATION
To be presented, with the permission of
The Faculty of Social Sciences
of Tampere University,
for public discussion in the auditorium F115
of the Arvo building, Arvo Ylpön katu 34, Tampere,
on 19 December, 2019, at 12 o'clock.

ACADEMIC DISSERTATION
Tampere University, Faculty of Social Sciences
Finland

Responsible supervisor and Custos	Docent Pekka Virtanen Tampere University Finland	
Pre-examiners	Professor Mattias Strandh University of Umeå Sweden	Docent Tea Lallukka University of Helsinki Finland
Opponent	Professor Eero Lahelma University of Helsinki Finland	

The originality of this thesis has been checked using the Turnitin OriginalityCheck service.

Cover design: Roihu Inc.

ISBN 978-952-03-1312-8 (print)
ISBN 978-952-03-1313-5 (pdf)
ISSN 2489-9860 (print)
ISSN 2490-0028 (pdf)
http://urn.fi/URN:ISBN:978-952-03-1313-5

PunaMusta Oy – Yliopistopaino
Tampere 2019

Dedication

In loving memory of Hely Kurki
(1932-2019)

ACKNOWLDEGEMENTS

I am very grateful to the University of Tampere, Finland, for offering me the opportunity to study and for providing me with the necessary resources and support during my study period.

My sincere and deepest gratitude goes to my supervisor Docent Pekka Virtanen, who was also the supervisor of my master's degree thesis. Your expertise, dedication and patience during your supervision of my master's degree thesis were key motivations for my deciding to pursue a doctoral degree under your supervision. You provided relentless support and invaluable guidance throughout these study years. Words cannot express how grateful I am to you for your tutorship. My sincere appreciation also goes to Prof. Clas-Hakan Nygård who provided helpful comments in my manuscripts and was always willing and ready to give his support whenever needed.

To my co-authors, Prof. Mikä Kivimäki, Prof. Jussi Vahtera, Jaana Pentti, and Laura Peutera, I am indeed grateful to you all for your valuable suggestions and collaborations. It was really a privilege working with you all. Thank you Tapio Nurmi, Heini Huhtala and Anna-Maija Koivisto for your statistical advice and suggestions. Thank you Virginia Mattila for providing the language checks for my manuscripts. Many thanks to Subas Neupane. You were always ready to pause and listen to me and give your support whenever needed. I truly appreciate your kindness. Special thanks to Catherine Ståhle-Nieminen and Leena Nikkari for providing help with administrative issues. Thank you to all the teachers and fellow students at the School of Health Sciences who all contributed in one way or the other to make my study and stay at the school an enjoyable one. Hearty thanks to the reviewers of my dissertation, Prof. Mattias Strandh and Docent Tea Lallukka for their careful review of my work. Your comments and advice are deeply appreciated.

My dear husband, Bright Nwaru, words cannot express how grateful I am to you. You have been part of this journey right from the beginning. The engaging discussions we have had, the numerous questions I asked you night and day, and the very useful comments you provided me all contributed to the success of this work. I would like to say from the deepest part of my heart that I truly appreciate you. To my girls, Chinomnso, Chinazam, and Chimamaka, thank you so much for being there for me and for making sure that mummy smiled even in the face of difficulties. To my dear mother, Mercy Ada Ejiowhor, I believe that your constant support, care, encouragement and prayers for me have brought me this far. My deepest thanks to my Uncle, T.C Ejiowhor and my aunties Chituru, Chinyere, Ego and all their family members. You prayers, support and encouragement are much appreciated.

To all my friends, Dibo, Miatta and John, Claudine, Sally and family, many thanks for your relentless support and words of encouragement. To my church family in Tampere, Finland and in Gothenburg, Sweden, thank you all for your prayers.

I owe my most sincere gratitude to God Almighty, without whom this work would not have been in the first place. To you alone be all glory, honor, majesty and praises forever and ever, Amen.

ABSTRACT

Poor health is a potential risk factor for being unemployed, but whether and how specific physical health problems affect employment status is largely unexplored. Moreover, little is known about the labor market attachment trajectories of re-employed people. This thesis investigated the association of muscular fitness (Study I) and musculoskeletal pain (Study II) with re-employment. The thesis characterized the labor market attachment trajectories of re-employed people and assessed whether specific chronic diseases (Study III) and previous sickness absence (Study IV) influenced these trajectories.

Data for Studies I and II were derived from the Career Health Care project, which was a three-year health intervention trial that was launched in 2002-2003. Participants in the project were unemployed people (n = 539) who took part in active labor market policy measures; they were subsequently followed up for three years. Survey questionnaire (sociodemographic characteristics, health status and employment history) and laboratory assessment (physical performance tests) were used to collect data. Data for Studies III and IV came from the register of the Finnish Public Sector study, which covered 10 municipalities in Finland. From that study, 18 944 long-term (> 12 months) unemployed people with first subsidized re-employment as full-time employees in 1994-2005 were recruited and followed for six years. Logistic regression was used to investigate the determinants of re-employment and labor market attachment. Latent class growth model with Zero-Inflated Poisson was used to characterize labor market attachment trajectories.

In Study I, after adjusting for age and gender, compared to participants with poor fitness test performance, those with good performance in dynamic lift, sit-up, and squatting tests, were nearly five, seven, and nine times more likely to regain employment, respectively. In study II, both in results from complete-case and multiple-imputation analyses, participants with severe pain in the lower back were less likely to be re-employed than those without pain. In Studies III, four distinct labor market attachment trajectories were derived, namely: strengthening (a relatively stable attachment throughout the follow-up time, comprising 77% of participants), delayed (initial weak attachment increasing later; 6%), leavers (attachment declined with time; 10%), and none-attached (weak attachment throughout the study period; 7%). Those with severe mental problems (compared to those without) were more likely to belong in the "leavers" and "none-attached" trajectories. In Study IV, those with >30 days of sickness absence compared to those with 0-≤10 days of sickness absence were more likely to belong in the "leavers" and "none-attached"

trajectories. The risk was particularly higher among people younger than 45 years compared to those aged 45-60 years.

Findings from these studies confirm that among unemployed people, poor health is a risk factor for subsequently finding a job. The results also demonstrated that the influence of poor health on future employment may depend on the type of health conditions. Sick unemployed people may face a double burden by virtue of their health and for the fact that they are not employed. It is important therefore to provide them with adequate support, including health care and rehabilitation in order to enhance their chances of gaining employment. Disentangling the specific health problems suffered by unemployed people may help to provide them with more targeted interventions, consequently increasing their employment outcomes.

Key words: unemployment, health selection, re-employment, labor market attachment, muscular fitness, chronic disease, sickness absence, musculoskeletal pain

TIIVISTELMÄ

Huono terveys voi olla työttömyyden riskitekijä, mutta erilaisten fyysisten terveysongelmien vaikutuksia työmarkkinastatukseen on paljolti tutkimatta. Toisaalta työllistymisen jälkeisistä työllisyysurista on niukasti tutkimustietoa. Tässä väitöskirjatyössä tutkittiin tuki- ja liikuntaelimistön toimintakyvyn (Osatutkimus 1) ja tuki- ja liikuntaelimistön kipujen (Osatutkimus II) yhteyttä tulevaan työllistymiseen. Väitöskirjassa eriteltiin myös tukityöllistettyjen henkilöiden työllisyystrajektoreita ja arvioitiin miten eräät krooniset sairaudet (Osatutkimus III) ja sairauspoissaolot (Osatutkimus IV) liittyivät trajektoreihin.

Osatutkimusten I ja II aineistot olivat peräisin vuosina 2002-2003 aloitetusta 'Työuraterveydenhuolto' – hankkeesta, jonka puitteissa tutkittiin terveydenhuolto-intervention vaikutuksia koeasetelmassa. Tutkitut (n=539) olivat työvoimapoliittisiin toimenpiteisiin osallistuneita työttömiä; seuranta-aika oli kolme vuotta. Tiedot kerättiin kyselylomakkeilla ja fyysisen suorituskyvyn testeillä. Osatutkimuksissa II ja IV käytetyt rekisteriaineistot olivat peräisin kymmenen Suomen kuntaa kattavasta Kunta10-tutkimuksesta. Tutkimus käsitti kuntiin vuosina 1994-2005 kokopäiväisesti työllisyystuella työllistetyt pitkäaikaistyöttömät (> 12 kk) henkilöt (n=18 944), joita seurattiin kuusi vuotta ensimmäisen tukityöjakson päättymisen jälkeen. Työllistymisen ja työllisyystrajektorien determinantteja tutkittiin logistisen regressioanalyysin avulla. Trajektorit eriteltiin latentin kasvun malleilla käyttäen vasteena nolla-inflatoitua (Poissson-jakautunutta) työllisyyttä.

Osatutkimuksen I mukaan henkilöt, jotka saivat hyvät tulokset käsipainojen nostotestissä, makuulta-istumaan testissä ja kyykistymistestissä, työllistyivät vastaavasti lähes viisi, seitsemän ja yhdeksän kertaa todennäköisemmin, ikä- ja sukupuolivakioinnin jälkeenkin. Osatutkimuksessa II vaikeista alaselkäkivuista kärsivät työllistyivät epätodennäköisemmin kuin kivuttomat; tulos oli samanlainen myös sen jälkeen kun puuttuvat muuttujat oli imputoitu. Tutkimuksissa III ja IV trajektorianalyysi tuotti neljä erityyppistä työllisyysuraa: 'vahvistunut' (suhteellisen vakaa työssäolo koko seuranta-ajan, 77% tutkituista), 'viivästynyt' (alun vähäinen työssäolo lisääntyi myöhempinä vuosina, 6% tutkitusta), 'poistuneet' (työssäolo vähentyi seurannan loppua kohti, 10%), ja ei-työssäolijat (ei juurikaan työssä seuranta-aikana, 7%). Vaikeista mielenterveysongelmista kärsivät päätyivät todennäköisemmin 'poistuneiden' ja 'ei-työssäolijoiden' trajektoriryhmiin. Osatutkimuksen IV mukaan henkilöt joilla oli yli 30 sairauspoissaolopäivää

tukityöjakson aikana päätyivät edellä mainituille trajektorille todennäköisemmin kuin ne joilla oli 0-10 poissaolopäivää; riski oli suurempi nuorilla (<45 v) kuin vanhoilla (45-60 v).

Osatutkimusten tulokset osoittivat, että huono terveys heikentää työttömän mahdollisuuksia työllistyä. Lisäksi havaittiin, että huonon terveyden vaikutus työllistymiseen riippui terveysongelman laadusta. Sairaus ja työttömyys voivat muodostaa toisiaan pahentavan kaksoiskuormituksen. Heille tulisi olla tarjolla riittävästi tukea, myös terveys- ja kuntoutuspalveluja, jotta heidän edellytyksensä työllistyä paranisivat. Tukitoimien tuloksellisuus ja osuvuus voisi kohentua, jos ne räätälöitäisiin myös osallistujien terveysongelmien laadun pohjalta.

CONTENTS

ABBREVIATIONS

ALMP	Active Labor Market Policy measures
CHC	Career Health Care
OHS	Occupational Health Service
FPS	Finnish Public Sector
COPD	Chronic Obstructive Pulmonary Disease
LGCM-ZIP	Latent Growth Curve Model with Zero-Inflated Poisson
OECD	Organization for Economic Co-operation and Development
EU	European Union
EREOSTAT	European Statistical Office
SRH	Self-Rated Health
GHQ	General Health Questionnaire
EWCS	European Working Conditions Survey
GBD	Global Burden of Disease
CDC	Center for Disease Control
WHO	World Health Organization
BIC	Bayesian Information Criteria
LMR-LRT	Lo Mendel and Rubin Adjusted Likelihood Ratio Test
OR	Odds Ratio
CI	Confidence Interval
MAR	Missing At Random
RM	Repetition Maximum

DEFINITION OF KEY CONCEPTS AS USED IN THE THESIS

Unemployed people	In Study I, it referred to unemployed job seekers and individuals out of the labor force, e.g. students, retirees, etc. In Study II, it referred to persons not in any paid job but were seeking employment during study follow-up.
Re-employment	Being employed or self-employed after a period of being unemployed.
Labor market attachment	Number of months as an employee or entrepreneur during the 12 six-month follow-up period
Muscular fitness	Dynamic muscle strength and endurance of the upper limb and the lower extremities
Musculoskeletal pain	Pain or numbness in any four locations during the preceding week. The locations were neck or shoulders, hands or upper extremities, lower back and feet or lower extremities
Chronic diseases	Referred to six common chronic diseases that were covered in the reimbursement program. The diseases include diabetes, heart disease, arthritis, asthma or chronic obstructive pulmonary disease (COPD), chronic hypertension, and severe mental problems
Sickness absence	Absence days lasting more than 10 working days
Subsidized re-employment	Government-financed temporary employment in the public or private sector, designed to support the re-employment of long-term unemployed people, youth or people with disabilities

LIST OF ORIGINAL PUBLICATIONS

I. Nwaru CA, Nygård C-H, Virtanen P. Muscular fitness and re-employment among unemployed job seekers in Finland: A three-year follow-up study. Work 2014;49:559-565

II. Nwaru CA, Nygård C-H, Virtanen P. Musculoskeletal pain and re-employment among unemployed job seekers: A three-year follow-up study. BMC Public Health 2016 16:531 DOI 10.1186/s12889-016-3200-0

III. Nwaru CA, Peutere L, Kivimäki M, Pentti J, Vahtera J, Virtanen PJ. Chronic diseases as predictors of labor market attachment after participation in subsidized re-employment program: A 6-year follow-up study. J Epidemiol Community Health 2017;71:1101-1106

IV. Nwaru CA, Kivimäki M, Pentti J, Vahtera J, Virtanen P. Sickness absence in a re-employment program as a predictor of labor market attachment among long-term unemployed individuals: A 6-year cohort study in Finland. Scand J Work Environ Health 2018;44(5):496-502

1 INTRODUCTION

It has been known for decades that unemployment poses detrimental effects to health and wellbeing. Compared to employed people, those who are unemployed are more likely to visit physicians, to take medications, and be admitted in hospitals (Jin et al., 1995). The risk of prediabetes and type 2 diabetes (Varanka-Ruuska et al., 2018), substance abuse (Henkel, 2011), mental health problems (Mckee-Ryan et al., 2005; Paul & Moser, 2009), suicide (Milner, Page & LaMontagne, 2014), and mortality (Roelfs et al., 2011) are also remarkably higher among unemployed people than among those that are employed.

People with long-term unemployment (i.e. unemployed for over one year) tend to suffer worse health compared to persons with shorter unemployment (McKee-Ryan et al, 2005; Milner, Paul & LaMontagne, 2013; Milner, Page & LaMontagne, 2014; Roelfs et al., 2011). The negative effect of unemployment may have long-lasting consequences with increasing duration of unemployment. For instance, Janlert, Winefield and Hammaström (2014) reported that the risk of self-assessed poor general health, somatic diseases and depression continued to increase with increasing duration of unemployment among women followed up for 14 years. Paul and Moser (2009) found that symptoms of mental ill health tended to stabilize at an elevated level during the second year of unemployment before being associated with a renewed increase in long-term unemployment. Roelfs et al (2011) reported that unemployed people had a 73% increased risk of death during the first five years, and that the risk remained relatively stable (76% increased risk) between 5 to10 years of follow-up, before declining to 42% after 10 years of follow-up. Milner, Page & LaMontagne (2013) also reported that the risk of suicide was greatest in the first five years, and that the risk persisted at a lower but elevated level up to 16 years after unemployment

Beyond unemployed people, the negative consequences of unemployment can also influence their spouses (Marcus, 2013), children (Raatikainen, Heskanen & Heinonen, 2006; Sleskova et al., 2006), and the society at large (Kuhn, Lalive & Zweimuller, 2009; Räisänen et al., 2014). Given these consequences, it is therefore important to create measures that will promote re-employment of unemployed people, reduce long-term unemployment, and prevent the negative health effects associated with unemployment. In several European countries, labor authorities have instituted active labor market policy measures (ALMP), such as job training, subsidized re-employment programs, and re-education courses, in an attempt to enhance chances of re-employment of unemployed people. Research findings however suggest that most of the ALMP programs have not been very effective in terms of meeting their set goals (Puhani & Steiner, 1997; Vuori & Vesalinen, 1999; Kluve, 2010). Hence, policy makers would need to continuously review

and improve the current measures in ways that will contribute to the realization of set goals and ultimately improving re-employment.

A better understanding of barriers to re-employment is crucial when planning preventive interventions aimed at promoting re-employment. Therefore, the aim of this thesis was to investigate whether specific physical health problems constituted barriers to labor market attachment of unemployed people participating in active labor market policy measures in Finland.

2 LITERATURE REVIEW

2.1 Impact of re-employment on health

The generally axiom is that regaining employment can mitigate the adverse health effects of unemployment. Evidence from studies comparing the health status of people who are re-employed versus those who remain unemployed provides credence for this axiom. Regaining employment has been repeatedly shown to improve both mental (Ginexi et al., 2000; Claussen, 1999; Schuring et al. 2011; Schuring, Robroek & Burdorf, 2017) and physical (Carlier et al., 2013; Carlier, Schuring & Burdorf, 2018; Park, Chan & William, 2016) well-being.

An important question however is to understand whether regaining any type of employment is better than no employment at all. In order words, does re-entering any type of paid work improved health compared to not being employed? Park, Chan & William (2016) investigated this question with respect to perceived mental and overall wellbeing across four employment statuses: full-time, part-time, self-employment and unemployment. Their findings showed that being re-employed improved perceived mental and overall health, but the magnitude of this improvement was larger for people who initially were unemployed later regained full-time employment than for those who regained part-time employment. Schuring, Robroek & Burdorf (2017) did not find any statistically significant difference in improved mental health between part-time and full-time re-employed people but they found that people who worked more hours had greater improved health than those who worked less hours. There is evidence that job security is an important determinant of improved health, so that unemployed people who later regained a secure job (compare to those who regained jobs they perceived not secure) had significantly improved health (Kessler, Turner, & House, 1989; Halvorsen, 1998; Ferrie et al., 2001; Butterworth et al., 2011). Furthermore, some studies have shown that the health of unemployed people who later regained insecure jobs were not better than people who continued in unemployment (Butterworth et al., 2011).

2.2 Overview of the health selection concept

The health selection hypothesis states that health has a direct influence on socio-economic position, that is, that individuals with good health are more likely to move upward, while those with poor health are more likely to move downward in the social hierarchy (Blane, Smith & Bartley, 1993). Earliest research on health selection dates back to the 1930s (Perrot & Collins, 1935), but the concept gained prominence after the emergence of the Black Report in 1980. The Black report

was a publication in the United Kingdom that highlighted the widening gap in socio-economic differences in health (Gray, 1982). The report suggested four potential explanations that might account for inequalities in health, of which health selection was one explanation (Blane, 1985, Smith, Blane & Bartley, 1994).

Since the Black report, different studies have evaluated the certainty of the health selection proposal and its contribution in explaining social inequalities in health (Chandola et al., 2003; Elstad & Krostad, 2003; Claussen et al., 2005; Warren, 2009; Foverskor & Holm, 2016). Most studies suggest that health selection can influence factors such as educational attainment (van de Mheen et al., 1998; Hass, 2006; Hass & Fosse, 2008; van Heesch et al., 2011), work-related earnings (Aittomäki et al, 2012; Hass, Glymour, & Berkmaan, 2011), and occupational mobility (Elstad, 2004). However, the influence of health selection on social health inequality is less clear: whereas some studies report no impact on health inequality (Power, Matthews & Manor, 1996), others report a minimal impact, which is probably limited to particular age groups and social strata (Blane, 1985; Blane, Smith & Bartley, 1993). A systematic review by Kröger, Pakphan & Hoffmann, (2015) concluded that health selection significantly influences health inequality, especially in areas relating to labor market activities, such as employment.

2.2.1 Health selection in the labor market

There are two forms of health selection studies in the labor market: intergenerational and intragenerational health selection. Whereas the former refers to mobility of an individual compared to his or her parents' occupation, the latter is used to describe mobility of an individual compared to his or her own occupational class earlier in life (van de Mheen, 1999). The present review focuses on intragenerational health selection, which consist of three main streams of research: health selection and mobility across occupational classes, health selection and mobility out of employment, and health selection and mobility into employment (Elstad & Krostad, 2003).

2.2.1.1 Health selection and occupational mobility

Research on health selection and occupational class mobility is limited, with most of the studies examining the influence of self-rated general health (Table 1). The studies show health status may have little (Cardano, Costa & Demaria, 2004; Ki et al., 2011; Manor, Mathew & Power, 2003) or no impact (van de Mheen et al., 1999; Elstad & Krokstad, 2003) on the likelihood of moving upward or downward the occupational ladder. Ki et al. (2011) suggested, among other things, that

one mechanism through which this effect is determined is through social policies. Such policies, may lead unhealthy individuals to self-select themselves out of the labor market rather than move down through a change of job on the account of poor health.

Table 1. Health selection and occupational class mobility

Author, Country	Length of follow-up	Health indicator	Main findings
Cardano, Costa, & Demaria, 2004, Italy	10 years	Hospital admissions	Health had small impact occupational mobility.
van de Mheen et al., 1999, The Netherlands	4.5 years	Perceived mental health, health complaints, chronic conditions	None of the health indicators was associated with moving upward or downward the occupational ladder
Ki et al., 2011, United Kingdom	2 years	General health status	No evidence of health selection between occupational classes.
Elstad & Krokstads, 2003, Norway	10 years	Perceived health	No evidence of health selection between occupational classes.
Manor, Matthew & Power, 2003, United Kingdom	10 years	Self-rated health at ages 23 and 33	Men with poor health at ages 23 were more likely to move downward and less likely to move up the social scale from earlier occupational position at ages 33. The trend was less evident for women.

2.2.1.2 Health selection and mobility out of employment

The evidence linking health selection to job loss is conflicting. Mastekaasa (1996) argued that health might have negligible impact on job loss, because decision to lay off an employee often involves much more than just health of the employee, but is influenced by several different players (employers, unions, job colleagues, and the individual employee), and guided by legal and contractual provisions. This position is supported by Arrow (1996) and McDonough & Amick (2001), who added that social positions, especially those designated by gender, age, education, etc. may influence job loss when health is compromised. Some evidence for this assumption has been documented in the literature. For instance, Schuring et al. (2007) found that poor self-rated health is more important factor for job loss among those with higher education than among those with lower education. Butterworth et al. (2012) also reported that common mental health problems (anxiety and depression) were risk factors for exiting employment among women but not among men. Other studies have shown that the effect of poor health on job loss is direct (Jusot et al.,2008;

Schuring et al.,2013; Carter et al.,2013), particularly for the effect of poor self-rated health and mental health problems (van de Berg et al., 2010; Tisch, 2015; Ki et al., 2013; Virtanen, Janlert & Hammaström, 2013, Elstad & Krokstad, 2003; Ki et al., 2011; van de Mheen et al., 1999). Long-lasting limiting health problems and chronic diseases (van de Mheen et al., 1999; Jusot et a., 2008; Arrow, 1996) may have direct impact on job loss, although the evidence supporting this is less clear (Table 2).

Table 2. Health selection and mobility out of employment

Author, Country	Length of follow-up	Health indicators	Main findings
Arrow, 1996, Germany	6 years	SRH, chronic illness, long sickness absence, health impairment	Chronic disease and long-term sickness absence was associated with the risk of unemployment in foreign and female workers
van de Berg et al., 2010, Europe	2 years	Self-perceived health, chronic disease	Self-perceived health was associated with exit from paid employment. Chronic disease had less influence on exit from paid employment.
Tisch, 2015, Germany	1 year	Self-perceived health	Poor health increased the probability of labor force exit
Ki et al., 2013, United Kingdom	2 years	Self-rated general health	Poor health influenced transition from employment to unemployment
Mastekaasa, 1996, Norway	4 years	Long-standing disease, Psychological distress	Long-standing health problems had no effect on lay-off. Psychological distress is strongly associated with being laid-off
Virtanen, Janlert & Hammaström, 2013, Sweden	12 years	Sub-optimal health (poor self-rated health and mood), problem with sleeping, sense functions, and musculoskeletal pain	Suboptimal self-rated health and suboptimal mood were associated with occurrence of unemployment. Sense of function, musculoskeletal pain and sleep quality were not.
Butterworth et al., 2012, Australia	5 years	Common mental health problems (anxiety and depression)	Men: mental health was not a significant predictor of the experience of unemployment. Women: poor mental health increased the risk of unemployment.
Elstad & Krokstad, 2003, Norway	10 years	Perceived health	Perceived health influenced transition out of employment
Ki et al., 2011, United Kingdom	13 years	General health	Health had effect on transition out of employment
van de Mheen et al., 1999, The Netherlands	4.5 years	Perceived health, health complaints, chronic conditions	All health indicators had effect on mobility out of employment
Jusot et al., 2008, France	4 years	Self-rated health, obesity	Obesity was associated with increased risk of unemployment among women Poor self-rated health increased the odds for exiting paid job in men and women
Schuring et al., 2013; The Netherlands	10 years	Self-reported general health	Poor self-reported general health increased the risk of exit out of employment
Carter et al., 2013 Australia	7 years	Health shock (defined as newly diagnosed disease)	Health shock increased the odds of subsequent non-participation in the labor market

2.2.1.3 Health selection and mobility into employment

Under this premise, the assumption is that health selection will have strong influence during re-employment, since the transition from unemployment to re-employment typically involves the employer and employee (Mastekaasa, 1996; Claussen, Bjørndal & Hjort, 1993). If this assumption is true, then it is important to understand potential health-related obstacles to re-employment as that would inform appropriate targeting of health interventions, thereby promoting re-employment and decreasing long-term unemployment.

So far, among the health indicators that have been studied (Table 3), the evidence regarding the association between poor self-rated health and reduced re-employment has been the most consistent (van de Mheen et al., 1999; Schuring et al., 2007; Schuring et al., 2013, Carlier et al., 2013; Ki et al., 2013; Lötters et al., 2013; Svane-Petersen & Dencker-Larsen, 2016). Self-perceived chronic health conditions (Schuring et al., 2007; Stewart, 2001) and self-reported poor mental health (Mastekaasa, 1996; Butterworth et al., 2012) have been suggested as potential risk factors as well, but contrary evidence also exists (Vesalainen & Vuori, 1999; Mastekaasa, 1996). A few studies (Claussen, Bjørndal & Hjort, 1993; Claussen, 1999; Svane-Petersen & Dencker-Larsen, 2016; Leino-Arjas et al., 1999) have examined the role of diagnosed mental and somatic health problems on re-employment, showing that physician-diagnosed mental health problems may reduce likelihood of re-employment. The negative impact of health on re-employment may be greater in women than in men (Ki et al., 2013; Svane-Petersen & Dencker-Larsen, 2016), although the reverse has also been documented (Butterworth et al., 2012).

2.3 Other factors that can influence selection into employment

Aside health-related variables, old age (Stewart, 2001; Schuring et al., 2007; Schuring et al., 2013; Lötter et al., 2013), previous unemployment (Liira & Leino-Arjas, 1999; Leino-Arjas et al., 1999) and long-term unemployment (Schuring et al., 2007; Schuring et al., 2013) have been linked to less likelihood or re-employment. On the other hand, being married has consistently been associated with increased likelihood of re-employment (Liira & Leino-Arjas, 1999; Leino-Arjas et al., 1999; Schuring et al., 2007; Schuring et al., 2013), while several studies (Schuring et al., 2013; Claussen, Bjørndal & Hjort, 1993; Vesalainen & Vuori, 1999) have reported that education appears not to influence re-employment. Risky lifestyle-related health behaviors, particularly smoking and heavy

alcohol intake, may negatively influence the likelihood of finding employment (Virtanen, Janlert & Hammarström, 2013; Liira & Leino-Arjas, 1999; Leino-Arjas et al., 1999).

Table 3. Health selection and mobility into employment

Author, Country	Length of follow-up	Health indicators	Main findings
van de Mheen et al., 1999 The Netherlands	4.5 years	Perceived general health, health complaints, and chronic conditions	Health showed effect on re-employment likelihood but only the effect was statistically significant for less than good perceived health
Claussen, 1999 Norway	5 years	Self-rated psychometric test and GHQ (psychological distress), and medically diagnosis for somatic and psychiatric symptoms	Only medical diagnoses of psychiatric symptoms and personality disorders were associated with decreased odds of re-employment
Schuring et al. 2007 European Community Household Panel Study	3 years	Self-perceived health, any chronic or mental health problem, illness or disability	Poor health and chronic health problem were risk factors for not entering the workforce.
Schuring et al., 2013 The Netherlands	10 years	Self-rated general health	Poor health influenced transition from employment to unemployment
Carlier et al., 2014, The Netherlands	6 months	Self-rated general health	Persons with poor self-rated health were about half as likely to return to paid employment
Mastekaasa, 1996, Norway	4 years	Long-standing disease, psychological distress	Psychological distress decreased re-employment likelihood. Long standing disease did not have effect on re-employment.
Claussen, Bjørndal & Hjort, 1993 Norway	2 years	Mental distress, medical diagnoses of somatic and psychiatric problems	Both mental distress and medical diagnosis were related to re-employment
Ki et al ., 2013, United Kingdom	2 years	Self-rated health	Men: poor health was not associated with transition from unemployment to employment Women: poor health influenced transition from unemployment to employment
Leino-Arjas et al., 1999 Finland	4 years	Frequency of symptoms of stress, diagnosed mental problem, gastrointestinal problems, skin problems, neurological problem	Mental disorders, skin disorders, and stress symptoms were predictors of long-term unemployment
Lötters et al., 2013, The Netherlands	18 months	Perceived health	Poor perceived health increased the risk of unemployment for more than 12 months
Svane-Petersen & Dencker-Larsen, 2016 Denmark	2½ years	Self-rated health, register-based prescription medicine purchases	Unemployed persons with poor self-rated health and registered-based prescription medicine purchases for mental illness were less likely to be re-employed. No association was found between prescription medicine for somatic illness and re-employment.
Vesalainen & Vuori, 1999, Finland	3 years	Psychological distress	Baseline levels of psychological distress did not predict re-employment status 3 years later

Butterworth et al., 2012, Australia	5 years	Common mental health problems (anxiety and depression)	Men: poor mental health was associated with increased duration of unemployment. Women: mental health was not a risk factor for duration of unemployment
Stewart, 2001, Canada	62 weeks	Impaired health (i.e. job termination due to illness or injury), long-lasting physical and mental health problems (health limitation)	Individuals with health limitation and impaired health had increased likelihood of having longer unemployment duration

2.4 Specific physical health indicators: meaning, determinants and impact on employment

2.4.1 Muscular fitness

Muscular fitness or musculoskeletal capacity is one of the domains of physical capacity and an essential part of an individual's functional capacity (Nygård et al., 1991; Rantanen, Parkatti & Heikkinen, 1992). The components of muscular fitness include joint flexibility, which relates to the range of motion available at a joint; muscle strength, which relates to the amount of external force that a muscle can exert; and muscle endurance, which relates of the ability of muscle groups to exert eternal force for any repetitions or successive exertions (Caspersen, Powell & Christenson, 1985; Katzmarzyk & Craig, 2002; Warburton, Gledhill & Quinney, 2001; Kell, Bell & Quinney, 2001). Muscular fitness test is often performed in occupational settings as part of the health-related fitness test aimed at promoting health and improving well-being of employees (Katzmarzyk & Craig, 2002; Smolander et al., 2010). Evaluation of muscular fitness can be done by means of laboratory techniques or as a self-assessed measurement (Caspersen, Powell & Christenson, 1985), although there are concerns that self-assessed measurements may be limited in terms of providing information across a broader range of the physical capacity spectrum (Kasper et al., 2017).

Age is a strong determinant of muscular fitness, so that in both men and women, with an increasing age, there is a decrease muscular fitness (Nassif et al., 2012; Payne et al., 2000; Savinainen, Nygård & Arola, 2004. Gender is also an important determinant, with women having lower muscle strength and endurance than men (Nassif et al., 2012). Employees in physically demanding work have increased risk of decreased muscular fitness than those in mentally or mixed mentally and physically demanding work (Nygård et al., 1987; Nygård et al., 1988; Savinainen, Nygård & Arola, 2004). Individuals with more behavioral risk factors (obesity, smoking, physical inactivity) and poor health conditions have increased risk for poor muscular fitness (Cooper, Muniz-Terrera & Kuh, 2016).

Measures of muscular fitness are risk markers of different health problems. Brill et al. (2000) found that low muscle strength and endurance may increase functional limitations in both older and middle aged adults. Häkkinen et al. (2010) found that higher muscular fitness index (consisting of measures of grip strength, push-ups, sit-ups and repeated squats) was associated with favorable scores in physical functioning and in general health perception dimensions of the health-related quality of life (HRQoL) index. Mason et al. (2007) reported that individuals with low muscular fitness (assessed using grip strength, push-ups, sit-up and trunk flexibility) had 78%

increased risk of weight gain (≥ 10kg) during a 20-year follow-up compared to those with high muscular fitness. Jurca et al. (2004) found that middle-aged men in the highest category of muscle strength had 67% lower odds of having metabolic syndrome compared to men the lowest strength quartile. A review by Artero et al. (2012) reported that muscle strength plays an important independent role in the prevention of cardiovascular fitness. Several studies have also reported an association between different measures of muscular fitness and all-cause mortality. For instance, Katzmarzyk & Craig (2002) found an association between low performance of sit-ups and increased risk of mortality in adult men and women. Rantanen et al. (2000) also found that poor performance in handgrip strength was significantly associated with increased risk of mortality in initially healthy men. In the study by Artero et al. (2011), high level of muscle strength (measured as one repetition maximum (RM) leg bench press) was also associated with a lower risk of all-cause mortality in hypertensive men.

The influence of muscular fitness on employment outcomes is unknown but studies have demonstrated associations between measures of muscular fitness and physical work performance. For instance, Nygård et al. (1991) found that factors describing muscular strength and endurance associated significantly with work ability index. They suggested that measures of muscular strength and endurance could be used to assess an individual's work ability. Smolander et al. (2010) also found a significant association between repetitive lift and work ability index as well as between squatting test and physical functioning. Pohjonen (2001) reported that poor performance in weight lifting test and lower extremity muscle was associated with decreased work ability during a five-year follow-up of home care workers. In the same study, compared with good sit-up performance, those with average performance had 3.7-fold, while those with poor performance had 8.9-fold, decrease in work ability. Poor performance in muscular fitness may increase the risk of sickness absence (Rasmussen et al., 2015; Kyrolainen et al., 2008), although others have also reported contrasting findings (Faber et al., 2012).

2.4.2 Musculoskeletal pain

Musculoskeletal pain is a common health condition that affects persons of all ages. WHO report (2018), estimated that between one in three and one in five people live with a painful and disabling musculoskeletal condition. The most recent Global Burden of Disease data (GBD, 2017) also showed that musculoskeletal health problems are the second largest (17.1%) contributor to years lived in disability (YLD) worldwide, and low back pain and neck pain as the two largest causes of musculoskeletal disability. Data from the fifth European Working Conditions Survey (EWCS)

reported one-year prevalence of back pain and neck/upper limb pain in Europe to be 46.1% and 44.6% respectively (Farioli et al., 2014). Musculoskeletal pain may present as acute or chronic pain (Briggs et al., 2016) and may be situated in specific regions of the body or be widespread (Haukka et al., 2015). Both regional and multisite pain are common in the working-age populations (Herin et al., 2014), although some studies suggest that multisite pain may be more common than pain in one body site (Picavet & Schouten, 2003; Fernandes & Burdorf, 2016).

Monotonous work, high job demands, low job control, low job satisfaction, awkward and static postures, forceful effort, and prolonged sitting or standing in the same position (Lang et al.,2012; Madsen et al, 2018; Herin et al., 2012; Herin et al., 2014) are some work-related factors that may heighten musculoskeletal pain. Regarding individual-related factors, most studies (Mandal et al., 2014; Gerdle et al., 2008; Herin et al., 2012; Kamaleri et al., 2008; Elliott et al., 2002) have shown that the risk of musculoskeletal pain is higher in females than in males. Other factors that may increase risk of musculoskeletal pain include obesity, sleep problems, general poor health or chronic health conditions (Mandal et al., 2014), and old age (Kamaleri et al., 2008). However, participation in sporting activities may decrease the risk (Herin et al., 2012).

Population-based studies examining the natural course of musculoskeletal pain indicate that, while some pain types may decline slowly overtime, absolute recovery may not be fully attained. For instance, Vasseljen et al. (2013) found that acute neck and low back pain declined rapidly by one month for most people while pain remained unchanged over a one-year follow-up for subjects with pain of equal intensity in the neck or low back areas at baseline and for those subjects with four or more pain sites. Elliott et al. (2002) found that chronic pain was persistent, with 78.5% of individuals at baseline still having chronic pain after four years. Andersson (2004) also reported that 85% of those with non-malignant chronic pain at baseline still reported chronic pain after 12 years. Temcan et al. (2010) studied the natural course of chronic and recurrent low back pain using latent class analysis of weekly pain diaries completed over a 12-month period. They uncovered four clusters of pain: mild, fluctuating, moderate and persistent pain; each of the clusters persisted over the 12-month study period. No recovering cluster of low back pain sufferers was found.

The effect of musculoskeletal pain on employment outcomes have also been documented. McDonald, DiBonaventura & Ullman (2011) found that workers who suffered arthritis, back or fibromyalgia pain reported significantly more work impairment (measured as number of absenteeism or percentage of impairment while at work due to health) than workers without pain. Straaton et al. (1996) reported that a high pain level was a strong barrier to return to work among unemployed due to arthritis and musculoskeletal disorders. Yelin, Trupin & Sebesta

(1999) reported that persons with musculoskeletal conditions were also less likely to be employed compared to those with non-musculoskeletal conditions. The evidence in support of poor work outcomes is even stronger for those with multiple site pain. For instance, Morken et al. (2003) found that multisite pain and low back pain were strongly associated with short and long-term sickness absence among aluminum industry workers. Fernandes & Burdorf (2016) found that multisite pain increased the risk of health care utilization, sickness absence and restriction at work. Several other studies from different occupational settings have also shown that multisite pain may increase risk of poor work ability (Miranda et al., 2010; Neupane et al., 2013; Kamaleri et al., 2009; Phongamwong & Deema, 2015).

2.4.3 Chronic disease

The Centers for Disease Control and Prevention (CDC) define chronic diseases as conditions that last one year or more and require ongoing medical attention or that limit activities of daily living or both (CDC, 2018). Chronic diseases contribute significantly to global annual mortality rate. According to WHO report, in 2016, cardiovascular diseases (particularly ischemic heart disease and stroke) accounted for 17.9 million deaths, followed by cancers (9.0 million), respiratory diseases (3.9 million), and diabetes (1.6 million) (WHO, 2018). These conditions, in addition to mental illness, are also among the leading causes of death in the European Union (Brennan et al., 2017). Aside the effect on mortality, chronic diseases are also strongly linked to poor health-related quality of life, poor self-rated health, and increased risk of disability, especially in older adults (Heyworth et al., 2009; McDaid et al., 2013). Many studies, particularly those conducted in high-income societies, have suggested that the burden of chronic disease may be a result of population aging (Brennan et al., 2017; Metoo, 2008). However, others have argued that the causes and inequalities related to chronic disease or non-communicable diseases do not stem mainly from population aging, but may in large part be a result of modifiable factors related to lifestyle (smoking, alcohol intake, lack of physical activity, low consumption of vegetables), occupation (e.g. exposure to pesticides), and living conditions (Balaj et al., 2017).

Several studies (mostly among older age population) have examined the influence of chronic diseases on employment outcomes. Most of the studies utilized cross-sectional design but overall the evidence indicate that chronic diseases increased the risk of missed work days (Ward, 2015), premature retirement (Vijan et al., 2004), poor workability (van den Berg, Burdorf & Robroek, 2017), sickness absence (Vijan et al., 2004; Casimirri et al., 2014; van den Berg, Burdorf & Robroek, 2017) and unemployment (Smith et al., 2014, Schofied et al., 2013; Chatterji, Joo &

Lahiri, 2017). The magnitude of the effect of chronic diseases on employment outcomes across diseases: cardiovascular conditions (Cai & Cong, 2009; Smith et al., 2014; Ward, 2015) and mental health problems (Leijten et al., 2014; Kubo et al., 2014; Majeed et al., 2017) appear to have the largest impact, while cancers (Cai & Cong, 2009) and thyroid conditions (Smith et al., 2014) may have minimal effect.

Most studies are in agreement that the risk of poor employment outcomes increases with increasing number of chronic diseases (Ward, 2015; Schofied et al., 2013; McDaid et al., 2013). What is unclear, however, is to understand how different chronic diseases combine to influence this increased risk. Smith et al. (2014) found that the combined effect of diabetes and heart disease produced larger effect on non-work participation due to illness than the independent effect of each of these conditions. Wang et al. (2014) also reported that the combined effect of depression and chronic disease on the risk of unemployment was larger than the individual effect of depression alone. On the other hand, McDaid et al. (2013) found that the combination of two or more chronic diseases did not seem to influence work disability. The study by Ward (2015) also supports this perspective.

While these findings emanate mostly from studies among active employees, knowledge of the role of chronic diseases on the employment outcomes of unemployed people is generally limited. The few studies that have examined the relationship suggest that chronic diseases reduce the likelihood of re-employment (van de Mheen, 1999; Schuring et al., 2007), but the role of specific chronic conditions remains unclear.

2.4.4 Sickness absence

Sickness absence is increasingly been studied in occupational health both as an outcome and as a risk factor. Studies typically distinguish between short and long-term absence. Short-term absences, in most cases, refer to absences lasting between one and seven working days (Hultin et al., 2012). This form of absence is mostly regarded as a coping mechanism (Kivimäki et al., 2003; Sumanen et al., 2015) and rarely influences poor work outcomes (Virtanen, Pentti & Kivimäki, 2004; Hultin et al., 2012). Long-term sickness absence are often used to describe sick leaves lasting over seven working, which requires issuance of medical certificate (Kivimäki et al., 2007; Siurin, Josephson & Vingård, 2009; Marmot et al., 1995, Melchoir et al., 2009). Long term sickness absence reflect a wide array of illnesses and health conditions including poor self-rated health (Eriksson et al., 2008; Ferrie et al., 2011), depression (Melchoir et al., 2010), all-cause mortality (Kivimäki et al., 2003; Björkestan et al., 2014) and mortality due to common chronic conditions

such as cancer, cardiovascular diseases, depression, chronic bronchitis, asthma and hypertension (Virtanen, Pentti & Kivimäki, 2004; Kivimäki et al. (2008). As an indicator of serious health conditions, long-term sickness absence can be used to measure health differentials among employees (Laaksonen, Liang & Pitkäniemi, 2013; Kivimäki et al., 2003).

In several studies, long-term sickness absence is associated with an increased risk of disability pension among employees (Labriola & Lund, 2007; Koopmans, Roelen & Groothoff, 2008; Hultin, Lindholm & Möller, 2012. Although there are only a few studies that have examined employment outcomes, the evidence indicates that long-term sickness absence is associated with increased risk of job termination (Koopmans, Roelen & Groothoff, 2008;Virtanen et al., 2006), unemployment (Hesselius, 2007; Hultin, Lindholm & Möller, 2012; Virtanen et al., 2006), and future risk of sickness absence (Roelen et al., 2011). Employees with long-term sickness absence may have considerable loss of zest (enthusiasm and satisfaction) for work (Sieuri, Josephson & Vingård, 2009). These findings align with the suggestion by Bryngelson (2009) that long-term sickness absence might start a process of labor market marginalization.

2.5 Summary of review

Empirical evidence abound, suggesting that poor health may exert strong influence on selection into employment. Based on the studies evaluating the impact of health selection on employment, poor health is associated with reduced likelihood of re-employment. However, indicators of poor health are mostly measured in general context, i.e. in terms of self-rated general health or chronic health problems. Although these are important and valid measures, they do not give indication of the specific roles of the health problems and diseases. Muscular fitness, musculoskeletal pain, chronic disease, and sickness absence can potentially influence employment outcomes but their role on re-employment is poorly understood. Poor health can also threaten favorable labor market attachment after re-employment, but the knowledge of labor market attachment trajectories of re-employed people is largely unexplored.

3. AIMS OF THE STUDY

The overall aim of this thesis was to examine the association between health and labor market attachment of unemployed job seekers participating in Finnish Active Labor Market Policy (ALMP) measures. Labor market attachment is used as a broader theoretical concept, which in this thesis is measured in two ways: re-employment and labor market attachment (employment) trajectory. The specific objectives of the thesis were:

a. To examine whether muscular fitness is a determinant of re-employment
b. To investigate the associations of localized and multisite musculoskeletal pain with re-employment
c. To describe the labor market attachment trajectories of re-employed people and to examine whether chronic diseases influence these trajectories
d. To investigate whether sickness absence during participation in a subsidized re-employment program is associated with subsequent labor market attachment trajectories.

4. MATERIALS AND METHODS

4.1 Study data and participants

The thesis was based on data from two projects: the Career Health Care project and the Finnish Public Sector study.

4.1.1 The Career Health Care project

The Career Health Care (CHC) was a three-year health intervention trial that was launched in 2002-2003. The project aimed to tackle health problems and risk related to unemployment. Since unemployed people do not have access to Occupational Health Services (OHS) that is provided for all waged and salaried employees in Finland, the motivation of CHC was to provide unemployed people with services that resembled OHS. The CHC also aimed to understand whether the provision of such services would improve the likelihood of re-employment among unemployed people. The CHC adopted specific health plans from existing Finnish OHS, with focus on health promotion and primary prevention. The activities of CHC included health screenings, assessment of client's work ability, and individual health promotion–oriented guidance and counselling. The most common topics of the health promotion and health counselling were smoking cessation, excess alcohol consumption, diet due to high cholesterol, diabetes or obesity, physical exercise and psychosocial conditions. Regular laboratory screenings or physician consultations were not routinely part of CHC package, but needs were accessed on individual basis, and clients received referrals and guidance to appropriate health services (Romppainen et al., 2014). Occupational health care nurses from established OHS centers were providers of CHC services. Participants in the project were unemployed people (n = 539) from six localities in southern Finland who were enrolled in ALMP program (vocational training courses, subsidized employment, and participatory training courses for entering the labor market). They were recruited at the beginning of the ALMP measures, during which they received oral and written information about the opportunity to participate in the study. Those who consented to the study were randomly allocated to intervention and control groups. The intervention group (n = 265) were clients of the CHC, who were invited to three health check-ups during the CHC project: at the beginning and end of the ALMP (which lasted maximally 24 months) measures, and three years after the first contact. The control group (n = 274) only used the communal health services.

Data collection was made at the beginning (2002-2003) and at three years after the first contact, using questionnaire survey and laboratory assessments. The questionnaire was used

to assess information on participants' socio-demographic characteristics, health status, and employment history. Both the intervention and control groups participated in the questionnaire survey. The laboratory assessment included measurements of physical performance tests, blood pressure, and pulse and body weight. Participants in the intervention group participated in voluntary laboratory assessment. The participants of the intervention group completed the questionnaire at the health check-ups while those of the control group returned the questionnaire by post (Romppainen et al., 2014). For Study I, the study sample was selected from among those who participated in the intervention group. Of the 265 participates, 130 had complete information on muscular fitness at baseline, and on employment status at the end of the three-year follow-up, and this constituted the final sample for the study. For Study II, out of the 539 participants who completed the questionnaire at baseline, three-year follow-up data was available for 311 subjects. Individuals who were classified as non-job-seekers at follow-up were excluded, leaving a final sample of 284 people with complete data on musculoskeletal health status at baseline and on employment status at follow-up. For both studies, the participants were aged between 18 and 59 years.

At the time of planning and implementation of the study, the Medical Research Act dealing with Ethics Committee had not yet been enacted in Finland. However, the Ethics Committee of Pirkanmaa University Hospital District assessed the study plan retrospectively, and stated that a study with a corresponding design would be approvable (ETL-code RI3024).

4.1.2 The Finnish Public Sector Study

The Finnish Public Sector (FPS) study, established in 1997/1998, is an ongoing prospective study of all employees in 10 municipalities and five hospital districts in Finland. The general aim of the project is to assess the work life of employees and the changes of work and work-related factors on the employees' health and wellbeing (Kivimäki et al., 2009).

The FPS study included employees who have been employed for at least six months in any year between 1991 and 2005 (n = 151,901). Data on job contracts from employer's registers, on health status from the registers of the Social Insurance Institution of Finland, and on work history from the registers of the Finnish Center for Pensions, have been linked to the cohort to the end of 2005 by means of the national identification number. These data were also available for long-term (>12 months) unemployed people who had their first period of subsidized re-employment in the service of the municipalities as full-time employees in 1994-2005 (n = 23,213). Subsidized re-employment is a government-financed temporary job in the public or private sectors,

designed to support the re-employment of long-term unemployed. The program has been around since the 1970s and has undergone several reforms, in the bid to increase its quality and effectiveness (Duell, Grubb & Singh, 2009; Martin, 2014). Participation in the program is voluntary, and the municipalities in cooperation with the local unemployment offices coordinate the selection of the participants. Unemployed people with less optimal health may also be selected into the program if they are deemed fit and capable of performing full-time job. Studies III and IV were based on the data from the FPS study. For both studies, the final sample was 18,944 (aged 18-60 years), which represented those long-term unemployed people who had complete information for the full six-month participation in the subsidy program (Figure 1). Individuals who dropped out of the program for any reason (n = 3999) were excluded as well as those who had an old-age pension (n = 74) or those who died (n = 196) during the follow-up. The Ethics Committee of the Hospital District of Helsinki and Uusimaa approved the FPS study.

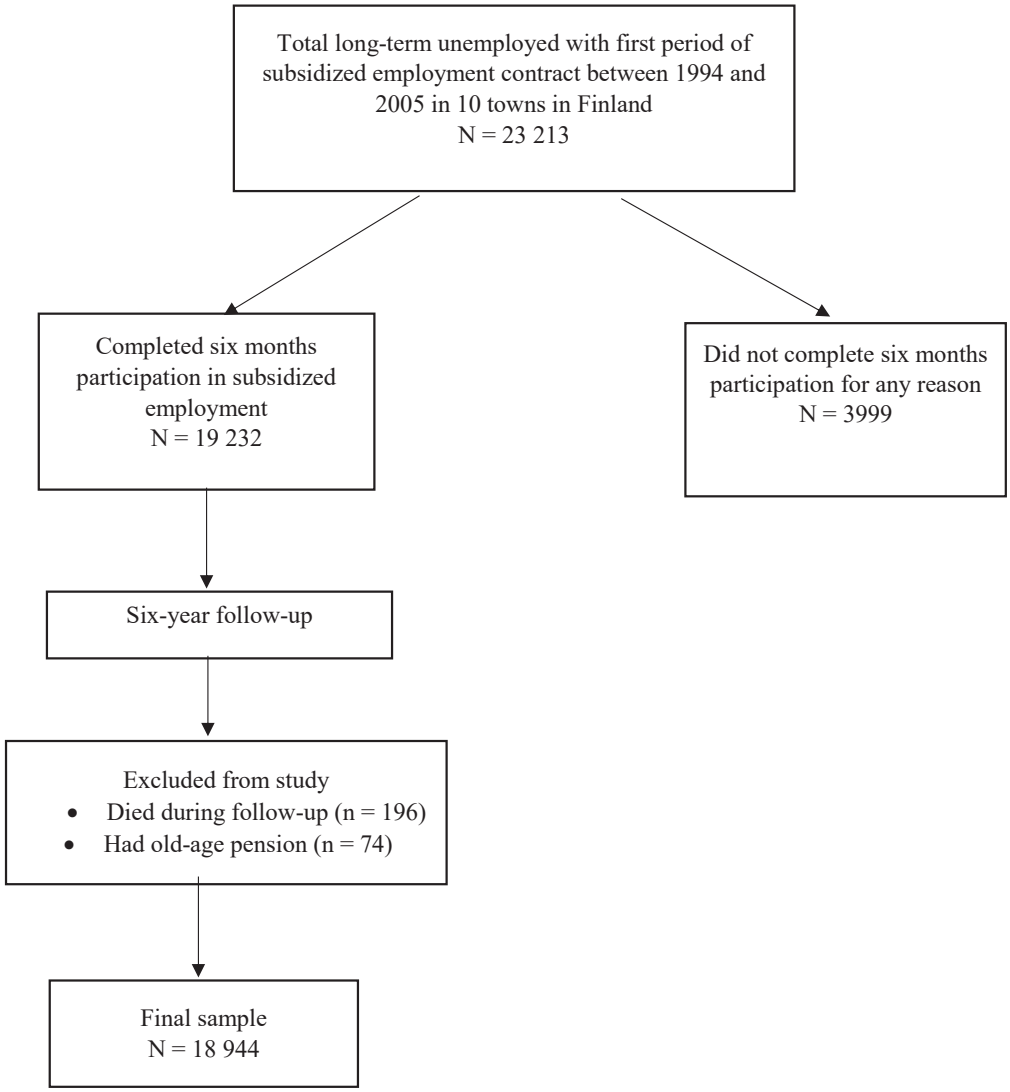


Figure 1. Flow chart illustrating FPS study design used for Studies III and IV

4.2 Measurements

4.2.1 Muscular fitness (STUDY I)

Muscular fitness was one of the physical performance tests that were evaluated during the CHC health check-ups. The dynamic muscle strength and endurance of the upper limb and the lower extremities of the participants was assessed using repetitive sit-ups and squats (Alaranta et al., 1994) and repetitive lift test (Kaukianen et al., 2001; Savinainen, Nygård & Arola, 2004). Occupational health nurses monitored the tests. In the sit-up test, the participant was lying in supine position with the knees flexed at 90^0, both feet placed flat on the floor and held by the tester, and arms stretched towards the knees. Participants were instructed to do an upper trunk curl such that the thenar region touched the kneecaps. The maximum repetition was 50 times. In the squatting test, participants stood feet 15cm and then asked to squat until the thighs were horizontal and then returned to a standing position. The maximum repetition was 50 times. In the lift test, participants stood with their feet 15cm apart and lifted 5-kg (for women) or 10-kg (for men) weights, alternately straight up from shoulder height overhead as many times as possible. The maximum repetitive was 50 times.

The result of each of the tests was calculated as the number of repetitions accomplished by each participant. A test was stopped if the performance did not fulfill the criteria for proper testing (Keskinen et al., 2004) or if the participant was exhausted. Each test was categorized separately for men and women and according to different age groups, based on a 5-point reference categorization: 1 = very poor, 2 = poor, 3 = moderate, 4 = good, and 5 = very good (Keskinen et al., 2004). Because of this participant categorization, the amount of responses within each analysis group was reduced and the data were not evenly distributed across all 5-point response categories. Therefore, to maintain efficiency of the estimates, some of the categories were collapsed to form a 3-point grouping (i.e. 1 and 2 = poor, 3 = moderate, 4 and 5 = good).

4.2.2 Musculoskeletal pain (STUDY II)

Musculoskeletal pain was measured using a modified version of the Nordic Musculoskeletal Questionnaire (Kuorinka et al., 1987). Participants were asked to report, on a scale of 0 to 10, whether they had experienced pain or numbness in four locations during the preceding week. The

locations were the hands or upper extremities, neck or shoulders, lower back, and the feet or lower extremities. The response for each pain variable was categorized into three groups: 0 = no pain, 1-5 = mild pain, and 6-10 = severe pain. To construct a multisite pain measure, mild and severe categories were combined into any pain = 1 and no pain = 0. All four musculoskeletal pain variables were then added up and the summed variable was expressed as the number of sites with pain (from 0 = no pain in any site to 4 = pain in four sites).

4.2.3 Chronic diseases (STUDY III)

Participants with chronic diseases were identified at the beginning of the subsidized re-employment program from the registers of the Social Insurance Institution on entitlements to special reimbursements for cost of purchased drugs for severe and chronic diseases. To be eligible for this entitlement, a patient must provide a physician's certificate about his or her conditions to the institution, where the application for entitlement is accepted after reviewing that the predefined criteria for the disease and its medication are met. For this study, six common chronic diseases were selected, which were covered in the reimbursement program. The diseases included diabetes, heart disease, arthritis, asthma or chronic obstructive pulmonary disease (COPD), chronic hypertension, and severe mental problems. Each of the chronic diseases was coded as 0 = those without disease, and 1 = those with disease. Participants were also classified into two groups based on whether they had any of the six chronic diseases or whether they had none of the chronic diseases.

4.2.4 Sickness absence (STUDY IV)

Data on sickness absence was obtained from the registers of the Social Insurance Institution. The register contains national records of all compensated sickness absence days. In Finland, sickness absence allowance can be paid to employees, self-employed, full-time students, persons on sabbatical leave or alternation leave, as well as unemployed job seekers. An individual is entitled to receiving sickness absence allowance if he or she is resident in Finland, aged between 16 and 67 years and has been certified by a doctor as being incapable of working based on medical grounds. There is a waiting period of 10 days, which is the day of start of work incapacity plus the following nine working days. The employer is responsible for paying the employee during the first nine days waiting period. If the employee has been working for at least three months before the start of the work incapacity, he or she is paid a full salary during the first nine days waiting period. However,

if he or she has been working for at least one month before the incident of the incapacity, he or she receives 50% of the salary instead. Unemployed job seekers receive unemployment benefit while they are completing the waiting period, so long as they have provided the Social Insurance Institution with a medical certificate concerning their incapacity for work. The Social Insurance Institution takes over the payment of the benefit after the waiting period and up to a maximum period of 300 working days. The length of the paid sick leave is defined by different collective agreements. In the case of a repeated spell for the same illness within a month (30 days) from the day allowance was last paid, the new illness is counted for the previous benefit period. However, if the new illness is not related to the previous case for which the beneficiary is receiving sickness benefit allowance, the Social Insurance Institution considers this as a different case and the allowance is paid after the new waiting period. Therefore, a person may have several sickness benefits during one year (Toivonen, 2012; Thorsen et al., 2015; Kela, 2019). For this study, the total number of sick days for all absences during the six-month participation in the subsidized re-employment program was calculated. The variable was categorized into three: no sickness absence/10 days or less, 11-29 absence days, and 30+ absence days.

4.2.5 Employment status (STUDIES I AND II)

Information on the employment status of the participants was assessed in the three-year follow-up questionnaire and classified into two: re-employed and unemployed. Participants were defined as re-employed if they reported being either employed or self-employed. The unemployed group in Study I included both unemployed job seekers and those out of labor force. In Study II, the group consisted of only those who reported not being in any paid job, but was seeking employment during the follow-up.

4.2.6 Labor market attachment (STUDIES III AND IV)

Data on employment history were obtained from the registers of the Finnish Centre for Pensions. This register details, with accuracy of one-month, the start and end date of all work contracts in both public and private sectors, as well as that of entrepreneurship. All such periods of employment are mandatorily insured according to the earnings-related pension. Starting at the end of the subsidized re-employment program, employment of each individual was followed-up for six years, which was divided into 12 six-month period to enable analysis of the labor market

attachment trajectories. Labor market attachment was defined as the number of months (0-6) as an employee or entrepreneur during the 12-time periods.

4.2.7 Potential confounding variables

In Studies I and II, the questionnaire survey was used to collect information on potential confounding variables. The variables included age (18-29, 30-44, 45-59), gender, educational level (college/university, vocational school, no occupational degree), and marital status (single, married/cohabiting, widowed/divorced). Others were alcohol use, which was elicited with the question 'how often do you drink beer, wine or other alcoholic drinks?' The response was categorized as never/less often, 2-4 times/month, and two or more times/week. Leisure-time physical activity, i.e., frequency of vigorous physical activity lasting at least 15 to 20 minutes, was categorized into three: not at all/only a little, moderate (once a week), and much (twice or more per week). Information on general health status was assessed with the question 'do you have diseases diagnosed by a physician?' Responses (yes or no) to nine somatic diseases that included diabetes, cardiovascular diseases, and respiratory illnesses (with the exception of musculoskeletal diseases) were considered. Participants were classified into two groups based on whether they reported as having any of the nine diseases or whether they had none of the diseases. Depression was measured using the Back Depression Inventory and dichotomized as depressed, and not depressed. Smoking was dichotomized as smokers and none-smokers, and duration of unemployment was grouped as: less than one year; and over one year.

In Studies III and IV, information regarding potential confounding variables were obtained from different registers. Age (18-29, 30-44, and 45-60) and gender variables were obtained from the employers' registers. Educational level (basic, vocational school, and college/university) was retrieved from Statistics Finland, and the data on calendar year in subsidized re-employment was obtained from the register of the Finnish Center for Pensions, and categorized as: 1994-1997, 1998-2001, and 2002-2005, based on the unemployment and subsidized re-employment rate at that time. Information on the ten towns were the participants worked during the follow-up was dichotomized as small (≤ 40 000 inhabitants) and big (>40 000 inhabitants) towns, as used in previous studies (Virtanen et al., 2006). The small towns included Raisio, Naantali, Nokia, Valkeakoski, and Virrat, while the big towns included Tampere, Turku, Oulu, Vantaa and Espoo.

4.3 Data analysis

4.3.1 Descriptive statistics

Frequencies and percentages (Studies I-IV) and histograms (Study I) were used to describe the background characteristics of the study participants. Chi-square statistics were used to test for the differences between groups (Studies I-IV).

4.3.2 Trajectory analysis

Latent class growth model with Zero-Inflated Poisson (LCGM-ZIP) was used to identify clusters (latent classes) of individuals who have followed a similar labor market attachment trajectory during the six-year follow-up period in Studies III and IV. An exploratory approach was employed, whereby as many classes as possible (two through six latent classes) that yielded proper solutions were estimated in the search for the optimum number of labor market attachment trajectory. In each model (k number of classes), a quadratic growth term was specified assuming that labor market attachment would decrease over time after an initial increase. The fit of the model, i.e. k and k-1 models, was compared using four main selection criteria. First, the Bayesian Information Criteria (BIC), where model with lower BIC values indicated a well-fitting model (Kreuter & Muthen, 2008). Second, the Lo Mendell and Rubin Adjusted Likelihood Ratio test (LMR-LRT), where a significant p-value ($p < 0.05$) indicates that the k class fit better than the k-1 class model (Nylund, Asparouhov, Muthen, 2007). Third, the average posterior probabilities of group membership for each class. This measure indicates the classification quality of the classes, where higher values (closer to 1) suggest that the trajectories correctly classifies individuals with similar pattern of labor market attachment, and discriminates between individuals with dissimilar attachment patterns (Andruff et al., 2009). Fourth, the usefulness of the classes in practice (Nagin & Odgers, 2010). Ideally, classes should differ with respect to their trajectory shapes and other explanatory characteristics. They should also be of reasonable sizes (at least five percent) to ensure precision (Muthen & Muthen, 2000; Andruff et al., 2009).

4.3.3 Regression analysis

Figure 2 illustrates potential relationship between all explanatory variables and re-employment/labor market attachment. Logistic regression was used to study the influences of

muscular fitness (Study I) and musculoskeletal pain (Study II) on re-employment, while multinomial logistic regression was used to study the influences of chronic diseases (Study III) and sickness absence (Study IV) on labor market attachment trajectories of long-term unemployed job seekers.

In Study I, unadjusted model was initially fitted in order to assess the association between each muscular fitness (repetitive lift, sit-ups and squats) performance and re-employment. Thereafter the model was adjusted model for age and gender.

In Study II, the association between musculoskeletal pain and re-employment was analyzed both with a complete-case (i.e., those who participated in both baseline and three-year follow-up, n = 284) and multiple imputation (i.e., imputation of data of the three-year follow-up for those who did not participate in the follow-up) analyses. Before conducting multiple imputation analysis, a chi-square test of differences between respondents and non-respondents at the three-year follow-up was conducted in order to test the plausibility of missing at random (MAR) assumption. It should be noted, however, that MAR assumption is impossible to test, and that a test of differences between groups, although is recommended as a possible plausibility test, do not provide a definitive evidence of MAR (Dong and Peng, 2013). This does call for a particular care in the interpretation of the results from multiple imputation, although estimates from multiple imputed data are said to be largely unbiased and valid (Pedersen et al., 2017). In the complete-case analysis, the modelling was performed in three steps: the unadjusted model (Model I) estimated the associations of the various localized pains as well as the number of pain sites and re-employment. The adjusted models included potential confounders in the model, with Mode II simultaneously adjusting for age, gender, educational attainment, and marital status. Model III additionally adjusting for the duration of unemployment, alcohol use, smoking, physical activity, somatic diseases, depression, and participation in CHC. An interaction term between musculoskeletal pain and participation in CHC was also examined in Model III, in other to assess whether participation in CHC was a potential effect modifier. In the multiple imputation analysis, 20 imputed datasets were created. All variables that were used in the complete-case analysis were included in the imputation model, irrespective of whether they had missing or not. After the imputation, Model III was repeated with the imputed data. An interaction term between musculoskeletal pain and participation in CHC was also investigated. All potential confounding variables were selected based on their relations with the exposure and the outcome in the present study and based on earlier findings.

In Study III, the association between each of the six chronic diseases and labor market attachment was first estimated; thereafter the model was adjusted for age, gender, educational level, size of town, and calendar year in subsidized re-employment program.

In Study IV, the association between sickness absence and labor market attachment was analyzed in both unadjusted and adjusted multinomial logistic regression. The adjusted model included all covariates in Study III, and chronic disease (with any diseases versus without disease). Age and gender were also examined as potential effect modifiers, by entering an interaction term between sickness absence and each of the variables in the adjusted model. Where the interaction term was significant ($p < 0.05$), the analysis was stratified and the stratum-specific estimates were calculated.

Results from all the regression analyses were presented as odds ratio (OR) with their 95% confidence interval (95% CI), and their statistical significance were defined as the two-sided p-value of < 0.05. All descriptive and regression analyses were performed with IBM SPSS Statistics versions 17 (Study I), 20 (Study II), and 23 (Studies III & IV). Mplus version 7 was used for the trajectory analysis in Studies III and IV. Stata version 13 was used for the multiple imputation analysis in Study II.

5. RESULTS

5.1 Background characteristics of the study populations

STUDY POPULATIONS I AND II

The background characteristics of study populations I and II are presented in Table 4. Half of the participants (50%) in Study I were re-employed by the end of the three-year study follow-up. Older participants, men, and individuals who had somatic diseases at baseline were less likely to regain employment. In Study II, 55% of the participants were re-employed by the end of the follow-up. Older participants were also less likely to be re-employed likewise those with lower educational attainment, and those who were either widowed or divorced.

STUDY POPULATIONS III AND IV

The participants in Studies III and IV consisted largely (70%) of individuals who had their subsidized re-employment between 1994 and 1997. Most of them (89%) worked in big towns, and were females (70%). Half of them (50%) had vocational educational qualification (Table 6).

Based on the information criteria (Table 5), a four-trajectory solution was the best to describe the different labor market attachment trajectories over the six-year follow-up period (Figure 3). The trajectories were characterized by trajectory 1- those who maintained a relatively stable attachment throughout the follow-up time (which was named 'strengthening', 77%); trajectory 2- those with initial weak attachment that steadily increased after 36 months (named 'delayed', 6%), trajectory 3- those whose attachment declined with time (named 'leavers', 10%), and trajectory 4- those who had a very weak attachment throughout the study period (named 'none attached', 7%). The two last trajectories are referred to as poor attachment trajectories. Participants who were aged between 45 and 60 years were more likely to belong in the poor attachment trajectories, likewise those who were males, those who worked in big towns, those with lower educational attachment, and those who participated in the subsidized re-employment program after 1997 (Table 6).

Table 4. Distribution of re-employment by background characteristics of the study participants for Studies I and II

	Study I			Study II		
	Total N = 130 n (%)	Re-employed at 3-year follow-up (n = 65) n (%)	p-value	Total N = 284 n (%)	Re-employed at 3-year follow-up (n = 156) n (%)	p-value
Age (years)			0.012			0.001
18-29	29 (22.3)	18 (62.1)		68 (23.9)	46 (67.6)	
30-44	59 (45.4)	34 (57.6)		127 (44.7)	75 (59.1)	
45-59	39 (30.0)	12 (30.8)		80 (28.2)	31 (38.8)	
Missing	3 (2.3)			9 (3.2)		
Gender			0.045			0.222
Male	47 (36.2)	18 (38.3)		89 (31.3)	44 (49.4)	
Female	83 (63.8)	47 (56.6)		194 (68.3)	111 (57.2)	
Missing				1 (0.4)		
Educational attainment			0.067			0.051
No occup. education	45 (34.6)	17 (37.8)		93 (32.7)	43 (46.2)	
Vocational school	55 (42.3)	30 (54.5)		120 (42.3)	68 (56.7)	
College/university	28 (21.5)	18 (64.3)		64 822.5)	42 (65.6)	
Missing	2 (1.5)			7 (2.5)		
Marital status			0.298			0.046
Single	41(31.5)	20 (48.8)		82 (28.9)	40 (48.8)	
Married/cohabiting	76 (58.5)	41 (53.9)		170 (59.9)	103 (60.6)	
Widowed/divorced	13 (10.0	4 (30.8)		30 (10.6)	12 (40.0)	
Missing				2 (0.7)		
Duration of unemployment			0.192			0.093
Less than one year	87 (66.9)	47 (54.0)		190 (66.9)	111 (58.4)	
More than one year	43 (33.1)	18 (41.9)		94 (33.1)	45 (47.9)	

Table 4 continued.

	Study I			Study II		
	Total N = 130 n (%)	Re-employed at 3-year follow-up (n = 65) n (%)	p-value	Total N = 284 n (%)	Re-employed at 3-year follow-up (n = 156) n (%)	p-value
Alcohol use			0.334			0.879
Never/once/month	46 (35.4)	27 (58.7)		113 (39.8)	60 (53.1)	
2-4 times/month	61 (46.9)	28 (45.9)		128 (45.1)	72 (56.3)	
2 or more times/month	23 (17.7)	10 (43.5)		43 (15.1)	24 (55.8)	
Smoker			0.271			0.679
No	84 (64.6)	45 (53.6)		179 (63.0)	100 (55.9)	
Yes	46 (35.4)	20 (43.5)		105 (37.0)	56 (53.3)	
Leisure-time physical activity			0.100			0.774
Much	41 (31.5)	25 (61.0)		91 (32.0)	50 (54.9)	
Moderate	33 (25.4)	18 (54.5)		70 (24.6)	41 (58.6)	
Not at all or only a little	51 (39.2)	20 (39.2)		111 (39.1)	59 (53.2)	
Missing	5 (3.8)			12 (4.2)		
Somatic diseases			0.008			0.118
No¨	69 (53.1)	41 (59.4)		153 (53.9)	90 (58.8)	
Yes	54 (41.5)	19 (35.2)		110 (38.7)	54 (49.1)	
Missing	7 (5.4)			21 (7.4)		
Depression			0.112†			0.082
No	120 (92.3)	63 (52.5)		253 (89.1)	144 (56.9)	
Yes	6 (4.6)	1 (16.7)		17 (6.0)	6 (35.3)	
Missing	4 (3.1)			14 (4.9)		

† *P*-value from Fisher's exact test

Figure 2. Diagram illustrating assumed association between health-related explanatory variables and re-employment/labor market attachment among unemployed people

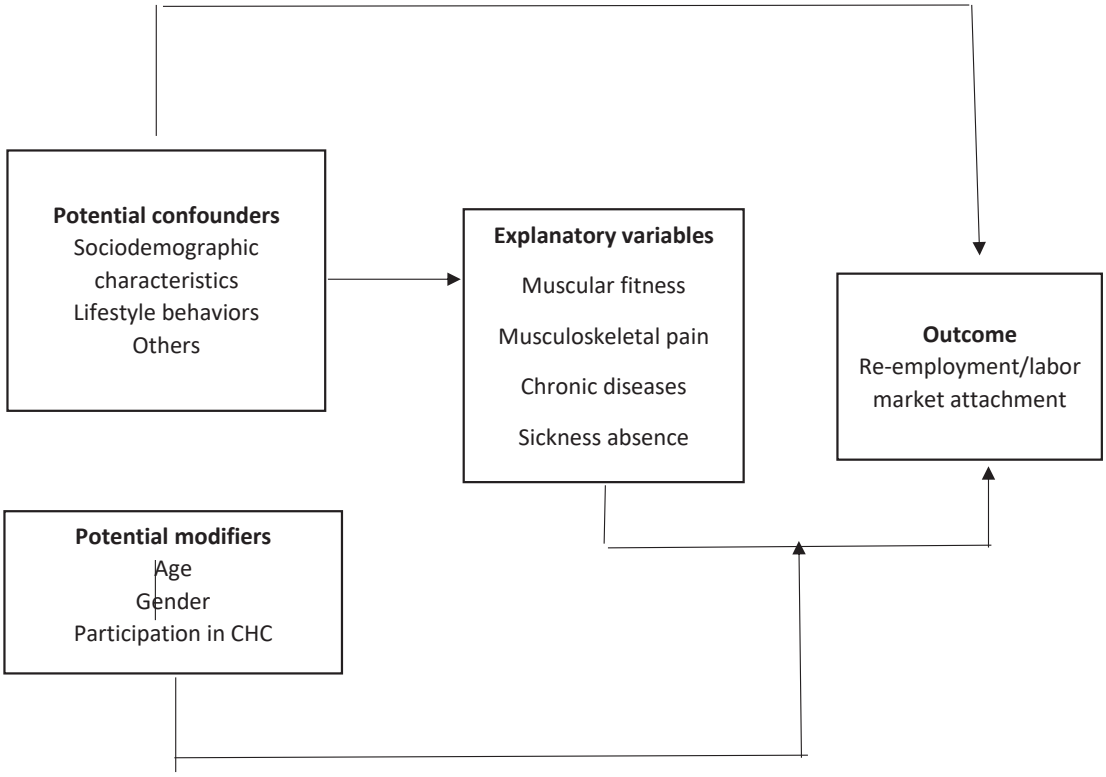
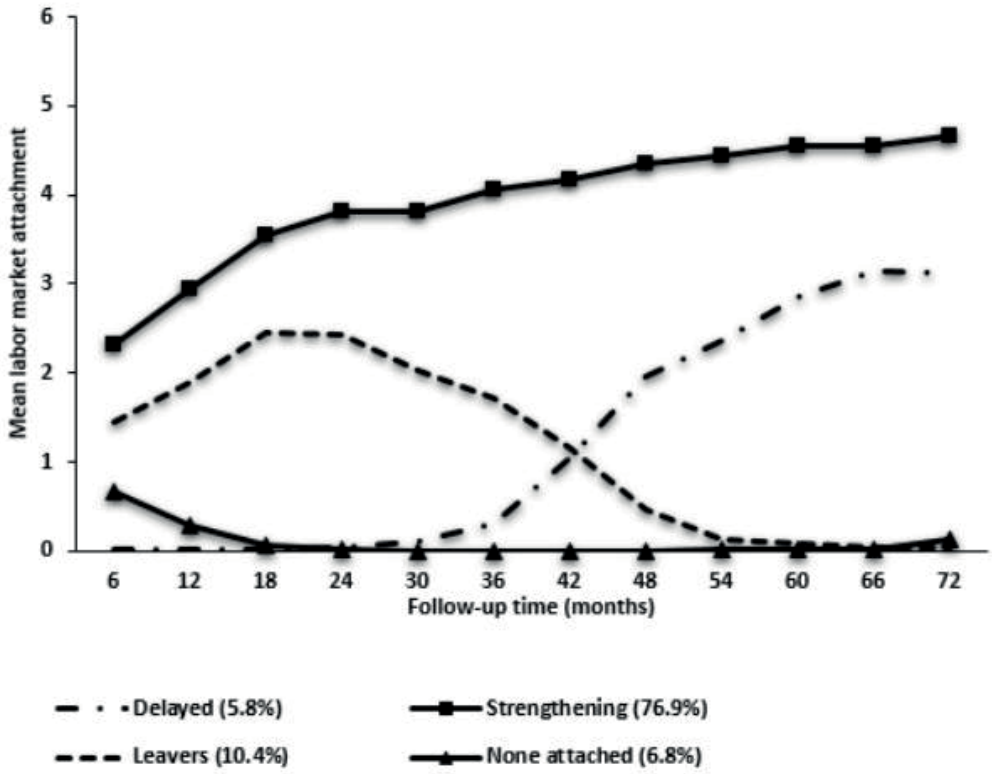


Table 5. Model fit statistics and class proportions of the quadratic LCGM-ZIP with two to six trajectory classes (n = 18,944)

Classes	BIC	Class proportions	Posterior Probabilities	LMR-LRT p-value
2	862341.942	0.87, 0.13	0.997, 0.981	0.0000
3	852166.103	0.07, 0.12, 0.81	0.973, 0.953, 0.994	0.0000
4	846412.297	0.06, 0.77, 0.10, 0.07	0.927, 0.991, 0.954, 0.978	0.0000
5	841777.001	0.06, 0.19, 0.05, 0.10, 0.60	0.976, 0.776, 0.931, 0.949, 0.928	0.0000
6	837861.118	0.06, 0.09, 0.05, 0.59, 0.05, 0.16	0.964, 0.889, 0.923, 0.928, 0.955, 0.767	0.0000

LCGM-ZIP, Latent Class Growth Analysis with Zero-Inflated Poisson

Figure 3. Labor market attachment trajectories of re-employed people during the six-year follow-up time (n = 18,944)



5.2 Distribution of explanatory variables

MUSCULAR FITNESS AND MUSCULOSKELETAL PAIN AMONG PARTICIPANTS IN STUDIES I AND II.

In Study I, 83, 95 and 102 subjects participated in the dynamic lift test, sit-up test, and squatting test respectively. Most of the participants performed poorly in all three tests examined: lift (40%), sit-up (60%) and squatting (42%) (data not shown). Males tended to perform worse than females in all the tests, while older participants tended to perform worse compared to younger participants in the squatting test (data not shown).

In Study II, in the week preceding the baseline measurement, 147 (52%) of the participants reported mild-to-severe pain in the hands/upper extremities, 195 (69%) in the neck/shoulders, 154 (52%) in the lower back, and 141(50%) in the feet/lower extremities. Over half of the respondents (59%, n = 168) had concurrent pain in two or more sites. Participants with somatic disease were more likely to report pain than those without somatic disease, regardless of the pain type. Reporting pain also increased with decreasing participation in vigorous physical activity although the differences were significant only for low ($p = 0.016$) and lower extremities ($p = 0.047$) (data not shown)

CHRONIC DISEASE AND SICKNESS ABSENCE AMONG PARTICIPANTS IN STUDIES III AND IV

In Study III, 1,567 (8.3%) out of the 18,944 participants had at least one chronic disease in the beginning of the subsidized re-employment program. Of the 1,567, 190 (1.0%) had diabetes, 46 (0.2%) had heart disease, 130 (0.7%) had arthritis, 562 (3.0%) had asthma or COPD, 642 (3.4%) had chronic hypertension, and 100 (0.5%) had severe mental problems. Chronic disease tended to be more common among older than younger participants and those who had lower than higher educational attainment, and less common among those who participated in the subsidized re-employment between 1994 and 1997 than among those who had their subsidized re-employment after 1997 (data not shown).

In Study IV, 1,173 (6.2%) out of the 18,944 participants had a sickness absence lasting at least more than 10 days during the six months participation in the subsidy program. Of the 1,173, 60% had sickness absence lasting between 11 and 29 days, while 40% had 30+ sickness absence days. Having > 30 sickness absence days tended to increase with increasing age and decreasing educational attainment. The proportion of people having >30 sickness absence days

was least among those who participated in the subsidized re-employment program between 1994 and 1997 than those who did participated after 1997 (Table 7).

Table 6. Distribution of labor market attachment by background characteristics of the study participants in Studies III & IV

	Trajectories of labor market attachment during the six-year follow-up					
	Total N = 18,944	Strengthening (n = 14577) n (%)	Delayed (n = 1101) n (%)	Leavers (n = 1970) n (%)	None attached (n = 1296) n (%)	p-value
Age						< 0.001
18-29	9924 (52.4)	7759 (78.2)	680 (6.9)	905 (9.1)	580 (5.8)	
30-44	6662 (35.2)	5390 (80.9)	363 (5.4)	565 (8.5)	344 (5.2)	
45-60	2358 (12.4)	1428 (60.6)	58 (2.5)	500 (21.2)	372 (15.8)	
Gender						< 0.001
Male	5555 (29.3)	3974 (71.9)	404 (7.3)	662 (11.9)	515 (9.3)	
Female	13389 (70.7)	10603 (79.2)	697 (5.2)	1308 (9.8)	781 (5.8)	
Educational level						< 0.001
Basic	5251 (27.7)	3607 (68.7)	371 (7.1)	708 (13.5)	565 (10.8)	
Vocational Sch.	9525 (50.3)	7436 (78.1)	588 (6.2)	951 (10.0)	550 (5.8)	
College/uni.	4168 (22.0)	3534 (84.8)	142 (3.4)	311 (7.5)	181 (4.3)	
Calendar year in subsidized re-employment						< 0.001
1994-1997	13174 (69.5)	10127 (76.9)	882 (6.7)	1303 (9.9)	862 (6.5)	
1998-2001	4158 (21.9)	3227 (77.6)	153 (3.7)	478 (11.5)	300 (7.2)	
2002-2005	1612 (8.5)	1223 (75.9)	66 (4.1)	189 (11.7)	134 (8.3)	
Size of town						0.015
Small	2329 (12.3)	5402 (77.6)	386 (5.5)	742 (10.7)	428 (6.2)	
Big	16615 (87.7)	9175 (76.5)	715 (6.0)	1228 (10.2)	868 (7.2)	
Chronic disease†						< 0.001
No	17377 (91.7)	14577 (77.5)	1024 (5.9)	1746 (10.0)	1144 (6.6)	
Yes	1567 (8.3)	1114 (71.1)	77 (4.9)	224 (14.3)	152 (9.7)	

† Used only in Study IV

Table 7. Distribution of sickness absence (SA = sickness absence) by background characteristics (N = 18 944)

	Total SA days	0-≤10 SA days	11-29 SA days	≥30 SA days	p-value
	N (%)	n (%)	n (%)	n (%)	
Age (years)					0.003
18-29	554 (5.6)	9370 (94.4)	329 (3.3)	225 (2.3)	
30-44	469 (7.0)	6193 (93.0)	293 (4.4)	176 (2.6)	
45-60	149 (6.3)	2209 (93.7)	86 (3.6)	63 (2.7)	
Gender					0.110
Male	313 (5.6)	5242 (94.4)	185 (3.3)	128 (2.3)	
Female	859 (6.4)	12 530 (93.6)	523 (3.9)	336 (2.5)	
Educational level					<0.001
Basic	403 (7.7)	4848 (92.3)	245 (4.7)	158 (3.0)	
Vocational school	583 (6.1)	8942 (93.9)	357 (3.7)	226 (2.4)	
College/university	186 (4.5)	3982 (95.5)	106 (2.5)	80 (1.9)	
Year in subsidized re-employment					<0.001
1994-1997	704 (5.3)	12 470 (94.7)	427 (3.2)	227 (2.1)	
1998-2001	324 (7.8)	3834 (92.2)	199 (4.8)	125 (3.0)	
2002-2005	144 (8.9)	1468 (91.1)	82 (5.1)	62 (3.8)	
Have chronic disease					<0.001
No	1034 (6.0)	16 343 (94.0)	633 (3.6)	401 (2.3)	
Yes	138 (8.8)	1429 (91.2)	75 (4.8)	63 (4.0)	
Size of town					0.184
Small	443 (6.4)	2191 (94.1)	93 (4.0)	45 (1.9)	
Big	729 (6.1)	15 581 (93.8)	615 (3.7)	419 (2.5)	

P-value based on Pearson's chi-square test

5.3 Associations between poor health and labor market attachment

MUSCULAR FITNESS AND RE-EMPLOYMENT (STUDY I)

The unadjusted analysis showed that good muscular fitness performance tests (dynamic lift, sit-up and squatting) was associated with increased likelihood of re-employment. After adjusting for age and gender, unemployed individuals whose performance in the dynamic lift test, sit-up, and squatting tests was good were nearly five, seven, and nine times more likely to re-gain employment, respectively, than those whose performance was poor in the fitness tests (Table 8)

MUSCULOSKELETAL PAIN AND RE-EMPLOYMENT (STUDY II)

In the complete-case analysis, the adjusted results showed that severe pain in the lower back and in the feet/lower extremities was associated with over 60% reduced (lower back OR 0.37, 95%CI 0.15-0.92; feet/lower extremities OR 0.38, 95%CI 0.15-0.93) likelihood of re-employment. Having pain in three or four body sites was associated with slightly reduced likelihood of re-employment, although the associations were not statistically significant (Table 9). The interaction term between participation in CHC and musculoskeletal pain was not significant for most pain types except for low back pain. When the analysis was subsequently stratified by participation in the CHC (intervention versus control group), the likelihood of re-employment was lower among those in the control group who had severe low back pain than among those in the intervention group (OR 0.18, 95% CI 0.04-0.77) (data not shown).

The results of the complete-case and multiple-imputation analyses were generally similar (Table 9), except that the confidence intervals for severe feet/lower extremity pain were wider and included one in the multiple imputation analysis (complete-case: OR 0.38, 95% CI 0.15-0.93; multiple imputation: 0.51, 95% CI 0.22-1.16). In addition, the significant interaction effect between low back pain and participation in CHC observed in the complete-case analysis was not seen in the multiple imputation analysis, suggesting that the significant interaction seen in the complete-case analysis may be a chance finding.

CHRONIC DISEASE AND LABOR MARKET ATTACHMENT (STUDY III)

With the exception of asthma, those who had any of the other chronic diseases were more likely to belong in the poor attachment trajectories; however, only the results of hypertension and mental problems were statistically significant. Having hypertension was associated with a 1.4-fold increased odd of belonging in

the "leavers" trajectory, while having severe mental problems was associated with a 3.6-fold and 3-4-fold increased odd of belonging in the "leavers" and "none-attached" trajectories, respectively (Table 10).

SICKNESS ABSENCE AND LABOR MARKET ATTACHMENT (STUDY IV)

The adjusted odds ratios for belonging in the 'none-attached' and 'leavers' trajectories was 5.06 and 1.96, respectively, for those with more than 30 sickness absence days. The corresponding odds ratio for those with 11-29 sickness absence days were 2.10 and 1.27(Table 11). Age modified the association between sickness absence and labor market attachment (*P* value for interaction = 0.005). Whilst having >30 sickness absence days was a risk factor for belonging in the 'none-attached' trajectory for all age-groups, the odds was profoundly higher for participants in ages 18-29 (OR 5.38, 95% CI 3.76-7.69) and 30-44 (OR 7.35, 95% CI 4.85-11.14) than for those in ages 45-60 (OR 2.15, 95%CI 1.67-3.96). Having 11-29 sickness absence days also increased the odds of belonging in the poor attachment trajectories for participants in ages 30-44 ('leavers' trajectory OR 1.86, 95% CI 1.30-2.68; 'none-attached trajectory OR 2.92, 95% CI 1.93-4.41), and in the 'none-attached' trajectory for those in ages 18-29 (OR 2.13, 95% CI 1.47-3.07). However, for participants in ages 45-60, no such risk was observed ('leavers' trajectory OR 1.08, 95% CI 0.62-1.88, 'none-attached trajectory' OR 1.20, 95% CI 0.65-2.22).

Table 8. Associations between baseline muscular fitness and re-employment at three years: Results obtained from binary logistic regression with odds ratio (OR) and 95% confidence interval (95% CI) (Study I)

Muscular fitness test	Re-employment at 3-year follow-up	
	Unadjusted Model OR (95% CI)	Adjusted Model OR (95% CI)
Lift (maximum repetitions)		
Poor	1.00	1.00
Moderate	3.38 (1.21-9.39)	2.82 (0.97-8.23)
Good	4.44 (1.25-15.82)	4.76 (1.27-17.89)
Sit-up (maximum repetitions)		
Poor	1.00	1.00
Moderate	3.54 (1.28-9.79)	3.37 (1.04-10.89)
Good	7.56 (1.53-37.29)	6.64 (1.19-36.83)
Squatting (maximum repetitions)		
Poor	1.00	1.00
Moderate	3.54 (1.41-8.88)	2.99 (0.99-9.02)
Good	9.81 (2.75-34.88)	8.74 (2.29-33.32)

Odds ratio adjusted for age and gender

Table 9. Associations between baseline musculoskeletal pain and re-employment at three years: Results obtained from binary logistic regression with odds ratio (OR) and 95% confidence interval (95% CI) (Study II)

	Re-employment at three-year follow-up OR (95%CI)			
	Complete-case analysis (N = 284)			Multiple imputation model (N = 539)
	Model I[a]	Model II[b]	Model III[c]	Model III
Hands/upper extremity				
None	1.00	1.00	1.00	1.00
Mild	0.84 (0.48-1.47)	1.45 (0.76-2.73)	1.40 (0.69-2.87)	1.22 (0.67-2.20)
Severe	0.54 (0.28-1.02)	0.63 (0.31-1.27)	0.63 (0.28-1.38)	0.54 (0.27-1.09)
Neck/shoulder				
None	1.00	1.00	1.00	1.00
Mild	0.93 (0.51-1.66)	1.01 (0.52-1.94)	0.87 (0.42-1.81)	1.05 (0.50-2.23)
Severe	0.78 (0.41-1.49)	0.72 (0.35- 1.49)	0.99 (0.44-2.24)	0.72 (0.41-2.32)
Low back				
None	1.00	1.00	1.00	1.00
Mild	0.92 (0.53-1.60)	1.11 (0.61-2.04)	0.96 (0.48-1.90)	1.07 (0.50-2.29)
Severe	0.41 (0.21-0.83)	0.40 (0.18-0.88)	0.37 (0.15-0.92)	0.35 (0.16-0.78)
Feet/lower extremity				
None	1.00	1.00	1.00	1.00
Mild	0.73 (0.42-1.25)	1.10 (0.60-2.01)	1.20 (0.60-2.40)	1.05 (0.48-2.29)
Severe	0.41 (0.20-0.82)	0.46 (0.21-0.98)	0.38 (0.15-0.93)	0.51 (0.22-1.16)
No. of musculoskeletal pain sites				
0	1.00	1.00	1.00	1.00
1	0.99 (0.45-2.16)	082 (0.36-1.88)	0.85 (0.35-2.10)	0.86 (0.40-1.84)
2	1.04 (0.48-2.22)	1.26 (0.55-2.88)	1.57 (0.61-4.02)	1.05 (0.48-2.27)
3	0.48 (0.23-0.99)	0.58 (0.26-1.29)	0.86 (0.35-2.09)	0.68 (0.31-1.47)
4	0.51 (0.27-0.99)	0.72 (0.35-1.49)	0.69 (0.29-1.61)	0.66 (0.33-1.32)

a Unadjusted model

b Adjusted for age, gender educational attainment, and marital status

c Adjusted for Model II + duration of unemployment, participation in CHC, alcohol use, smoking, physical activity, somatic diseases and depression

Table 10. Adjusted associations between chronic diseases and labor market attachment trajectories: results obtained from multinomial logistic regression with Odds ratio (OR) and their 95% confidence interval (95%CI) (Study III)

	Labor market attachment trajectories during the 6-year follow-up		
	Delayed vs. strengthening	Leavers vs. strengthening	None-attached vs. strengthening
	OR (95%CI)	OR (95%CI)	OR (95%CI)
With any chronic disease	1.06 (0.83-1.35)	1.27 (1.08-1.49)	1.27 (1.05-1.54)
Diabetes	1.25 (0.69-2.28)	1.47 (0.97-2.22)	1.26 (0.75-2.10)
Arthritis	0.48 (0.15-1.51)	1.26 (0.74-2.14)	1.39 (0.75-2.59)
Asthma	1.18 (0.83-1.68)	1.06 (0.80-1.40)	0.78 (0.53-1.15)
Hypertension	0.81 (0.52-1.26)	1.13 (0.89-1.43)	1.37 (1.06–1.77)
Heart disease	1.81 (0.54-6.01)	1.19 (0.53-2.67)	1.70 (0.75-3.85)
Severe mental problems	1.19 (0.43-3.30)	3.61 (2.23–5.37)	3.41 (1.91–6.10)

Odds ratio adjusted for age, gender, educational level, size of town, and calendar year in subsidized re-employment program

Table 11. Association between sickness absence and labor market attachment trajectories: results obtained from multinomial logistic regression with Odds ratio (OR) and their 95% confidence interval (95%CI) (Study IV)

	Trajectories of labor market attachment during the 6-year follow-up		
	Delayed vs. strengthening	Leavers vs. strengthening	None-attached vs. strengthening
Sickness absence (days)	OR (95%CI)	OR (95%CI)	OR (95%CI)
Unadjusted Model			
No / less than 11	1.00	1.00	1.00
11-30	1.76 (1.33-2.31)	1.29 (1.01-1.63)	2.08 (1.63-2.65)
> 30	2.54 (1.84-3.50)	1.96 (1.49-2.58)	4.98 (3.92-6.32)
Adjusted Model			
No / less than 11	1.00	1.00	1.00
11-30	1.79 (1.36-2.36)	1.27 (1.00-1.62)	2.10 (1.64-2.79)
> 30	2.64 (1.91-3.65)	1.96 (1.48-2.60)	5.06 (3.95-6.49)

Odds ratio adjusted for age, gender, educational level, and year in subsidized re-employment, size of town, and chronic diseases

6. DISCUSSION

6.1 Summary of findings

The results of the studies included in this thesis showed that, among unemployed people who participated in active labor market policy measures, those with poor compared to those with good muscular fitness were less likely to regain employment after three years of follow-up. Those with severe low back pain were also less likely to regain employment than those with no low back pain.

The studies also identified four distinct labor market attachment trajectories during the six-year follow-up of participants who took part in the state subsidized re-employment program. The trajectories were labelled 'strengthening', 'delayed', 'leavers, and 'none-attached'. Although 77% of the participants assumed the trajectory of strengthening attachment, 17% belonged in the poor attachment trajectories (i.e. leavers and none-attached).

Participants with severe mental health problems at baseline were more likely to belong in the poor labor market attachment trajectories than those without mental health problems at baseline. Having other somatic diseases did not appear to significantly influence membership of any of the attachment trajectories. Medically certified sickness absence during participation in the state subsidized re-employment program was associated with poor labor market attachment trajectories during the six-year follow-up. Age modified the association between sickness absence and labor market attachment, so that younger unemployed people with sickness absence were more likely to have poor labor market attachment than older unemployed people.

6.2 Strengths and limitations of the study

Major strengths of the studies include the longitudinal design and the use of specific health indicators, which provided the opportunity to evaluate the role of different chronic diseases in determining future employment outcomes among unemployed people. Assessment of chronic diseases were based on registered data from the special re-imbursement program, which has been established for a long time and is popular among physicians, pharmacist, and citizens. The measurement of employment outcomes at multiple times (in Study III) and the use of labor market attachment trajectories as an outcome in Studies III and IV is another strength of this study. Clearly, this approach provided a more dynamic perspective to the discourse on labor market experience of unemployed job seekers than that commonly seen in the wider literature.

As a limitation, the findings from this study may not be extrapolated to unemployed population in general since the sample consisted of a selected group of long-term unemployed people, i.e., those participating in active labor market policy measures. However, on the average, they may be regarded as a representative sample of unemployed people in Finland given that they were pooled from different localities in Finland with varying recruitment criteria.

The small sample size in Study I and to some extent in Study II is also another limitation of this study. Decrease in the Study I sample was mainly because participation in the muscular test was restricted to participants within the intervention arm of the study. In Study II, we evaluated the effect of several covariates and conducted multiple imputation analysis in order to appraise the extent of bias due to missing data. The results from the multiple imputation analysis were mostly similar to that of complete-case analysis but there were some differences in the magnitude and precision of the estimates. These differences may be due to residual confounding. The general recommendation is to include in the imputation model, all variables that are (a) of theoretical interest (b) associated with the missing mechanism and (c) correlated with the variables with missing data in order to make the MAR assumption more plausible and to estimate missing values more precisely (Dong and Peng, 2013). In our study, all the variables that were used in the complete-case analysis were entered in the multiple imputation model but there could be other unmeasured determinants of re-employment that may have been of importance in the study, e.g., self-rated general health.

Another potential limitation is the use of baseline measures to assess future employment outcomes. This approach may suggest that we assumed that the health status (e.g. muscular fitness and musculoskeletal pain status) of unemployed people, and the differences in it, remained constant throughout the follow-up; thus, may not have been influenced by the participants' differential exposure to the health benefits of the ALMP measures during follow-up. Whilst it is possible that there would have been a change in the health status over time, we think that the level of change would not have been substantial to the extent of explaining away our findings, since unemployed people seldom experience dramatic changes in health status over a short time (Bartley, Sacker and Clarke, 2004; Schuring et al., 2007). A longitudinal analysis of changes during follow-up would have provided basis for substantiating this claim, but this was not feasible in our case due to the low number of observations in subsequent measurement points.

Data on exposure and outcome variables in Studies III and IV were derived from the register, but that of Studies I and II were based on self-report measurements, which may introduce information bias. However, self-reporting of musculoskeletal pain is usually reliable (Kuorinka et al., 1987) and commonly used for pain studies (Mirada et al., 2010; Natvig, Eriksen,

& Bruusgaard, 2002). Moreover, the time into the past (one-week) participants were asked to recall any pain was short and therefore the potential for recall bias should be minimal.

In Studies III and IV, we did not have data on the nature of employment contracts of the participants during the follow-up; hence, it was difficult to distinguish between permanent and temporary jobs or between full-time and part-time employment. Given that behavioral factors and other health parameters, such as musculoskeletal problems, anxiety and depressive disorders, were not covered in the re-imbursement scheme, these factors could not be adjusted for in Studies III and IV.

Study III was restricted to the chronic diseases that were covered in the re-imbursement program, which does not give an exhaustive list of the diseases that could affect labor market participation. In Study IV, we used long-term sickness absence as a proxy for poor health, but the measure has been criticized as a pure indicator of health on the basis that other non-health related factors such as availability of financial benefits and fluctuations in the business cycle, can also influence sickness absence behavior (Nordberg & Røed , 2009; van Amelsvoort, Jansen & Kant, 2017). However, Askildsen and colleague (2000) have suggested that unemployment may have a disciplining effect on the sickness absence behavior of unemployed people. By comparing the influence of business cycle on the sickness absence behavior of marginal (those working very few hours, were unemployed or were outside the labor force) and non-marginal (those with more stable labor market attachment) workers, they found that non-marginal workers tended to change their behavior and increase their sickness absence during period of economic upturn, whereas marginal workers had the lowest sickness absence probability during the period of observation. These findings have been corroborated by Virtanen et al. (2004), in which they found that permanent employees had higher absence rate than temporary employees during a period of economic upturn in Finland.

6.3 Comparisons of results with previous findings and interpretation of findings

For better comparison of the present study findings to previous studies, it is important to highlight the context in which the data collection for the studies included in this thesis were undertaken, which occurred between 1994 and 2005. Finland experienced deep economic recession at the beginning of the 1990s, consequently, unemployment rate plummeted from 3% in 1990 to 18% in 1994. Since then, the unemployment rate in Finland has been declining until in 2008 when the global economic crisis occurred (Statistics Finland, 2010; OECD, 2019). The period of collection of the study data thus falls within the period of economic recovery. Therefore, the question is

whether the study has any contemporary application. Considering the current trends in unemployment as well as findings from studies conducted before and after the 2008 recession, will help to answer this question.

The economic crisis in 2008 led to increase in unemployment rate around the world (ILO, 2010). In the EU-28, unemployment rate rose from 7% in 2008 to 11% in 2013. The rate has since been declining such that by the end of 2018, an average of 7% of people were unemployed, although marked variations exist across countries (OECD, 2019). Since the recession, several studies have examined health selection in the labor market. A study by Wagenaar et al. (2015) showed that workers reporting decreased work performance due to impaired health at baseline (in 2010) were less likely to regain employment two years after being dismissed than workers whose work performance were never or rarely hampered by poor health. Another study by Jørgensen et al. (2019) found that unemployed people with drinking problem and who consumed high amounts (35+ drinks per week) of weekly alcohol at baseline (in 2010) were less likely to regain employment five years later than those who consumed 1-6 drinks per week and with non-problem drinking. Heggebø and Dahl (2015) investigated health selection in 28 European countries using cross-sectional data from 2007 (pre-crisis) and 2011 (post-crisis). According to their findings, in countries with a high and increasing overall unemployment rate (countries with > 10% unemployment rate in 2011 or where unemployment rate doubled from 2007 to 2011), people with ill health were found to experience unemployment to a lower extent than people with good health. However, in countries where the economic crisis had minimal (1.0%-2.5% increase) or intermediate impact (2.6%-5.0% increase), people with ill were more likely to become unemployed than those with good health. They also suggested that most countries in Europe belonged to the countries with minimal or intermediate crisis, where poor health is expected to have significant impact on selection in the labor market. Therefore, the findings of studies in this thesis, which generally support health selection in the labor market, are relevant and applicable to contemporary situation across most European countries.

Research on the role of muscular fitness in re-employment are scarce; therefore, further studies would be required to confirm our findings. Nevertheless, when compared to the few existing studies, our findings that people with severe lower back pain are less likely to regain employment than those without are in agreement with the studies of Straaton et al. (1996), Yelin, Trupin & Sebasta (1999), and Virtanen, Janlert & Hammarström (2013), which all showed that musculoskeletal pain decreased the chance of re-employment. We found that pain in the lower back was associated with a reduced likelihood of re-employment, while pain in other body regions (hands/upper extremities, neck/shoulders, and lower extremities) was not. An explanation for this

finding may be that low back pain might have persisted during periods of unemployment and thus, discouraged the motivation for seeking for employment. The occurrence of low back pain is not only associated with work-related factors, but also with psychological (anxiety, depression, emotional instability) and lifestyle-related (smoking and excess body weight) factors (Woolf & Pfleger, 2003), which are common among unemployed individuals (Theodossiou, 1998; Bartley, 1994). Moreover, pain in the lower back is suggested to be highly recurrent and rarely resolves (Woolf & Pfleger, 2003), and may therefore be associated with activity restrictions (Haukka et al., 2013).

Our trajectory analysis did not produce a group with full, i.e., six-month labor market attachment: at best, in those assuming the trajectory of 'strengthening attachment', the employment rate remained at the level of four months. Thus, it can be concluded that subsidized re-employment may lead to permanent full employment relatively seldom, even if the health and work ability of the participants are optimal.

The association between severe mental problems and poor labor market attachment trajectories is consistent with findings from previous studies (Claussen, 1999; Claussen, Bjørndal & Hjort, 1993), which showed that long-term unemployed people with physician-diagnosed mental disorders are less likely to regain employment than people with no mental disorders. We found that the impact of chronic somatic diseases on labor market attachment was lower than the impact of mental problems; additionally, only the association, between hypertension and non-attached trajectory was statistically significant. These findings are in agreement with previous studies that found no significant association between diagnosed somatic diseases (Claussen, 1999) or register-based prescription medicine for somatic diseases (Svane-Peterson & Dencker-Larsen, 2016) and re-employment.

Further findings from our study was that sickness absence was associated with subsequent poor labor market attachment in a dose-response manner, so that increasing number of sickness absence days was associated with greater risk. Previous research on the association between previous sickness absence and re-employment is scarce, perhaps due to difficulty in accessing sickness absence during unemployment. However, long-term sickness absence days are often regarded as indicators of ill health (Marmot et al., 1995), mostly due to serious health conditions (Kivimäki et al., 2008). Our findings that sickness absence is associated with greater likelihood of belonging in the non-attached trajectory agrees with observations from previous studies (Schuring et al., 2007, Schuring et al., 2013, Carlier et al., 2014, Svane-Peterson & Dencker-Larsen, 2016), which showed poor health reduces the likelihood of re-employment. Beyond this, our finding that sickness absence increased the chance of belonging in the leavers trajectory also

shows that poor health could constitute a risk factor for unemployed people who regained employment immediately after the subsidized re-employment period.

Younger individuals tend to have fewer long-term sickness absence (Sumanen et al., 2015) and better chances of re-employment than older persons (Schuring et al., 2013, Lötters et al., 2013). We found that younger long-term unemployed people with over 30 days of sickness absence were more likely to experience poor labor market attachment than did their older counterparts. Virtanen et al. (2006) had previously reported similar finding, in which they showed that younger temporary employees with high sickness absence were more likely to experience subsequent unemployment, whereas older temporary employees had no such unemployment experience. Knutsson & Goine (1998) stratified sickness absence diagnosis by age and found that psychiatric diseases and allergies were more common among younger individuals, whereas cardiovascular diseases were more common among older people. They reported that musculoskeletal diseases increased from ages 16 to 44 years, and thereafter leveled off. Virtanen et al (2006) suggested that the differences in the diagnoses underlying sickness absence in younger and older people might explain the age-differences in the association between sickness absence and labor market outcomes.

7. CONCLUSIONS AND IMPLICATIONS FOR FUTURE RESEARCH

The results from the studies included in this thesis show that, among unemployed people who participated in an active labor market policy measures in Finland, those with poor health were less likely to re-enter paid job than those with good health. However, the influence of poor health on re-employment varied by type of health conditions. For example, pain in the lower back decreased the chance of re-employment, whereas pain in other body regions (hands/upper body extremities, neck/shoulders, the lower extremities) and multiple pain sites did not influence re-employment. In addition, while severe mental health problems reduced the chance of labor market attachment, such an impact was not seen with other somatic diseases. These findings demonstrate the need to disentangle the specific health problems of unemployed people in order to offer them more targeted interventions that will improve their chances of re-entering paid job. Clearly, this is paramount, especially for those health problems that are modifiable.

Evidence from the present study also suggest that re-employed people tended to follow distinct labor market attachment trajectories over time and that poor health is an obstacle to maintaining favorable employment even after successfully re-entering into paid job. This highlights the problem of work accommodation for sick employees. Sick unemployed people may face a double burden by virtue of their health and unemployment status. Providing them with adequate support, including health care and rehabilitation, is vital in order to enhance their chances of re-employment as well as their chances of maintaining favorable labor market attachment in the long term. Deciding on the kind of support and rehabilitation program that would promote re-employment and favorable labor market attachment of sick unemployed people is critical. Clearly, an understanding of the mechanisms connecting poor health and re-employment/labor market attachment is crucial in designing appropriate interventions. Employer discrimination and reluctance in hiring people with ill health at recruitment are often mentioned as possible mechanisms (Svane-Petersen & Dencker-Larsen, 2016), therefore, future research may benefit from investigating their roles in re-employment/labor market attachment. It is also important to seek out programs and policies that would promote work accommodation of sick employees in order to reduce the risk of poor labor market attachment. Future considerations may include the need to undertake large-scale studies in investigating association between muscular fitness and re-employment in order to confirm the findings of the current study. We were unable to test the synergistic effect of specific disease combinations on labor market attachment due to lack of statistical power. Future studies should consider this relationship as information on specific

combinations of diseases might be beneficial when planning preventive interventions for the unemployed.

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PUBLICATIONS

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I

Muscular fitness and re-employment among unemployed job seekers in Finland: A three-year follow-up study

Nwaru CA, Nygård C-H, Virtanen P

Work 2014;49:559-565

Work 49 (2014) 559–565
DOI 10.3233/WOR-131731
IOS Press

Muscular fitness and re-employment among unemployed job seekers in Finland: A three-year follow-up study

Chioma A. Nwaru*, Clas-Håkan Nygård and Pekka Virtanen
School of Health Sciences, University of Tampere, Tampere, Finland

Received 19 April 2012
Accepted 6 August 2013

Abstract.
BACKGROUND: Research suggests that health is an important determinant of re-employment. However, the association between specific physical health components, such as muscular fitness, and re-employment has not been well studied.
OBJECTIVE: In a three-year follow-up of unemployed people, we investigated whether muscular fitness is associated with re-employment.
METHODS: In 2002–2005, unemployed people ($n = 130$) who were participants in active labour market policy measures were recruited to participate in a Career Health Care (CHC) project. Data on background characteristics and muscular fitness were collected in 2002/2003 using a questionnaire and laboratory measurements. Clientship in the CHC lasted for three years, and at its end, participants' employment status was assessed by a questionnaire. Logistic regression was used to investigate the association between baseline muscular fitness (repetitive lift, sit-ups, and squats) and re-employment after three years.
RESULTS: The probability of re-employment within three years significantly increased with improved performances on muscular fitness tests (lifting, sit-up, and squatting) after adjustment for age and gender.
CONCLUSIONS: Unemployed people with good muscular fitness had increased probability for re-employment as compared to those with poor muscular fitness.

Keywords: Health, selection, Career Health Care, unemployment

1. Introduction

Unemployment has been associated with increased risk of morbidity and mortality due to cardiovascular diseases, suicide, mental health problems [1,2], and poor lifestyle behaviors [3]. Re-employment has also been associated with increased health satisfaction [4], and improved mental health [5,6].

The process of re-employment is complex. Several factors may influence re-employment including an individual's socio-demographic characteristics [7], social and labour market policies [8], previous unemployment spell [7], and the local unemployment rate [9]. The impact of health is also highlighted, and in some cases, has been considered as a major determining factor for re-employment [10,11].

The impact of health on re-employment is based on the health selection theory that assumes that poor health may reduce the possibility of becoming re-employed [10]. A recent meta-analysis by Paul and Moser [5] showed that health-selection does occur in the labour market and that impaired mental health is one health factor that may reduce the possibility of becoming re-employed. There is also evidence for the selection hypothesis on the account of poor physical

*Corresponding author: Chioma Nwaru, School of Health Sciences, FIN-33014, University of Tampere, Tampere, Finland. Tel.: +358 442019495; Fax: +358 335516057; E-mail: chioma.nwaru@uta.fi.

health [9,12] although these studies were based on self-perceived general health surveys which fail to demonstrate the impact of specific diseases or health problems on re-employment.

Muscular fitness is an important aspect of health that has gained prominence in occupational research in recent times. Muscular fitness had been shown as a useful tool in predicting several health outcomes such as functional limitation in both middle-aged [13] and older populations [14,15], musculoskeletal disorders and injuries [16,17], sickness absence [18], and mortality [19]. The importance of muscular fitness on work ability has also been demonstrated in several past studies among different occupational groups. Nygård et al. [20] showed that of all the components of physical capacity assessed that is cardiorespiratory capacity, musculoskeletal capacity and mental health, only factors describing muscular fitness and endurance correlated significantly with work ability index in a sample of Finnish municipal employees. Pohjonen [21] found that poor results in sit-up, dynamic lifting, squatting, knee extension strength and balance test strongly predicted a high risk for reduced work ability among female home care workers. Smolander et al. [22] also reported a significant correlation between dynamic lifting test results and work ability in male employees in physically demanding jobs.

Muscular fitness is maintained by active physical activity [23]. It is assumed that the unemployed may experience decreased muscular fitness due to imposed inactivity [24]. However, it is not known whether muscular fitness predicts re-employment among the unemployed. Considering the importance of muscular fitness, and its relevance in occupational health research, the present study aimed to investigate the association between muscular fitness (muscle endurance test measures) and re-employment in a three-year follow-up study of unemployed job seekers in Finland.

2. Materials and methods

2.1. Study design and subjects

The data used in the present study is based on the Career Health Care (CHC) project. The CHC was a novel health intervention that was launched between 2002 and 2005 [25]. Its main aim was to tackle the health problems and risk-related to unemployment and atypical work. Its services focused on health promotion and primary prevention with specific health plan adopted from Occupational Health Care (OHC). Six occupational health care nurses from established OHC centers in three localities in southern and central Finland were recruited as providers of CHC services. Unemployed job seekers ($n = 265$) were recruited as clients of CHC. These unemployed people were participants of active labour market policy (ALMP) measures that lasted 3 to 24 months. They were invited to three health check-ups during the CHC project: at the beginning (2002/2003) and end of the ALMP measures and three years after the first contact. During these check-ups, questionnaire surveys on the labour market status, their personal characteristics, and employment history were administered as well as a voluntary laboratory assessment of their muscular fitness status. There were no exclusion criteria for participation in CHC. However, subjects were excluded from participating in the muscular fitness assessment if they had acute pain or disorder in the musculoskeletal system or acute heart disorders.

Subjects who were aged 18 to 59 years, had participated in the muscular fitness assessment at baseline, and had information on their personal or demographic characteristics and employment status at the beginning and end of the three-year follow-up ($n = 130$) were included in the analysis. According to the national practices at the time of the filedwork, no processing by an ethics committee was required of this kind of health services research. However, the study followed the conventional ethical rules of scientific research and especially those applicable to health research. At recruitment, all participants were provided with oral and written information about the study, where it was made explicit that enrolment was voluntary, and did not affect participation in the ALMP and associated benefits. The study had a steering group consisting of representatives of the Finnish Ministry of Labor and the Finnish Ministry of Social Affairs and Health.

2.2. Assessment of muscular fitness

The dynamic muscle endurance of the upper limb and the lower extremities of the subjects were measured at baseline, using a repetitive lift test [24,26]; and repetitive sit-ups and squats [27]. In the lift test, the subjects stood with their feet 15 cm apart and lifted 5-kg (for females) or 10-kg (for males) weights, alternately straight up from shoulder height overhead as many times as possible. The different weights were used for females and males as have been done in previous studies among general non-sporting popula-

tion [24,26]. The maximum repetition for both arms was 50 times. Eighty–three people participated in the lift test (36 males and 47 females). In the sit-up test, the subject was lying in supine position with the knees flexed at 90°, both feet placed flat on the floor and held by the tester (occupational health nurse), and arms stretched towards the knees. The subject was instructed to do an upper trunk curl such that the thenar region touched the kneecaps. The movement was repeated as many times as possible in peaceful but constant position (maximum repetition 50 times). Ninety-five people participated in the sit-up test (36 males and 59 females). In the squatting test, the subject stood feet 15 cm and then asked to squat until the thighs were horizontal and then returned to a standing position. The maximum repetition was 50 times. One-hundred and two people participated in the squatting test (37 males and 65 females).

The outcome for each of the tests was calculated as the number of repetitions accomplished by the subject. A test was stopped if the performance did not fulfill the criteria for proper testing [28] or if the subject were exhausted. Each test was categorized separately for men and women and according to different age groups, based on a 5-point standard reference categorization: 1 = very poor, 2 = poor, 3 = moderate, 4 = good, and 5 = very good [28]. As a result of this subject categorization, the amount of responses within each analysis group was reduced and the data were not evenly distributed across all 5-point response categories. Therefore, to maintain efficiency of the estimates, we collapsed the categories to form a 3-point grouping (i.e. 1 and 2 = poor, 3 = moderate, 4 and 5 = good).

2.3. Questionnaire-based variables

The questionnaire comprised of questions on employment status (measured at three-year follow-up) and on background characteristics (measured at baseline). Employment status was categorized into two: employed or non-employed (including unemployed job seekers and those out of the labour force). The background characteristics which included age, gender, educational level and marital status were also categorized with age categorized into three groups: younger age (18–28), middle age (30–44), and older age (45–59). Educational level was classified as: university or college qualification, vocational school qualification, and no educational qualification. Marital status was categorized as: single, married or cohabiting, and widowed or divorced.

Table 1
Background characteristics of the study subjects

Background characteristics	$n = 130$	%
Age (years)		
18–29	29	23
30–44	59	45
45–59	39	30
Missing	3	2
Gender		
Male	47	36
Female	83	64
Educational level		
No occupational education	45	35
Vocational school	55	42
College/university	28	22
Missing	2	1
Marital status		
Single	41	32
Married/cohabiting	76	58
Widowed/divorced	13	10

2.4. Statistics

Simple frequencies and histograms were used to present descriptive data. Chi-square statistics was used to test for differences in baseline characteristics between participants and non-participants. Logistic regression was employed to study the association between baseline muscular fitness (repetitive lift, sit-ups, and squats) and re-employment measured at three-year follow-up. The initial analysis determined the association between each of the muscular fitness tests and re-employment in a bivariate logistic regression. After that, a multiple logistic regression analysis was performed, adjusting for age and gender. Age and gender were included as covariates because they were significantly related to both the predictor (muscular fitness) and outcome (re-employment) variables in a bivariate logistic regression. For the bivariate and multiple logistic regression analyses odds ratios (OR) are presented with their 95% confidence intervals. Statistical significance was defined as two-sided P value < 0.05. All statistical analyses were carried out with IBM SPSS Statistics 17.

3. Results

To test for possible participation bias, we compared the differences in the background characteristics between study participants and non-participants. A significant difference was found in terms of gender, with females having a higher likelihood of participation than males ($P \leqslant 0.001$). Other characteristics such as

Table 2
Associations between baseline background characteristics and re-employment at three years: Results obtained from bivariate and multiple logistic regression with odds ratio (OR) and 95% confidence interval (95%CI)

Characteristics	OR[a]	95%CI	*p*-value	OR[b]	95%CI	*p*-value
Age (years)			0.01			0.04
18–29	3.68	1.34–10.13		3.34	1.03–10.79	
30–44	3.06	1.30–7.19		1.15	1.24–8.03	
45–59	1.00					
Gender			0.04			0.05
Male	0.47	0.23–0.99		0.45	0.20–1.03	
Female	1.00			1.00		
Educational level			0.07			0.29
No occupational education	1.00			1.00	0.56–3.31	
Vocational school	1.98	0.88–4.41		1.36	0.81–6.55	
College/university	2.96	1.11–7.90		2.29		
Marital status			0.31			0.67
Single	2.14	0.57–8.08		1.34	0.27–6.54	
Married/cohabiting	2.64	0.75–9.30		1.74	0.41–7.33	
Widowed/divorced	1.00			1.00		

[a]Odds ratio obtained from bivariate logistic regression analysis. [b]Odds ratio obtained from multiple logistic regression analysis in which all covariates were simultaneously included in the same model.

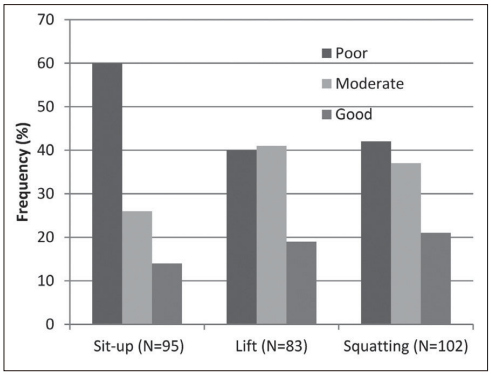

Fig. 1. Frequency distribution of the subjects in each muscular fitness group at baseline.

age, education level, and marital status did not show any significant result (result not shown).

Table 1 shows the baseline characteristics of the study subjects. Most of the subject either were in the middle (46%) or in the older age (31%) groups. Sixty-four percent were females, and 42% had vocational education. The distribution of the subjects' marital status was 32%, 59%, and 10% for single, married/cohabiting and widowed/divorced, respectively. The results in Fig. 1 show that most of the subjects performed poorly in all three tests examined: lift (40%), sit-up (60%), squatting (42%). Half of the subjects (50%) were re-employed by the end of the three-year follow-up (result not shown).

Table 2 shows the associations between baseline background characteristics and re-employment at three-year follow-up. Of all the characteristics, only age was statistically related to re-employment ($P = 0.04$). Being of younger age was associated with increased probability of becoming re-employed.

Table 3 presents the associations between baseline muscular fitness and re-employment at three years. In the bivariate analysis, moderate and good fitness performance in all the muscular fitness tests (lifting, sit-up, squatting) as compared to poor fitness performance were associated with higher likelihood of re-employment after three years. This effect remained even after controlling for age and gender, particularly for good performance compared to poor performance. Unemployed subjects whose performance in the lifting test, sit-up, and squatting tests was good had nearly five, seven, and nine times increased probability for re-employment, respectively, compared to those subjects whose performance was poor in the fitness tests.

4. Discussion

The results of this study suggest that baseline muscular fitness measured as repetitive lift, sit-up and squatting tests significantly predict re-employment after three years irrespective of the subjects' age and gender. In other words, unemployed people with good muscular fitness were more likely to become re-employed as compared to those with poor fitness level.

Table 3
Associations between baseline muscular fitness and re-employment at three years: Results obtained from bivariate and multiple logistic regression with odds ratio (OR) and 95% confidence interval (95%CI)

Muscular fitness test	OR[a]	95%CI	*p*-value	OR[b]	95%CI	*p*-value
Lift (maximum repetitions)			0.02			0.04
Poor	1.00			1.00		
Moderate	3.38	1.21–9.39		2.82	0.97–8.23	
Good	4.44	1.25–15.82		4.76	1.27–17.89	
Sit-up (maximum repetitions)			<0.001			0.03
Poor	1.00			1.00		
Moderate	3.54	1.28–9.79		3.37	1.04–10.89	
Good	7.56	1.53–37.29		6.64	119–36.83	
Squatting (maximum repetitions)			<0.001			<0.001
Poor	1.00			1.00		
Moderate	3.54	1.41–8.88		2.99	0.99–9.02	
Good	9.81	2.75–34.88		8.74	2.29–33.32	

[a]Odds ratio obtained from bivariate logistic regression analysis. [b]Adjusted for age and gender.

These findings are in accordance with several previous studies [9,12,29,30] which showed that health was an important determining factor for re-employment among the unemployed. Good muscular fitness has been previously associated with lower risk of functional limitation [13]. It has also been suggested that muscular fitness tests may be used as a proxy for understanding other aspects of well-being, such as motivation [14]. The association between good muscular fitness and re-employment in the present study could be that unemployed people with good muscular fitness may consider themselves functionally capable to carry out their job demands, and thus more motivated to seek for employment. On the other hand, employers may be more willing to hire high fit job seekers in order to ensure maximum productivity. Previous studies have suggested that poor muscular fitness may incur additional costs to employers due to productivity loss [18].

In this study, lower extremity (squatting and sit-up) measures seemed to be stronger predictors of re-employment than upper extremity measure (lift test) even though all of the test batteries were measurements of muscle endurance. A Canadian study on musculoskeletal fitness and mortality showed that sit-up was an independent predictor of mortality in men and women aged 20 to 69 years, whereas push-ups, an upper extremity measure, was not [19]. A U.S-based study [31] on the relationship between physical performance and risk of disability in older women also showed that lower extremity measures had greater predictive abilities for incident for disability outcomes than the upper extremity measures. Onder et al. [31] suggested that measures of lower extremities seem to capture information of general well-being rather than localized poor function.

Of the demographic characteristics (age, gender, educational level, and marital status) studied, only age was independently related to re-employment, with younger age significantly increasing the likelihood of becoming re-employed. Past studies have reported no relationship between age and re-employment [32], and a positive association between marital status and re-employment [33]. The non-statistical significant associations observed in our study between gender, educational level and re-employment agrees with those of previous studies [29,32].

We may not generalize these findings to the unemployed population at large considering that the subjects in the present study were unemployed people who actively participated in the active labour market (ALMP) measures. Due to their participation in ALMP, it is probable that these subjects may constitute a relatively healthy group that may not be a representative of the general unemployed population.

We may not also assume that the muscular fitness, and the differences in it, remained constant throughout the follow-up. The subjects' differential exposure to the health benefits of ALMP measures may have influenced their muscular fitness level during follow-up. However, it is unlikely that this would have substantially affected our findings considering that the unemployed seldom experience dramatic changes in health status over a short time [9,34]. Moreover, it has been suggested that stable muscular fitness level is maintained mainly if moderate, regular, and diverse physical activity is conducted [23].

The small sample size may have influenced the statistical power of our study. Reduction in the sample size was mainly because participation was voluntary. Nonetheless, the comparison of the background char-

acteristics between those subjects who participated in the study and those who did not showed only minor differences that we think should not substantially affect our findings.

To the best of our knowledge, the present study seems to have been the first to investigate the relationship between muscular fitness and re-employment among the unemployed. In addition, our findings were based on performance fitness measurements, which are likely to give more accurate records of the subjects' fitness status than self-assessed measurement.

5. Conclusions

Our results indicate that unemployed subjects with good muscular fitness (measured as repetitive lift, sit-up and squatting) may be more likely to become re-employed within three years than those with poor muscular fitness. Large-scale studies are needed to investigate if these findings might be replicated.

Acknowledgments

The Career Health Care Project received grants from Academy of Finland (grant no 207515); the Finnish Ministry of Labour; the Ministry of Social Affairs and Health; and the Juho Vainio Foundation.

Authors' contribution

PV and CHN were involved in the data collection. CN analyzed the data and wrote the manuscript. All authors read, revised, and approved the final manuscript.

Conflicts of interest

none declared.

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PUBLICATION
II

Musculoskeletal pain and re-employment among unemployed job seekers: A three-year follow-up study

Nwaru CA, Nygård C-H, Virtanen P
BMC Public Health 2016 16:531
DOI: 10.1186/s12889-016-3200-0

Nwaru et al. BMC Public Health (2016) 16:531
DOI 10.1186/s12889-016-3200-0

BMC Public Health

RESEARCH ARTICLE Open Access

Musculoskeletal pain and re-employment among unemployed job seekers: a three-year follow-up study

Chioma A. Nwaru*, Clas-Håkan Nygård and Pekka Virtanen

Abstract

Background: Poor health is a potential risk factor for not finding employment among unemployed individuals. We investigated the associations between localized and multiple-site musculoskeletal pain and re-employment in a three-year follow-up of unemployed job seekers.

Methods: Unemployed people ($n = 539$) from six localities in southern Finland who participated in various active labour market policy measures at baseline in 2002/2003 were recruited into a three-year health service intervention trial. A questionnaire was used to collect data on musculoskeletal health and background characteristics at baseline and on employment status at the end of the follow-up. We conducted a complete case ($n = 284$) and multiple imputation analyses using logistic regression to investigate the association between baseline musculoskeletal pain and re-employment after three years.

Results: Participants with severe pain in the lower back were less likely to become re-employed. This was independent of potential confounding variables. Pain in the hands/upper extremities, neck/shoulders, lower extremities, as well as multiple site were not determinants of re-employment.

Conclusions: Our findings lend some support to the hypothesis that poor health can potentially cause health selection into employment. There is the need to disentangle health problems in order to clearly appreciate their putative impact on employment. This will allow for more targeted interventions for the unemployed.

Keywords: Unemployment, Musculoskeletal pain, Localized pain, Multiple pain sites, Re-employment

Background

Unemployment has a detrimental effect on the health and well-being of individuals [1], their spouses [2], their children [3, 4], and the public at large [5–7]. Prospective studies have shown that re-employment could improve the health of the unemployed. Evidence of such improvement has been demonstrated in both a five-year [8] and a ten-year [9] follow-up study, where a significant improvement in mental health was reported among the unemployed after they re-entered paid employment. Schuring et al. [10] and Carlier et al. [11] also demonstrated that re-employment improved physical health, hence suggested that labour force participation should be considered as a therapeutic measure within the health promotion framework for the unemployed.

Poor health is an important risk factor for not finding employment. According to the health selection theory, unemployed persons with poor health may be less likely hired by prospective employers, thus are at risk of being selected into prolonged spell of unemployment [8, 12]. Many studies have investigated health selection using mental or physical health as determining factors. Findings regarding mental health are inconsistent. In a two-year follow-up study in Norway, mental disorders and physician-diagnosed psychiatric syndromes or personality disorders were risk factors for not regaining employment among long-term (more than 12 weeks) unemployed people [13]. In a five-year follow-up of that study, only the doctor's diagnosis of psychiatric syndromes or personality disorders was however significantly associated with reduced re-employment [8]. In a three-year study in Finland, psychological distress was not associated with re-employment

* Correspondence: Chioma.nwaru@uta.fi
School of Health Sciences, University of Tampere, FI-33014 Tampere, Finland

among registered unemployed persons [14], but a twelve-year follow-up study in Britain reported an increased likelihood of re-employment among unemployed women with psychological distress [15].

Regarding physical health, van de Mheen et al. [16] reported that poor general health, a chronic condition, and health complaints were determinants of re-employment after 4.5 years. Similar findings were reported in the European Household survey, with poor health and chronic conditions as determinants of not entering paid employment in most European countries [17]. Poor general health [18, 19] and decreased work performance due to impaired health [20] have also been shown to reduce likelihood of re-employment. One limitation in these studies is that the indicators of physical health were measured in a general context, i.e. in terms of chronic health problems or general self-rated health, which despite being important and valid measures – do not give indication of the specific roles of the health problems and diseases.

Musculoskeletal pain is a widespread problem among the working population, and it is a known risk factor for poor work ability [21, 22], increased absence due to sickness [23], early retirement [24], and health-related job loss [25]. Musculoskeletal pain may also reduce the possibility of regaining employment, but the evidence emerge from studies conducted among persons with arthritis and musculoskeletal disorders who were unemployed [26] and those of pre-retirement age [27]. Generalizing these findings to the general unemployed population would require further studies among individuals with differential symptom patterns and unemployment histories. In the present study, we investigate whether localized and multiple-site musculoskeletal pain are associated with re-employment in a three-year follow-up of registered unemployed people aged 18 to 59 years in Finland.

Methods

Study design and subjects

The study data originated from the Career Health Care (CHC) project, a three-year intervention trial that was launched in 2002–2003 in Finland with the goal of tackling health problems and risks related to unemployment [28]. Participants in the project were unemployed people ($n = 539$) from six localities in southern Finland who were enrolled in active labour market policy (ALMP) measures. They were recruited at the beginning of the ALMP measures, during which they received oral and written information about the study. This information made it explicit that participation was voluntary and not a condition for participation in the ALMP or access to the associated benefits. Those who consented to the study were randomly allocated to the intervention and control groups. The intervention group ($n = 265$) were recipients of the CHC package (i.e. the extra health services that targeted the unemployed). The control group ($n = 274$) only used communal health services. Both groups completed the baseline questionnaire during the recruitment exercise. Follow-up data was collected three years after the first encounter and 311 persons responded to this follow-up. The intervention group completed the follow-up questionnaires during the CHC encounter, and the control group returned their questionnaires by post. We excluded a group of respondents ($n = 27$) who were classified as non-job seekers at follow-up from the present study, because they were not at risk for unemployment. This gave rise to a sample of 284 people aged 18–59 years who responded to the three-year follow-up (see Fig. 1).

Measurements

We measured musculoskeletal complaints at baseline using a modified version of the Nordic Musculoskeletal Questionnaire [29]. Respondents were asked to report, on a scale of 0 to 10, whether they had experienced pain or numbness in four locations during the preceding week. The locations were the hands or upper extremities, neck or shoulders, lower back, and the feet or lower extremities. The response for each pain variable was categorized into three groups: 0 = no pain, 1–5 = mild pain, and 6–10 = severe pain. To construct a multiple site

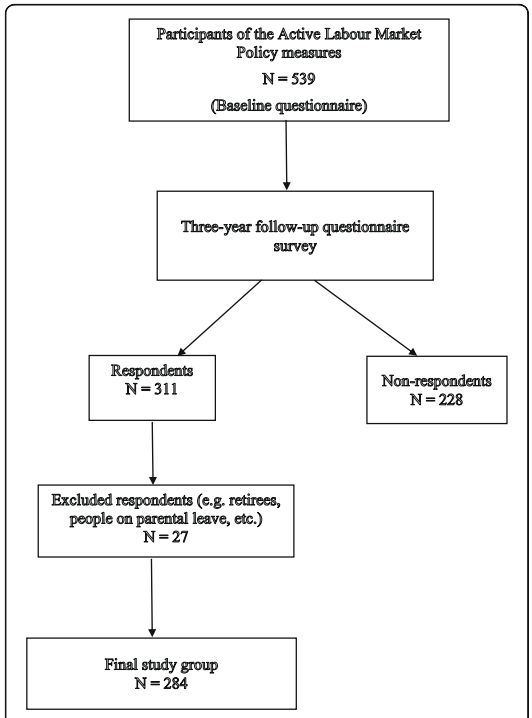

Fig. 1 Flowchart of the participants' response at baseline and follow-up

pain measure, mild and severe categories were combined into any pain = 1 and no pain = 0. All four musculoskeletal pain variables were then added up and the summed variable was expressed as the number of sites with pain (from 0 = no pain in any site to 4 = pain in four sites).

Other variables that were measured at baseline and considered as potential confounders included age, gender, educational attainment, marital status, duration of unemployment, alcohol use, smoking, physical activity, somatic diseases, and depression. Age was categorized into three groups: "18–29", "30–44", and "45–59". Educational attainment was classified into three levels: "college/university degree", "vocational school degree", and "no occupational degree". Marital status was categorized as "single", "married/cohabiting", or "widowed/divorced". Duration of unemployment was dichotomized to "less than one year" and "more than one year". Alcohol use was elicited with the question "how often do you drink beer, wine or other alcoholic drinks?" The response was categorized into three: "never/less often", "2–4 times a month", and "2 or more times/week". Smoking was dichotomized to "smokers" and "none smokers", and leisure-time physical activity (i.e. frequency of vigorous physical activity for at least 15 to 20 min) was categorized into three: "not at all or only a little", "moderate" (once per week), and "much" (twice or more per week). General health was assessed with the question "do you have diseases diagnosed by a physician?" A list of 18 different diseases was provided with a dichotomized reply (yes or no). We considered the responses that included one or more of the nine somatic diseases listed, i.e. cardiovascular illnesses, respiratory illnesses, diabetes, etc. (with the exception of musculoskeletal diseases). The sum score of the diseases was dichotomized (yes or no), and those subjects reporting one or more diseases were categorized as having somatic disease(s). Depression was measured with the Beck Depression Inventory [30] and dichotomized to "depressed" and "not depressed".

Current employment status was determined in the three-year follow-up questionnaire and classified into two categories: "re-employed" and "unemployed". Subjects were defined as re-employed if they reported being either employed or self-employed. The unemployed group consisted of those who reported not being in any paid job but seeking employment during the follow-up.

Statistical analysis

The description of the subjects' characteristics are presented as frequencies and percentages, and differences between groups were tested with a chi-squared test for categorical variables. The association between musculoskeletal pain and re-employment was examined with binary logistic regression. Re-employment was coded in such a manner that an odds ratio > 1 indicated an increased likelihood of re-employment. We conducted both complete-case (i.e. those who participated in both baseline and there-year follow-up) and multiple imputation (i.e. to impute data of the three-year follow-up for those who did not participate in the follow-up) analyses. The complete-case analysis was undertaken using IBM SPSS Statistics for Windows, version 20.0. (Armonk, NY: IBM Corp). In the complete-case analysis, unadjusted and adjusted models were performed. The unadjusted model (Model I) estimated the independent effect of the various localized pains, as well as the number of pain sites. The adjusted models included potential confounders in the model, with Model II simultaneously controlling for age, gender, educational attainment, and marital status. Model III additionally adjusted for the duration of unemployment, alcohol use, smoking, physical activity, somatic diseases, depression and participation in CHC. Although a recent study by Romppainen et al. (2014) did not find any beneficial effect of the CHC on re-employment, we also explored its role as a potential effect-modifying variable by entering an interaction term between musculoskeletal pain and participation in CHC in the adjusted model in relation to re-employment. If the interaction term was significant, we stratified the analysis by participation in CHC and calculated the stratum-specific estimates adjusting for all other confounders.

The multiple imputation (assuming missing at random) was conducted using the Multiple Imputation by Chained Equations (MICE) algorithm in Stata (version 13). A total of 20 imputed datasets were created. All variables that were used in the complete-case analysis, irrespective of whether they had missing or not, were included in the imputation model. After the imputation, we then repeated the Model III logistic regression analysis conducted with the complete-case analysis. An interaction term between musculoskeletal pain and participation in CHC was also investigated in the Model III of the multiple imputation model. Results are presented as odds ratios (OR) with their 95 % confidence intervals (CI), and their statistical significance was defined as the two-sided p-value <0.05.

Results

At the three-year follow-up, 311 of the original 539 participants responded to the questionnaire survey (response rate 58 %). An analysis of non-respondents versus respondents showed a lower response rate among males (47 %) than among females (64 %), among smokers (50 %) than among none smokers (64 %), and among participants in the intervention (49 %) than among the control (66 %) group. Participants who were either widowed or divorced had the lowest response rate (47 %) compared to their counterparts who were single (52 %) or were married or cohabiting (64 %). Differences in other individual

characteristics (age, educational attainment, alcohol use, physical activity, somatic diseases, and depression) as well as musculoskeletal pain were not statistically significant (see Additional file 1: Table S1).

By excluding 27 (9 % of those who completed both questionnaire) ineligible respondents, who consisted of retirees or those receiving disability pension ($n = 9$), those on parental leave ($n = 7$), non-job seekers ($n = 1$), or those excluded for some other reason ($n = 10$), the subsequent analyses included 52 % (284/539) of the original study population. The baseline individual and health characteristics of the 284 respondents are given in Table 1. The participants were predominantly middle-aged (45 %, $n = 127$), with most of them (67 %, $n = 190$) having been unemployed for less than one year at baseline. Twenty-two percent of them had attained a college/university degree. In the week preceding the baseline measurement, 147 (52 %) reported mild-to-severe pain in the hands/upper extremities, 195 (69 %) in the neck/shoulders, 154 (52 %) in the lower back, and 141 (50 %) in the feet/lower extremities. Over half of the respondents (59 %, $n = 168$) had concurrent pain in two or more sites.

Participants with somatic diseases were more likely to report pain compared to those without somatic diseases, regardless of the pain type (Table 2). Reporting pain also increased with decreasing participation in vigorous physical activity although the differences were significant only for low back pain ($p = 0.016$) and lower extremity pain ($p = 0.047$). Other characteristics, such as age, gender, educational attainment, marital status, duration of unemployment, participation in CHC, alcohol use, smoking, and depression were not significant determinants of most musculoskeletal pain. Regarding employment status during the three-year follow-up, over half (55 %, $n = 156$) of the participants were re-employed. The likelihood of re-employment decreased with increasing age and decreasing educational attainment. Participants who were either widowed or divorced (40 %) were less likely to regain employment than those who were either single (49 %) or married/cohabiting (61 %).

Table 3 shows the results of the associations between musculoskeletal pain at baseline and re-employment after three years. Based on the unadjusted result, those with severe pain in the lower back or feet/lower extremities had a reduction of up to 59 % in the likelihood of re-employment. In the adjusted models, the reduced likelihood of re-employment with pain in the lower back (OR 0.37, 95 % CI 0.15–0.92) or feet/lower extremities (OR 0.38, 95 % CI 0.15–0.93) remained unchanged even after controlling for age, gender, educational attainment, marital status, duration of unemployment, participation in CHC, alcohol use, smoking, physical activity, somatic diseases, and depression. A reduced likelihood for re-employment was also found for those participants with three (OR 0.48, 95 % CI 0.23–0.99) or four (OR 0.51, 95 % CI 0.27–0.99) pain sites, although these associations were not retained when adjustments for confounders were introduced into the model (Table 4). The interaction between participation in CHC and musculoskeletal pain was not significant for most pain types except for low back pain. When we stratified the analysis by participation in CHC, the estimated odds for finding employment was significantly lower for those individuals in the control group who had severe low back (OR 0.18, 95 % CI 0.04–0.77) (see Additional file 2: Table S2).

Results from the complete-case and multiple imputation analyses were generally similar to each other, except that the confidence interval for lower extremity pain included one in the multiple imputation analysis (complete-case: OR 0.38, 95 % CI 0.15–0.93; multiple imputation: OR 0.51, 95 % CI 0.22–1.16). In addition, the significant interaction effect between low back pain and participation in CHC observed in the complete-case analysis was not seen in the multiple imputation analysis, suggesting that the complete-case interaction may be a chance finding.

Discussion

We found that severe pain in the lower back was associated with a reduced likelihood of re-employment after three years among unemployed job seekers. Pain in the hands/upper extremities, neck/shoulders, the lower extremities, as well as multiple site did not influence re-employment. These results were similar both in complete-case and multiple imputation analyses.

We recorded a moderate but acceptable participation rate of 58 % at three-year follow-up, which is similar to those achieved in previous studies [31, 32]. Usually high drop-out rates have been observed for the unemployed [33, 34]. Although differences between participants and non-participant at the three-year follow-up were observed only for sex, marital status, smoking, and participation in the CHC, we undertook multiple imputation analysis to impute missing data for those who did not take part in the follow-up assessment. This provided us with relevant sensitivity analysis to appraise the extent of bias due to follow-up with the complete-case analysis. Our assessment of the subjects' musculoskeletal pain status was based on a self-report, which may introduce information bias, however self-reporting of pain indicators has been noted to be reliable [29] and it is commonly used for pain studies [24, 35, 36]. The time into the past (one week) participants were asked to recall any pain is short and therefore should minimize the risk of recall bias.

There may be the possibility of residual confounding since we could not assess the influence of all potential confounders, particularly body mass index, although previous studies [37] did not find an independent association

Table 1 Distribution of study participants by baseline socio-demographic and health characteristics

Individual characteristics	Unemployed job-seekers (*N* = 284) *n* (%)
Age (years)	
18–29	68 (23.9)
30–44	127 (44.7)
45–59	80 (28.2)
Missing	9 (3.2)
Gender	
Male	89 (31.3)
Female	194 (68.3)
Missing	1 (0.4)
Educational attainment	
No occupational education	93 (32.7)
Vocational school	120 (42.3)
College/university	64 (22.5)
Missing	7 (2.5)
Marital status	
Single	82 (28.9)
Married/cohabiting	170 (59.9)
Widowed/divorced	30 (10.6)
Missing	2 (0.7)
Duration of unemployment	
Less than one year	190 (66.9)
More than one year	94 (33.1)
Participation in CHC	
Intervention group	119 (41.9)
Control group	165 (58.1)
Lifestyle/health characteristics	
Alcohol use	
Never/less often	113 (39.8)
2–4 times/month	128 (45.1)
2 or more times/week	43 (15.1)
Smoker	
No	179 (63.0)
Yes	105 (37.0)
Physical activity	
Much	91 (32.0)
Moderate	70 (24.6)
Not at all or only a little	111 (39.1)
Missing	12 (4.2)
Somatic diseases	
No	153 (53.9)
Yes	110 (38.7)
Missing	21 (7.4)
Depression	
No	253 (89.1)
Yes	17 (6.0)
Missing	14 (4.9)
Hands/upper extremity pain	
None	120 (42.3)
Mild	90 (31.7)
Severe	57 (20.1)
Missing	17 (6.0)
Neck/shoulder pain	
None	75 (26.4)
Mild	119 (41.9)
Severe	76 (26.8)
Missing	14 (4.9)
Low back pain	
None	106 (37.3)
Mild	106 (37.3)
Severe	48 (16.9)
Missing	24 (8.5)
Feet/lower extremity pain	
None	126 (44.4)
Mild	96 (33.8)
Severe	45 (15.8)
Missing	17 (6.0)
Number of musculoskeletal pain sites	
0	74 (26.1)
1	42 (14.8)
2	46 (16.2)
3	50 (17.6)
4	72 (25.4)

between body mass index and re-employment. The generalizability of our findings is equally limited owing to the fact that our data were based on unemployed persons who actively participated in various labour market policy measures. Hence, they constituted a relatively unique group that may not be representative of the unemployed population as a whole. Nonetheless, the findings of this study reflect evidence from unemployed people who still belong to the labour force. Vesalainen and Vuori [14] showed that the level of job-seeking activities might influence an individual's probability of finding a job. It is also possible that the level of job-seeking activities will vary among members of different unemployment groups. Our study excluded those in other unemployment groups such as retirees, those receiving disability pensions, those on

Table 2 Individual characteristics of participants by baseline musculoskeletal pain and re-employment at three-year follow-up

	Baseline musculoskeletal pain									
	% with no hands/upper extremity pain	*p*-value	% with no neck/ shoulder pain	*p*-value	% with no low back pain	*p*-value	% with no feet/lower extremity pain	*p*-value	% re-employed at 3-year follow-up	*p*-value
	(*n* = 120)		(*n* = 75)		(*n* =106)		(*n* = 126)		(*n* = 156)	
Age (years)		0.079		0.410		0.420		0.605		0.001
18–29	54.5		25.8		43.3		53.0		67.6	
30–44	46.3		30.3		44.4		49.6		59.1	
45–59	37.5		27.4		35.3		40.3		38.8	
Gender		0.819		0.001		0.286		0.342		0.222
Male	44.8		42.4		47.6		41.4		49.4	
Female	45.3		20.7		37.7		50.3		57.2	
Educational attainment		0.098		0.001		0.167		0.119		0.051
No occupational educ.	40.9		25.8		38.8		44.3		46.2	
Vocational educ.	43.6		24.3		36.8		45.5		56.7	
College/university	54.0		35.9		54.8		58.1		65.6	
Marital status		0.023		0.702		0.957		0.174		0.046
Single	38.0		27.5		42.3		39.2		48.8	
Married/cohabiting	50.3		26.5		39.4		53.1		60.6	
Widowed/divorced	35.7		34.6		46.2		37.0		40.0	
Duration of unemployment		0.970		0.081		0.616		0.745		0.093
Less than one year	45.2		24.2		39.4		47.2		58.4	
More than one year	44.4		35.2		43.5		47.2		47.9	
Participation in CHC		0.645		0.898		0.124		0.163		0.929
Intervention group	43.0		26.3		38.8		40.9		54.6	
Control group	46.4		28.8		41.4		52.0		55.2	
Alcohol use		0.692		0.363		0.432		0.456		0.879
Never/less often	48.1		25.7		45.6		43.4		53.1	
2–4 times/month	43.8		25.4		34.5		46.7		56.3	
2 or more times/week	40.5		39.5		46.3		58.5		55.8	
Smoker		0.819		0.965		0.442		0.028		0.679
No	43.9		27.2		38.0		44.8		55.9	
Yes	46.6		28.7		45.4		51.0		53.3	
Physical activity		0.128		0.068		0.016		0.047		0.774
Much	55.4		35.6		53.6		55.3		54.9	

Table 2 Individual characteristics of participants by baseline musculoskeletal pain and re-employment at three-year follow-up *(Continued)*

Moderate	41.8		24.3		36.4		50.7		58.6	
Not at all/only a little	39.0		20.0		32.3		36.5		53.2	
Somatic diseases		0.006		0.057		0.002		0.001		0.118
No	52.8		32.7		50.0		54.5		58.8	
Yes	32.7		19.2		29.3		35.2		49.1	
Depression		0.059		0.063		0.220		0.007		0.082
No	47.1		29.3		43.0		49.8		56.9	
Yes	17.6		17.6		23.5		17.6		35.3	

P-value by χ^2 tests

Table 3 Associations between localized pain at baseline and re-employment at three-year follow-up

Localized musculoskeletal pain	Re-employment at 3-year follow-up OR (95 % CI)			
	Model I[a]	Model II[b]	Model III[c]	Multiple imputation model[d]
Hands/upper extremity				
None	1.00	1.00	1.00	1.00
Mild	0.84 (0.48–1.47)	1.45 (0.76–2.73)	1.40 (0.69–2.87)	1.22 (0.67–2.20)
Severe	0.54 (0.28–1.02)	0.63 (0.31–1.27)	0.63 (0.28–1.38)	0.54 (0.27–1.09)
Neck/shoulder				
None	1.00	1.00	1.00	1.00
Mild	0.93 (0.51–1.66)	1.01 (0.52–1.94)	0.87 (0.42–1.81)	1.05 (0.50–2.23)
Severe	0.78 (0.41–1.49)	0.72 (0.35–1.49)	0.99 (0.44–2.24)	0.72 (0.41–2.32)
Low back				
None	1.00	1.00	1.00	1.00
Mild	0.92 (0.53–1.60)	1.11 (0.61–2.04)	0.96 (0.48–1.90)	1.07 (0.50–2.29)
Severe	0.41 (0.21–0.83)	0.40 (0.18–0.88)	0.37 (0.15–0.92)	0.35 (0.16–0.78)
Feet/lower extremity				
None	1.00	1.00	1.00	1.00
Mild	0.73 (0.42–1.25)	1.10 (0.60–2.01)	1.20 (0.60–2.40)	1.05 (0.48–2.29)
Severe	0.41 (0.20–0.82)	0.46 (0.21–0.98)	0.38 (0.15–0.93)	0.51 (0.22–1.16)

[a]Unadjusted model
[b]Adjusted for age, gender, educational attainment, and marital status
[c]Adjusted Model II + duration of unemployment, participation in CHC, alcohol use, smoking, physical activity, somatic diseases and depression
Models I, II, and III are based on complete-case analysis ($N = 284$)
[d]Adjusted for age, gender, educational attainment, marital status, duration of unemployment, participation in CHC, alcohol use, smoking, physical activity, somatic diseases and depression ($N = 539$)

parental leave, non-job seekers, and those in other situations who are likely to adopt passive job-seeking behaviour.

Our findings of reduced re-employment among participants with severe lower back pain supports those of Straaton et al. [26], Yelin, Trupin & Sebasta [27], and Virtanen, Janlert, & Hammarström [37], who all showed that musculoskeletal pain was a determinant factor in regaining re-employment. The contribution of the present study is that it distinguished pain in local sites from that in multiple sites, and provided insight into their respective roles in the relationship between health and employment. This is necessary considering that the differences in the risk factors and prognosis of the various pain types require different interventional measures.

A potential explanation why pain in the lower back was associated with a reduced likelihood of re-employment while pain in the other body regions (hands/upper extremities, neck/shoulders, and lower extremities) was not may

Table 4 Associations between number of musculoskeletal pain sites at baseline and re-employment at three-year follow-up

Number of musculoskeletal pain sites	Re-employment at 3-year follow-up OR (95 % CI)			
	Model I[a]	Model II[b]	Model III[c]	Multiple imputation model[d]
0	1.00	1.00	1.00	1.00
1	0.99 (0.45–2.16)	0.82 (0.36–1.88)	0.85 (0.35–2.10)	0.86 (0.40–1.84)
2	1.04 (0.48–2.22)	1.26 (0.55–2.88)	1.57 (0.61–4.02)	1.05 (0.48–2.27)
3	0.48 (0.23–0.99)	0.58 (0.26–1.29)	0.86 (0.35–2.09)	0.68 (0.31–1.47)
4	0.51 (0.27–0.99)	0.72 (0.35–1.49)	0.69 (0.29–1.61)	0.66 (0.33–1.32)

[a]Unadjusted model
[b]Adjusted for age, gender, educational attainment, and marital status
[c]Adjusted Model II + duration of unemployment, participation in CHC, alcohol use, smoking, physical activity, somatic diseases and depression
Models I, II, and III are based on complete-case analysis ($N = 284$)
[d]Adjusted for age, gender, educational attainment, marital status, duration of unemployment, participation in CHC, alcohol use, smoking, physical activity, somatic diseases and depression ($N = 539$)

be that low back pain may have persisted during periods of unemployment and thus, discouraged the motivation for finding employment. The occurrence of low back pain is not only associated with work-related factors, but also with psychological (anxiety, depression, emotional instability) and lifestyle-related (smoking and excess body weight) factors [38], which are prevalent among unemployed individuals [39, 40]. In addition, empirical evidence has shown that pain in the lower back is highly recurrent and rarely resolves [38], with some studies showing that low back pain may be associated with activity restriction [41]. It could be that these characteristics of low back pain may limit job search activities among individuals suffering from severe low back pain.

It was a surprising finding that the number of pain sites was not associated with re-employment considering the deleterious impact of pain on work and productivity [24, 42]. It is possible that pain in multiple sites is less burdensome during periods of unemployment due to reduced exposure to occupational factors that are considered major predisposing agents for pain in multiple sites [43].

Conclusion

In this study, we find that severe low back pain is a significant determinant of re-employment among unemployed job-seekers. This finding demonstrates the need to disentangle health problems in order to clearly appreciate their putative impact on employment. This is of paramount importance, especially for those health problems that may be modifiable. In further research, it would be helpful to understand whether similar associations may exist for chronic versus acute musculoskeletal pain.

Additional files

Additional file 1: Table S1. Relation of background characteristics to respondents to the questionnaire survey at 3-year follow-up. (DOCX 18 kb)

Additional file 2: Table S2. Modification of the effect of low back pain on re-employment by participation in CHC. (DOCX 16 kb)

Abbreviations

CHC, Career Health Care; ALMP, Active labour market policy; MICE, Multiple Imputation by Chained Equations

Acknowledgements

We would like to thank Dr Bright Nwaru for his helpful comments and statistical guidance.

Funding

This study was supported by grants from the Academy of Finland (grant no 207515), the Finnish Ministry of Employment and the Economy, the Finnish Ministry of Social Affairs and Health, and the Juho Vainio Foundation.

Availability of data and materials

The dataset that was used in this article is available from Dr Pekka Virtanen (pekka.j.virtanen@uta.fi) on request.

Authors' contributions

PV conceived this study and is the principal investigator of the CHC project; he prepared and delivered the data for the study and contributed to the analyses and writing of the manuscript. CN participated in the data analysis and was chiefly responsible for writing the manuscript drafts. CHN participated in the planning and implementation of the CHC project and contributed to the writing of the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors have no competing interests to declare.

Consent for publication

All authors have read and approved the final version of the paper being submitted for publication.

Ethics approval and consent to participate

At the time of the planning and implementation of the study, the Medical Research Act dealing with Ethics Committees had not yet come into force in Finland. There were Ethics Boards, which, however, were oriented narrowly to biomedical experiments, and this kind of study on health promotion services was not subjected to external ethical assessment. However, the Ethics Committee of Pirkanmaa University Hospital District assessed the study plan retrospectively, and stated that a study with a corresponding design would be approvable (ETL-code R13024). The study had a steering group consisting of representatives from the Ministry of Employment and the Economy and the Ministry of Social Affairs and Health.

Received: 17 November 2015 Accepted: 8 June 2016
Published online: 08 July 2016

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PUBLICATION
III

Chronic diseases as predictors of labor market attachment after participation in subsidized re-employment program: A 6-year follow-up study

Nwaru CA, Peutere L, Kivimäki M, Pentti J, Vahtera J, Virtanen PJ
J Epidemiol Community Health 2017;71:1101-1106
http://dx.doi.org/10.1136/jech-2017-209271

Chronic diseases as predictors of labour market attachment after participation in subsidised re-employment programme: a 6-year follow-up study

Chioma A Nwaru,[1] Laura Peutere,[1] Mika Kivimäki,[2,3,4] Jaana Pentti,[3] Jussi Vahtera,[5] Pekka J Virtanen[1]

► Additional material is published online only. To view please visit the journal online (http://dx.doi.org/10.1136/jech-2017-209271).

[1]Faculty of Social Sciences, School of Health Sciences, University of Tampere, Tampere, Finland
[2]Department of Clinicum, Faculty of Medicine, University of Helsinki, Helsinki, Finland
[3]Department of Occupational Health, Finnish Institute of Occupational Health, Turku, Finland
[4]Department of Epidemiology and Public Health, University College London, London, UK
[5]Department of Public Health, University of Turku and Turku University Hospital, Turku, Finland

Correspondence to
Chioma A Nwaru, Faculty of Social Sciences, School of Health Sciences, University of Tampere, Tampere, Finland; Nwaru.Chioma.A@student.uta.fi

Received 30 March 2017
Revised 7 September 2017
Accepted 8 September 2017
Published Online First 19 September 2017

ABSTRACT

Background Little is known about the work patterns of re-employed people. We investigated the labour market attachment trajectories of re-employed people and assessed the influence of chronic diseases on these trajectories.

Methods The study was based on register data of 18 944 people (aged 18–60 years) who participated in a subsidised re-employment programme in Finland. Latent class growth analysis with zero-inflated Poisson was used to model the labour market attachment trajectories over a 6-year follow-up time. Multinomial logistic regression was used to examine the associations between chronic diseases and labour market attachment trajectories, adjusting for age, gender, educational level, size of town and calendar year in subsidised re-employment programme.

Results We identified four distinct labour market attachment trajectories, namely: strengthening (a relatively stable attachment throughout the follow-up time; 77%), delayed (initial weak attachment increasing later; 6%), leavers (attachment declined with time; 10%) and none-attached (weak attachment throughout the study period; 7%). We found that severe mental problems strongly increased the likelihood of belonging in the leavers (OR 3.61; 95% CI 2.23 to 5.37) and none-attached (OR 3.41; 95% CI 1.91 to 6.10) trajectories, while chronic hypertension was associated with none-attached (OR 1.37; 95% CI 1.06 to 1.77) trajectory. The associations between other chronic diseases (diabetes, heart disease, asthma and arthritics) and labour market attachment trajectories were less evident.

Conclusions Re-employed people appear to follow distinct labour market attachment trajectories over time. Having chronic diseases, especially mental disorders appear to increase the risk for relatively poor labour market attachment.

INTRODUCTION

Unemployment is a risk factor for many health problems. Re-employment is often promoted as a key measure to mitigate the adverse effects of unemployment. Several systematic reviews have shown that regaining employment improves mental health.[1–3] Re-entering paid job may also promote other aspects of health. For instance, Schuring *et al*[4] reported that physical functioning, social functioning, vitality, bodily pain and role limitations due to emotional or physical illness of those who regained employment improved compared with those who remained unemployed. Carlier *et al*[5] also showed that those who re-entered paid work were three times more likely to change from poor to good health and two times more likely to change from poor to good quality of life than those who continued to be unemployed.

Poor health can be both a consequence and a determinant of unemployment. According to a recent systematic review,[6] a poor health and a chronic disease are important predictors of exit out of paid job due to disability pension, unemployment and early retirement. A poor health and a chronic disease can also influence the likelihood of re-entering paid jobs among unemployed people.[7] In past studies, poor health conditions such as mental problems,[8 9] poor self-perceived general health,[10–12] and to some extent, musculoskeletal pain,[13 14] were shown to reduce the likelihood of regaining paid jobs among unemployed people, although there are also some studies that reported contrasting findings. For instance, in a study by García-Gómez *et al*,[15] women with psychological distress were reported to have increased likelihood of re-employment, whereas in a study by Vesalainen and Vuori,[16] no association was found between psychological distress and re-employment.

Fewer studies have investigated the influence of chronic disease on re-employment. The study by van de Mheen *et al*[10] showed that chronic disease was a risk factor for not re-entering paid job but the association did not reach statistical significance. Schuring *et al*[7] also found that chronic health problem was an important determinant of re-employment in 9 out of 11 European countries that were studied, but the association was statistically significant in only four countries. Although these studies seem to suggest that chronic disease is a potential determinant of re-employment, they do not provide information regarding the role of specific diseases on the likelihood of re-employment. Given that there are differences between the chronic diseases with respect to the nature and with respect to degree of limitations in functional capacity and with respect to their prognosis, care and management, it is probable that they may also exert differing influence on re-employment. This is why their individual role on re-employment needs to be evaluated.

Subjects of the current study consist of long-term unemployed people who participated in a labour market policy measure (state subsidised

To cite: Nwaru CA, Peutere L, Kivimäki M, *et al*. *J Epidemiol Community Health* 2017;**71**:1101–1106.

Table 1 Chronic diseases and their International Classification of Diseases codes

Diseases	ICD codes (version 10)
Diabetes	E10-E14, E89.1
Heart disease	111.0, 113, 150, 197.1, P29.0, 120–122, 124.0, 125
Arthritis	A04.6, A39.8, A50.5, D76.0, D76.3, H20.1, H30, I33.0, J84, K50.9, K51.9, K73.2, K74.3, K83.0, L40.5, M02, M05, M06, M08, M13.9, M30–M35, M45, M46.1, M46.9, M94.1, N03, N04, Q44.2
Asthma or chronic obstructive pulmonary disease	E84.0, J41-J45, P27.1
Chronic hypertension	110–113, 115, 127.0
Severe mental problems	A52.1, A69.2, A81.0, B22.0, B56.9, B57.2, E01.8, E03.9, E52, E53.8, E75.6, E83.0, E83.5, F01, F03, F06.0-F06.3, F20-F25, F28, F29, F30.1, F30.2, F31, F32.3, F33.3, F84, G10, G20, G30.0, G30.1, G30.8, G30.9, G31.0, G35, G40.9, M30.0, M32.8

re-employment scheme). We explore their labour market attachment trajectories across a 6-year period and examine the association between chronic diseases and these trajectories. Our hypothesis is that chronic diseases will influence labour market attachment and that the influence will differ depending on the type of disease.

METHODS

Design and study population

The present study is based on data from the Finnish Public Sector (FPS) study. The FPS study is an ongoing prospective study of employees in 10 towns and 5 hospital districts in Finland. The general goal of the FPS study is to assess the work life of employees and the impact of work and work-related changes on the employee health and well-being.[17] The Ethics Committee of the Hospital District of Helsinki and Uusimaa approved the study.

The FPS study includes employees who have been employed for at least 6 months in any year between 1991 and 2005 (n=151 901) in the participating organisations. Data on all periods of employment in the participating organisations, drawn from employers' records, and work history, obtained from the register of the Finnish Centre for Pensions, have been linked to the cohort using the unique national identification number. These data were also available for long-term unemployed individuals (n=23 213) who had their first period of subsidised re-employment in the service of 10 towns in 1994–2005. Subsidised re-employment is an element of Finland's active labour market policy measures. It is designed for long-term unemployed people who have problems in finding job in the regular labour market. In practice, the municipalities in cooperation with the local unemployment offices select the participants. Health is not considered in recruiting the participants; therefore, individuals with less optimal health may also be selected into the programme if they are deemed fit and capable of performing full-time job. It is a rule that the contract of the subsidy programme lasts for 6 months; if a participant interrupt the period, this is because his/her work ability is too poor to perform the job or because he/she finds a job in the open labour market. To ensure a homogenous group of participants for the present study in order to subsequently allow for comparable labour market trajectories, we restricted our analysis to 18 944 individuals who had complete information for the full 6-month participation in the subsidy programme and excluded the rest who dropped out of the programme for any reason (n=3999). In addition, the included individuals had to be aged 18–60 years at the end of the scheme. Those who had an old-age pension (n=74) or who died (n=196) during the follow-up were also excluded as they were not at risk of re-employment or did not have complete information on labour market attachment.

Labour market attachment

Employment history data were obtained from the registers of the Finnish Centre for Pensions. This register details, with accuracy of 1 month, the start and end date of all work contracts in both public and private sectors, as well as that of entrepreneurship. All such periods of employment are mandatorily insured according to the earnings-related pension. Starting at the end of the subsidised re-employment period, employment of each individual was followed-up for 6 years, which was divided into 12 6-month periods to enable analysis of the labour market attachment trajectories. Herein, labour market attachment is defined as the number of months (0–6) as an employee or entrepreneur during the 12 time periods.

Chronic diseases

Subjects with chronic diseases were identified at the beginning of the subsidised re-employment programme using the records from the Social Insurance Institution on entitlements to special reimbursements for cost of purchased drugs for severe and chronic diseases. To be eligible for this entitlement, a patient must provide a physician's certificate about his or her conditions to the institution, where the application for entitlement is accepted after reviewing that the predefined criteria for the disease and its medication are met. We considered six common chronic diseases that were covered in the reimbursement programme: diabetes, heart disease, arthritis, asthma or chronic obstructive pulmonary disease (COPD), chronic hypertension and severe mental problems. The International Classification of Diseases (ICD) codes (version 10) for these diseases is provided in table 1. Each of the chronic diseases was coded as 0=those without disease and 1=those with disease. Participants were also classified into two groups based on whether they had any of the six chronic diseases or whether they had none of the chronic diseases.

Sociodemographic variables

Age and gender variables were obtained from the employers' registers. Age was categorised into three: '18–29', '30–44' and '45–60'. Educational level, retrieved from Statistics Finland, was classified as: 'basic', 'vocational school' and 'college or university degree'. Data on calendar year in subsidised re-employment was derived from the register of the Finnish Centre for Pensions and categorised as: '1994–1997', '1998–2001' and '2002–2005' based on the unemployment and subsidised re-employment rate at that time. Information on the 10 towns where the participants worked during the follow-up was used as a proxy for the area of residence. The variable was dichotomised as 'small' and 'big' towns. The small towns included Raisio, Naantali, Nokia, Valkeakoski and Virrat, while the big towns included Tampere, Turku, Oulu, Vantaa and Espoo.

Table 2 Sociodemographic characteristics of the study population

	Total (n=18 944) n (%)	Chronic disease status at beginning of the subsidised re-employment programme: With chronic disease(s) (n=1567) n (%)	Without chronic disease (n=17 377) n (%)	p Value
Age				<0.001
18–29	9924 (52.4)	453 (4.6)	9471 (95.4)	
30–44	6662 (35.2)	659 (9.9)	6003 (90.1)	
45–60	2358 (12.4)	455 (19.3)	1903 (80.7)	
Gender				0.259
Male	5555 (29.3)	440 (7.9)	5115 (92.1)	
Female	13 389 (70.7)	1127 (8.4)	12 262 (91.6)	
Educational level				<0.001
Basic	5251 (27.7)	495 (9.4)	4756 (90.6)	
Vocational school	9525 (50.3)	721 (7.6)	8804 (92.4)	
College/university	4168 (22.0)	351 (8.4)	3817 (91.6)	
Calendar year in subsidised re-employment				<0.001
1994–1997	13 174 (69.5)	1004 (7.6)	12 170 (92.4)	
1998–2001	4158 (21.9)	386 (9.3)	3772 (90.7)	
2002–2005	1612 (8.5)	177 (11.0)	1435 (89.0)	
Size of town				0.555
Small	2329 (12.3)	200 (8.6)	2129 (91.4)	
Big	16 615 (87.7)	1367 (8.2)	15 248 (91.8)	

p Value by Pearson's χ^2 test.

Statistical analysis

We used latent class growth model (LCGM) to identify subgroups (latent classes) within the population that are following similar labour market attachment trajectories during the 6-year period.[18–20] We applied the zero-inflated Poisson (ZIP) model of LCGM[20] since the outcome variable (labour market attachment) was a count with large values at 0 month and at 6/6 months. ZIP model is well suited for modelling count data with excess zeros.[20] We estimated two to six latent class models or trajectories and specified a quadratic growth term in all the models assuming that labour market attachment will decrease with time after an initial increase. We evaluated the fit of the models, that is, compared k and k−1 models, using four main selection criteria. First, the Bayesian information criteria (BIC), where model with lower BIC values indicated well-fitting model.[21] Second, the Lo Mendell and Rubin Adjusted Likelihood Ratio test, where a significant p value ($p<0.05$) indicates that the k class fit better than the k−1 class model.[22] Third, the average posterior probabilities of group membership for each class. This measure indicates the classification quality of the classes, where higher values (closer to 1) suggest that the trajectories correctly classifies individuals with similar pattern of labour market attachment and discriminates between individuals with dissimilar attachment patterns.[23] Fourth, and most importantly, is the usefulness of the classes or trajectories in practice. This is determined by examining both the distinctiveness and the sizes (proportions) of each of the trajectory groups.[20] For trajectory groups to serve a useful substantive purpose, they should be distinguishable in terms of their shapes and other explanatory characteristics. They should also be of reasonable sizes (at least 5%) to ensure precision.[18 23]

Having established the optimal number of latent classes (ie, labour market attachment trajectories), we then examined the association between chronic disease and these trajectories in a multinomial logistic regression. Multinomial logistic regression is designed for modelling categorical outcome variable with more than two categories.[18 24] We conducted both unadjusted and adjusted analysis. The adjusted model included potential covariates such as age, gender, educational level, size of town and calendar year in subsidised re-employment programme. We presented the results of the regression analyses as OR with their 95% CI. We used Mplus V.7 for LCGA-ZIP[25] and IBM SPSS Statistics for Windows V.23.0 for the multinomial logistic regression.

RESULTS

In the beginning of the subsidised re-employment programme, 1567 out of the 18 944 participants had at least one chronic disease. Of the 1567, 190 (1.0%) had diabetes, 46 (0.2%) had heart disease, 130 (0.7%) had arthritis, 562 (3.0%) had asthma or COPD, 642 (3.4%) had chronic hypertension and 100 (0.5%) had severe mental problems. Table 2 shows the sociodemographic characteristics of the study participants. The proportion of participants with chronic disease was higher among older people, those with basic educational qualification and those who participated in the subsidy programme after 1997.

In the trajectory analysis, after considering the fit indices in table 3, we arrived at a four-class trajectory. Figure 1 presents the diagrammatic representation of the four-class labour market attachment trajectories. The trajectories included those who maintained a relatively stable attachment throughout the follow-up time ('strengthening', 77%), those with initial weak attachment that steadily increased after 36 months ('delayed', 6%), those whose attachment declined with time ('leavers', 10%) and those who had a very weak attachment throughout the study period ('none attached', 7%). We refer to the two last groups as poor attachment trajectories.

All sociodemographic characteristics were significantly related to labour market attachment trajectories (see online

Table 3 Fit statistics of the LCGM-ZIP with two to six latent classes (n=18 944)

Class	BIC	Average posterior probabilities for the most likely latent class membership	LMR-LRT p Value	Classification (proportions) of individuals based on their mostly likely class membership	Number of parameters
2	862341.942	0.99, 0.98	0.000	0.87, 0.13	10
3	852166.103	0.97, 0.95, 0.99	0.000	0.07, 0.12, 0.81	14
4	846412.297	0.93, 0.99, 0.95, 0.98	0.000	0.06, 0.77, 0.10, 0.007	18
5	841777.001	0.98, 0.78, 0.93, 0.95, 0.93	0.000	0.07, 0.18, 0.05, 0.10, 0.60	22
6	837861.118	0.96, 0.89, 0.93, 0.93, 0.96, 0.77	0.000	0.06, 0.09, 0.05, 0.58, 0.05, 0.17	26

BIC, Bayesian information criteria; LCGM-ZIP, latent class growth model zero-inflated Poisson; LMR-LRT, Lo Mendell and Rubin Adjusted Likelihood Ratio test.

supplementary file 1). Individuals aged between 45 and 60 years were more likely to belong in the poor attachment trajectories than those in other age groups, likewise males than females and persons with low educational qualification. People who had their subsidised re-employment between 1994 and 1997 were less likely to belong in the poor attachment trajectories than those in other groups, likewise those who lived in small towns than those who lived in big towns.

Table 4 shows the association between each of the chronic disease and labour market attachment trajectories. We present only the adjusted association because there was no substantial difference in the results of the unadjusted and adjusted models. With the exception of asthma, all chronic diseases increased the risk of belonging in the poor attachment trajectories; however, only the result of hypertension and mental problems reached the conventional level of statistical significance. Having hypertension was associated with a 1.4-fold increased odd of belonging in the 'none-attached' trajectory, while having severe mental problems was associated with a 3.6-fold and 3.4-fold increased odd of belonging in the 'leavers' and 'none-attached' trajectories, respectively.

DISCUSSION

We identified four distinct labour market attachment trajectories over a 6-year follow-up period among participants of state subsidised re-employment programme. Although 77% of the re-employed people assumed the trajectory of strengthening attachment throughout the study, 17% belonged in the poor attachment trajectories. We found that severe mental problem strongly increased the risk of belonging in the poor attachment trajectories, while the effect of somatic diseases varied according to the type of the disease and was less evident.

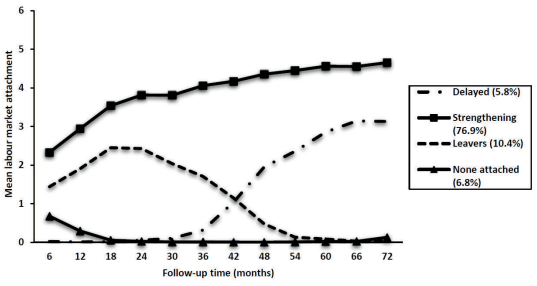

Figure 1 Labour market attachment trajectories of re-employed people during the 6-year follow-up time (n=18 944).

Although there are empirical evidence on the association between chronic disease and non-re-employment,[7–9] the present study, to our knowledge, is the first to identify the work trajectories of re-employed people and to demonstrate the relationship between chronic diseases and these trajectories. The finding of an association between severe mental problems and poor labour market attachment trajectories confirms previous studies,[8 9] which showed reduced likelihood of re-employment among long-term unemployed people with physician-diagnosed mental disorders. In our study, the influence of severe mental problem on labour market attachment was prominent. Research suggest that severe mental problems are highly recurrent[26] and is associated with increased sickness absence recurrence[27] and work impairment.[28] There are also reports that suggest that persons with mental disorders may face discrimination in the labour market.[29 30] It is possible therefore that difficulty in finding jobs or in coping with work activities partly explain the finding of poor labour market attachment among individuals with severe mental problems. Also, employers may be reluctant in hiring or accommodating persons with a history of severe mental problems in order to avoid loss of productivity.

Our study shows that the effect of somatic disease on labour market attachment was less compared with that of mental problems. More so, the results were mostly non-significant except for the association between hypertension and none-attached trajectory. This finding is in agreement with the 2-year[9]and 5-year[8] follow-up studies from Norway, which also did not find any significant association between diagnosed somatic disease and re-employment. These findings seem to suggest that chronic somatic diseases are less an obstacle to work participation among re-employed people.

There are some limitations with our study. One is that we do not have information regarding the type of contract, hence we could not distinguish between full-time and part-time job. Another is that we lacked adequate power to have conducted analysis that is more detailed, for instance, to explore the role of age and gender as potential effect modifiers, which would have provided concrete information regarding potential targets for possible intervention. There may be the possibility of residual confounding since we did not have information on all potential confounders, particularly, on marital status. Given that the health of unemployed people are generally worse than that of employed people,[31] we cannot rule out the fact that our reference group does not have health problems. Our investigation was restricted to those diseases that are covered in the reimbursement programme, which are only a 'tip of the iceberg' of diseases that could affect labour market participation. It is

Table 4 Adjusted association between chronic diseases and labour market attachment trajectories: results obtained from multinomial logistic regression with their OR and their 95% CI

	Labour market attachment trajectories during the 6-year follow-up		
	Delayed versus strengthening OR (95% CI)	Leavers versus strengthening OR (95% CI)	None-attached versus strengthening OR (95% CI)
With any chronic disease (n=1567)	1.06 (0.83 to 1.35)	1.27 (1.08 to 1.49)	1.27 (1.05 to 1.54)
Diabetes (n=190)	1.25 (0.69 to 2.28)	1.47 (0.97 to 2.22)	1.26 (0.75 to 2.10)
Arthritis (n=130)	0.48 (0.15 to 1.51)	1.26 (0.74 to 2.14)	1.39 (0.75 to 2.59)
Asthma (n=562)	1.18 (0.83 to 1.68)	1.06 (0.80 to 1.40)	0.78 (0.53 to 1.15)
Hypertension (n=642)	0.81 (0.52 to 1.26)	1.13 (0.89 to 1.43)	1.37 (1.06 to 1.77)
Heart disease (n=46)	1.81 (0.54 to 6.01)	1.19 (0.53 to 2.67)	1.70 (0.75 to 3.85)
Severe mental problems (n=100)	1.19 (0.43 to 3.30)	3.61 (2.23 to 5.37)	3.41 (1.91 to 6.10)

OR adjusted for age, gender, educational level, size of town and calendar year in subsidised re-employment programme.

also possible that our reliance on the records of the reimbursement programme may have resulted in under-representation of chronic diseases, but we think that if there are any under-representation, it may not be substantial. The reason is that in Finland, the special reimbursement programme has been established for a long time and is popular among physicians, pharmacist and citizens. Therefore, it is highly improbable that a patient fulfilling the diagnostic criteria is not applying for the entitlement, and there is no reason to suspect that long-term unemployed people would be in particular risk of not applying. The extrapolation of our findings to the general population may be limited since our sample constituted of a selected group of long-term unemployed people, that is, those who participated in the state-subsidised re-employment scheme, and among these, we focused only on those with complete information during the subsidised re-employment scheme. However, on the average, they may be regarded as a representative sample of re-employed people in Finland given that they were pooled from 10 towns in Finland with varying recruitment criteria.

A major strength of our study relates to the longitudinal design, which made it possible for us to evaluate the labour market experience of re-employed people over many time points. In addition, the use of reliable register-based data provided us with the opportunity to overcome methodological drawbacks associated with missing data, selection bias and recall bias, which were common among many past studies.

Conclusions

Our study shows that re-employed people follow distinct labour market attachment trajectories over time and that severe mental problems strongly increased the risk of belonging in the poor attachment trajectories. The influence of chronic somatic diseases on labour market attachment was less evident. Policy programmes that would promote supportive work environment for re-employed people with severe mental problems should be encouraged in order to prevent future unemployment of re-employed people with severe mental problems.

What is already known on this subject

- Poor health have been associated with reduced likelihood of re-employment among unemployed people.
- However, less is known about the labour market attachment trajectories of re-employed people and the influence of different chronic diseases on these trajectories.

What this study adds

- During 6 years subsequent to the period of subsidised re-employment, the participants assumed four distinct labour market attachment trajectories that are characterised as 'strengthening', 'delayed', 'leavers' and 'none-attached'.
- Having severe mental problem strongly increased the risk of belonging in the poor attachment trajectories, while the effect of chronic somatic diseases differed according to the type of disease and was less evident.
- Policy programmes that would promote supportive work environment for re-employed people with severe mental problems should be encouraged in order to prevent future unemployment among this group of re-employed people.

Acknowledgements We are grateful to Tapio Nurmi and Bright Nwaru for their advice and suggestions during the preparation of this manuscript.

Contributors MK, JP, JV and PJV designed the study and provided the study data. CN, LP and PJV designed the data analysis plan and analysed the data. CN drafted the manuscript with different rounds of critical comments from MK, JP, JV, PJV and LP.

Funding This project was supported by the funding from the doctoral school of health sciences, university of Tampere and by the academy of Finland (grant number 267727). MK is supported by Nordforsk, the nordic program on health and welfare and the UK medical research council (K013351).

Competing interests None declared.

Patient consent Detail has been removed from this case description/these case descriptions to ensure anonymity. The editors and reviewers have seen the detailed information available and are satisfied that the information backs up the case the authors are making.

Ethics approval The Ethics Committee of the hospital district of helsinki and uusimaa.

Provenance and peer review Not commissioned; externally peer reviewed.

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Chronic diseases as predictors of labour market attachment after participation in subsidised re-employment programme: a 6-year follow-up study

Chioma A Nwaru, Laura Peutere, Mika Kivimäki, Jaana Pentti, Jussi Vahtera and Pekka J Virtanen

J Epidemiol Community Health 2017 71: 1101-1106 originally published online September 19, 2017
doi: 10.1136/jech-2017-209271

PUBLICATION
IV

Sickness absence in a re-employment program as a predictor of labor market attachment among long-term unemployed individuals: A 6-year cohort study in Finland

Nwaru CA, Kivimäki M, Pentti J, Vahtera J, Virtanen P
Scand J Work Environ Health 2018;44(5):496-502
DOI:10.5271/sjweh.3742

Original article

Scand J Work Environ Health 2018;44(5):496-502

doi:10.5271/sjweh.3742

Sickness absence in a re-employment program as a predictor of labor market attachment among long-term unemployed individuals: A 6-year cohort study in Finland

by Nwaru CA, Kivimäki M, Pentti J, Vahtera J, Virtanen P

This paper investigates whether sickness absence during participation in a subsidized re-employment program in Finland influenced future employability of long-term unemployed people. Findings suggested an increased risk of poor labor market attachment among unemployed people with sickness absence, especially among young adults with >30 days of sickness absence. Sick unemployed people may require extra support in terms of healthcare and rehabilitation.

Affiliation: School of Health Sciences, Faculty of Social Sciences, 33014, University of Tampere, Tampere, Finland. Nwaru.Chioma.A@student.uta.fi

Refers to the following texts of the Journal: 2013;39(2):121-216 2017;43(6):505-603

Key terms: cohort study; employability; employment trajectory; Finland; Finland; health; health; labor market attachment; long-term unemployed; poor health; re-employment; re-employment program; sickness absence; unemployment

This article in PubMed: www.ncbi.nlm.nih.gov/pubmed/29870044

Original article

Scand J Work Environ Health. 2018;44(5):496–502. doi:10.5271/sjweh.3742

Sickness absence in a re-employment program as a predictor of labor market attachment among long-term unemployed individuals: A 6-year cohort study in Finland

by Chioma A Nwaru, MSc,[1] Mika Kivimäki, PhD,[2, 3, 4] Jaana Pentti, MSc,[3] Jussi Vahtera, MD, PhD,[5] Pekka Virtanen, MD, PhD [1, 6]

Nwaru CA, Kivimäki M, Pentti J, Vahtera J, Virtanen P. Sickness absence in a re-employment program as a predictor of labor market attachment among long-term unemployed individuals: A 6-year cohort study in Finland. *Scand J Work Environ Health*. 2018;44(5):496–502. doi:10.5271/sjweh.3742

Objectives We examined whether sickness absence during participation in a state subsidized re-employment program among long-term unemployed people was associated with subsequent labor market attachment.

Methods We linked 18 944 long-term unemployed participants (aged 18–60 years) of a six-month subsidized re-employment program in Finland to their records of sickness absence during the program and labor market status after the program. We used the latent class growth model to identify labor market attachment trajectories over a six-year follow-up period and multinomial logistic regression to investigate the association between sickness absence and labor market attachment trajectories.

Results We identified four labor market attachment trajectories: "strengthening", (77%), "delayed" (6%), "leavers" (10%), and "non-attached" (7%). Sickness absence was associated with an increased risk of belonging to the leavers and non-attached trajectories. Having >30 days of sickness absence during the six-month re-employment program increased the risk for belonging to the future non-attached trajectory in all age groups, but in particular for those aged 30–44 [odds ratio (OR) 7.35, 95% confidence interval (CI) 4.85–11.14] and 18–29 years (OR 5.38, 95% CI 3.76–7.69). At these ages, having fewer than 30 days sickness absences was also associated with an elevated risk of belonging to the non-attached trajectory, while this risk was lower for those aged 45–60.

Conclusions Sickness absence during participation in a subsidized re-employment program increased the risk for poor labor market attachment during the subsequent six years. The risk was particularly high among younger participants with >30 days of sickness absence.

Key terms employability; employment trajectory; health; poor health; unemployment.

There is a large body of research on the effects of unemployment on health. There is also a growing number of studies suggesting improved health status among re-employed individuals compared to those who remain unemployed (1–5). Much of the concern on how to improve the re-employment prospects of unemployed people is associated with concern about how to prevent health deterioration resulting from long-term unemployment (6, 7). In attempting to address this concern, labor authorities in several European countries have instituted active labor market policy measures such as job training, subsidized re-employment programs, and re-education courses, but the effectiveness of these measures has remained controversial (8–10). Hence policy-makers need to review and develop the current measures and seek for means that would contribute to the realization of the goal of improving re-employment.

A better understanding of the factors that constitute barriers to re-employment is crucial when planning preventive interventions aimed at promoting re-employ-

1 School of Health Sciences, Faculty of Social Sciences, University of Tampere, Tampere, Finland.
2 Clinicum, Faculty of Medicine, University of Helsinki, Helsinki, Finland.
3 Finnish Institute of Occupational Health, Helsinki, Turku and Tampere, Finland.
4 Department of Epidemiology and Public Health, University College London, London, UK.
5 Department of Public Health, University of Turku and Turku University Hospital, Turku, Finland.
6 Uppsala University, Department of Public Health, Faculty of Medicine; Uppsala, Sweden.

Correspondence to: Chioma A. Nwaru, School of Health Sciences, Faculty of Social Sciences, 33014, University of Tampere, Tampere, Finland. [E-mail: Nwaru.Chioma.A@student.uta.fi]

ment. Earlier studies have identified self-perceived general poor health (11–14) and musculoskeletal pain (15) as factors that may reduce the likelihood of re-employment. Research also suggests that unemployed people with physician-diagnosed mental problems (6, 16, 17) are at greater risk of not re-entering the labor market than their counterparts with no such health problems. However, an aspect that has been less explored is the association between previous sickness absence and re-employment. Assessing sickness absence during unemployment is complex due to the lack of a concrete everyday job. Our access to the sickness absence records of unemployed people during their participation in active labor market policy measures (ALMP) affords us the possibility of addressing the knowledge gap on the role of previous sickness absence on re-employment outcomes.

Sickness absence, particularly medically certified absence, is a well-known risk marker for mortality (17, 18) as well as many chronic health problems (19). Medically certified sickness absence has also been associated with increased risk of future sickness absences (20), job termination (21, 22) and unemployment (22–24) among active employees. Therefore, sickness absence during participation in ALMP could serve as a strong proxy for poor health and as such presents an objective measure to investigate the sustainability of the re-employment intervention for persons with serious health problems.

In our earlier study (17), we identified employment trajectories of re-employed people after their participation in a state subsidized re-employment program. Our aim in the present study is to examine whether sickness absence during such programs is a predictor of subsequent labor market attachment. We hypothesize that sickness absence is associated with poor labor market attachment, and that the risk of poor attachment increases with increasing number of sickness absence days.

Methods

Design and study population

We derived our study data from the Finnish Public Sector (FPS) study, which is an ongoing prospective study of employees in ten towns and five hospital districts in Finland. The overall aim of the FPS study is to assess the work life of employees and the impact of work and work-related changes on employee health and well-being (25). The Ethics Committee of the Hospital District of Helsinki and Uusimaa approved the study.

We used the part of the FPS study that included data on originally long-term unemployed individuals (N=23 213) who had their first period of subsidized re-employment in the service of the ten towns in 1994–2005. Subsidized re-employment schemes are an essential component of Finland's ALMP measures. They are designed for long-term unemployed people (as a rule those unemployed for ≥12 months) who have problems finding a job in the regular labor market. Participation in the program is voluntary and the selection of the participants is coordinated by the municipalities in cooperation with the local employment authorities. Individuals are selected if upon assessment they are considered capable of performing a full-time job. The employment contract lasts for six months. For the purposes of this study, the sample included the individuals (N=18 944) who completed the full six months' participation in the subsidized program and excluded those who were compelled to drop out due to poor health or who discontinued the program due to finding a job in the open labor market. All participants had to be 18–60 years old at the end of the scheme. Those who moved into retirement during the six-year follow-up were excluded.

Data on labor market attachment

Starting at the end of the subsidized re-employment period, subsequent employment of each individual was followed-up for six years, which were divided into 12 six-month periods to enable analysis of the labor market attachment trajectories. Labor market attachment here refers to the number of months (0–6) as an employee or entrepreneur during each of the 12 time periods. We obtained information on the employment histories from the register of the Finnish Centre for Pensions. This register includes monthly records of all employment contracts, as well as entrepreneurship which is eligible for inclusion in the formation of the statutory earnings-related pension insurance.

Data on sickness absence

We retrieved information on sickness absence from the register of the Social Insurance Institution of Finland (KELA). This nation level register contains records of all sickness absence periods lasting >10 working days, while costs of shorter periods are covered by the employer (26). Like other employees, participants in the subsidized re-employment program were also entitled to an earnings-related sickness allowance. We categorized the total number of their sickness absence days across the six-month period as: 0–≤10, 11–29, and ≥30 sickness absence days.

Background variables

Information on gender and age (18–29, 30–44, and

45–60) was obtained from the employers' registers. Educational level (basic, vocational school, and college or university degree) was retrieved from Statistics Finland, while information on chronic diseases was retrieved from the records of the Social Insurance Institution on entitlements to special reimbursements for the costs of purchased drugs for severe and chronic diseases. The chronic disease' variable was a summed score of six common diseases (heart disease, rheumatoid arthritis, asthma or chronic obstructive pulmonary disease (COPD), chronic hypertension, and severe mental problems). We categorized participants into two groups based on whether or not they had at least one of the chronic diseases mentioned. Information on calendar year in subsidized re-employment was derived from the employer's register, and calendar time was categorized as: 1994–1997, 1998–2001, and 2002–2005 in order to control for variations in unemployment and subsidized re-employment rates. We used the information on the ten towns where the participants had worked as a proxy for dichotomizing the area of residence into small towns and big towns. The small towns included Raisio, Naantali, Nokia, Valkeakoski and Virrat, while the big towns were Tampere, Turku, Oulu Vantaa and Espoo.

Statistical analysis

We used latent class growth model with zero-inflated Poisson (LCGM-ZIP) (27, 28) to identify subgroups within the population following a similar pattern of change in labor market attachment during the six-year follow-up period. We adopted an exploratory approach and estimated as many classes as possible (two through six latent class solutions) that yielded proper solutions, in the search for the optimum number of trajectory classes. We specified a quadratic growth term in each model (k number of classes), assuming that labor market attachment would decrease over time after an initial increase. We compared the models (ie, the k and k-1 models) using four selection criteria: (i) the Bayesian Information Criteria (BIC), where a model with lower BIC values indicated a well-fitting model (29); (ii) the Lo Mendell and Rubin Adjusted Likelihood Ratio test (LMR-LRT), where a significant P-value ($P<0.05$) indicates that the k class fits better than the k-1 class model (30); (iii) the average posterior probabilities of group membership for each class, where higher values (closer to 1) suggested that the trajectories correctly classified individuals with a similar pattern of labor market attachment and discriminated between individuals with dissimilar attachment patterns (31); (iv) the practical usefulness of the trajectories. To evaluate this, we examined both the distinctiveness and the sizes (proportions) of each of the trajectory groups (28). For trajectory groups to serve a useful substantive purpose, they should be distinguishable in terms of their shapes and other explanatory characteristics. They should also be of reasonable sizes (≥5%) to ensure precision (27, 31).

Upon establishing the optimum number of trajectory classes, we then used multinomial logistic regression to investigate the association between sickness absence and labor market attachment trajectories. We ran both unadjusted and adjusted models, where the adjusted model included age, gender, educational level, calendar year in a subsidized re-employment program, chronic conditions, and size of town. We also examined whether age and gender acted as potential modifiers by entering an interaction term between sickness absence and each of the variables in the fully adjusted model. If the interaction term was significant ($P<0.05$), the analysis was stratified and the stratum-specific estimates calculated. We presented the results of the regression analyses as odds ratio (OR) with their 95% confidence intervals (95% CI). We used Mplus version 7 for LCGA-ZIP and IBM SPSS Statistics for Windows version 23.0 (IBM Corp, Armonk, NY, USA) for the multinomial logistic regression.

Results

Altogether, 1172 of the 18 944 study participants had a recorded sickness absence during the six month period they were enrolled in the re-employment program. The absence lasted 11–29 days among 708 (60%) individuals, while the rest had >30 days of sickness absence. Having >30 absence days was more common in the older age group, among those with basic educational qualifications only, and in those who participated in the program between 2002–2005. Participants with chronic diseases were also more likely to have >30 days of sickness absence than those without such diseases (table 1).

On the basis of the information criteria, the four-trajectory solution discerned the different labor market attachment trajectories best over the six-year follow-up. figure 1 illustrates the four labor market attachment trajectories. The curves are constructed based on the mean proportion of months of the attachment at each half-year period of the individuals classified into each trajectory. The strengthening trajectory (N=14 577, 77%) represented those with a relatively stable attachment throughout the follow-up time. The delayed trajectory (N=1101, 6%) included those whose initially weak attachment steadily improved after 36 months. In the leavers trajectory (N=1970, 10%), attachment declined with time, while among the non-attached (N=1296, 7%) the trajectory assumed a very low level throughout the follow-up period.

Table 1. Descriptive statistics of study population (N=18 944) [SA = sickness absence]

	Number of participants		SA among participants during the six-month participation in the subsidized program							
			Total SA days		0–≤10 SA days		11–29 SA days		≥30 SA days	
Age (years)	N	%	N	%	N	%	N	%	N	%
18–29	9924	52.4	554	5.6	9370	94.4	329	3.3	225	2.3
30–44	6662	35.2	469	7.0	6193	93.0	293	4.4	176	2.6
45–60	2358	12.4	149	6.3	2209	93.7	86	3.6	63	2.7
Gender										
Male	5555	29.3	313	5.6	5242	94.4	185	3.3	128	2.3
Female	13 389	70.7	859	6.4	12 530	93.6	523	3.9	336	2.5
Educational level										
Basic	5251	27.7	403	7.7	4848	92.3	245	4.7	158	3.0
Vocational school	9525	50.3	583	6.1	8942	93.9	357	3.7	226	2.4
College/university	4168	22.0	186	4.5	3982	95.5	106	2.5	80	1.9
Year in subsidized re-employment										
1994–1997	13 174	69.5	704	5.3	12 470	94.7	427	3.2	227	2.1
1998–2001	4158	21.9	324	7.8	3834	92.2	199	4.8	125	3.0
2002–2005	1612	8.5	144	8.9	1468	91.1	82	5.1	62	3.8
Chronic disease status										
No	17 377	91.7	1034	6.0	16 343	94.0	633	3.6	401	2.3
Yes	1567	8.3	138	8.8	1429	91.2	75	4.8	63	4.0
Size of town										
Small	2329	12.3	443	6.4	2191	94.1	93	4.0	45	1.9
Big	16 615	87.7	729	6.1	15 581	93.8	615	3.7	419	2.5

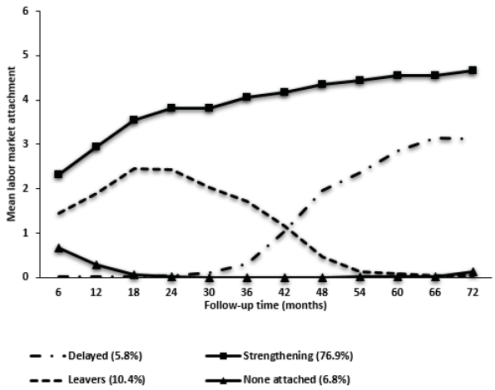

Figure 1. Labor market attachment trajectories of re-employed people during the six-year follow-up time (N=18 944)

Table 2 shows the associations between sickness absence and labor market attachment trajectories. After adjusting for potential confounders, participants having >30 days of sickness absence had 5.1 and 2.0 times higher odds of belonging to the "non-attached" and "leavers" trajectories respectively compared with those in the reference group. Those with 11–29 days of sickness absence also had 2.1-fold and 1.3-fold increased odds of belonging respectively to the "non-attached" and "leavers" trajectories.

Age turned out to be the only background variable that interacted significantly (P=0.004) with sickness absence. Table 3 presents the age-stratified associations after controlling for gender, educational level, calendar year in subsidized program, size of town, and chronic disease. Having >30 days of absence significantly increased the odds of belonging to the 'non-attached' trajectory in all age groups, but the odds were decidedly higher for participants aged 18–29 [odds ratio (OR) 5.38, 95% confidence interval (CI) 3.76–7.69] and 30–44 (OR 7.35, 95% CI 4.85–11.14) than for those aged 45–60 (OR 2.15, 95% CI 1.67–3.96). Having 11–29 days of sickness absence also increased the risk for belonging to the poor attachment trajectories for participants in age groups 30–44 and 18–29 years.

Discussion

We hypothesized that sickness absence during participation in a subsidized re-employment scheme would be associated with poor labor market attachment in the future and that the risk would increase with increasing number of days of sickness absence. The findings were consistent with these hypotheses. We also observed that age modified the association between sickness absence and labor market attachment, with younger unemployed people with sickness absence having an elevated risk for poor labor market attachment while the risk was less among older unemployed people, ie, those aged between 45 and 60 years.

Several studies, especially among long-term unemployed people (6, 15, 17), suggest that poor health

Table 2. Association between sickness absence (SA) and labor market attachment trajectories: results obtained from multinomial logistic regression with their odds ratio (OR) and their 95% confidence intervals (95% CI).

SA (days)	Trajectories of labor market attachment during the 6-year follow-up					
	Delayed vs. strengthening		Leavers vs. strengthening		Non-attached vs. strengthening	
	OR [a]	95% CI	OR [a]	95% CI	OR [a]	95% CI
Unadjusted model						
0–≤10	1.00		1.00		1.00	
11–29	1.76	1.33–2.31	1.29	1.01–1.63	2.08	1.63–2.65
≥30	2.54	1.84–3.50	1.96	1.49–2.58	4.98	3.92–6.32
Adjusted model						
0–≤10	1.00		1.00		1.00	
11–29	1.79	1.36–2.36	1.27	1.00–1.62	2.10	1.64–2.79
≥30	2.64	1.91–3.65	1.96	1.48–2.60	5.06	3.95–6.49

[a] Odds ratio adjusted for age, gender, educational level, year in subsidized re-employment, size of town, and chronic diseases.

Table 3. Age-stratified association between sickness absence (SA) and labor market attachment trajectories: results obtained from multinomial logistic regression with their odds ratio (OR) and their 95% confidence intervals (95% CI)

SA (days) according to age group	Trajectories of labor market attachment during the 6-year follow-up					
	Delayed vs. strengthening		Leavers vs. strengthening		Non-attached vs. strengthening	
	OR [a]	95% CI	OR [a]	95% CI	OR [a]	95% CI
18–29 years						
0–≤10	1.00		1.00		1.00	
11–29	1.73	1.20–2.50	0.92	0.61–1.39	2.13	1.47–3.07
≥30	2.33	1.48–3.66	2.23	1.50–3.30	5.38	3.76–7.69
30–44 years						
0–≤10	1.00		1.00		1.00	
11–29	1.66	1.03–2.68	1.86	1.30–2.68	2.92	1.93–4.41
≥30	2.97	1.75–5.07	2.27	1.41–3.66	7.35	4.85–11.14
45–60 years						
0–≤10	1.00		1.00		1.00	
11–29	3.80	1.54–9.39	1.08	0.62–1.88	1.20	0.65–2.22
≥30	4.62	1.70–12.56	0.89	0.43–1.81	2.15	1.67–3.96

[a] Odds ratio adjusted for gender, educational level, calendar year in subsidized re-employment, size of town, and chronic disease

reduces the likelihood of regaining a paid job. Not only is our study in agreement with earlier studies (as indicated in the association between sickness absence and the non-attached trajectory), but our findings moreover show that poor health could also constitute a risk factor even among those who regained employment immediately after the subsidized re-employment period (as seen in the association between sickness absence and the leavers trajectory). This has an important implication in that the emphasis should not only be on getting the unemployed back to work, but also on ensuring that re-employed people maintain favorable labor market attachment over time.

Earlier studies have suggested that poor health can negatively influence the job-seeking behavior of unemployed people that in turn may result in reduced likelihood of finding paid jobs (13). It has also been suggested that employers may be reluctant to hire job seekers with a history of poor health. Given that long-term sickness absences are mostly associated with ill-health (32) mostly due to serious health conditions (19) that can interfere with everyday activities, it is plausible that these explanations may account for our findings of an association between sickness absence and poor labor market attachment among previously long-term unemployed people.

There is evidence that younger individuals tend to have fewer long-term sickness absences (33) and better chances of re-employment (11, 12). Our findings revealed that younger long-term unemployed people with >30 days of sickness absence had a higher odds for poor labor market attachment than their older counterparts. This finding is similar to that of Virtanen et al (22) in which younger temporary employees with high sickness absence were reported to be at increased risk of subsequent unemployment, whereas among older temporary employees no such association was found. Knutsson & Goine (34) stratified sickness absence diagnosis by age and found that psychiatric diseases and allergies were more prevalent among younger individuals, while cardiovascular diseases were more common among older people. That study also reported that musculoskeletal diseases increased from ages 16–44 years, and thereafter leveled off. Virtanen et al (22) suggested that these differences in the diagnoses underlying sickness absence among younger and older people may explain the age-differences in the association between sickness absence and labor market outcomes.

Schuring et al (35) found that a poor self-rated health increased the likelihood of non-re-employment among men, but had less influence among women. In our study, gender did not modify the association between sickness absence and labor market attachment. It appears that the effect of gender on labor market outcomes may be sensitive to the health indicator measured.

It is noteworthy that the 94% of the study subjects were able to work the six-month period without needing long sick leaves. The high figure may be due to health-related selection in enrolling individuals on subsidized schemes or due to poor health among those who did not complete the period (and were therefore excluded from the study sample). But on the other hand, there may have been a high "sickness presence" either due to high motivation of the participants to demonstrate their work ability or due to the liberal attitude of the employer to the sometimes relatively poor productivity of these workers. In sum, those 6% who needed longer-term sick leaves evidently had relatively severe problems in health – notably in the areas that were not covered by the chronic conditions adjusted in the analyses.

It is also noteworthy that the trajectory analysis did

not produce a group with full, ie, six-month labor market attachment: at best, in those assuming the trajectory of "strengthening attachment", the employment rate remained at the level of four months. Thus, we can conclude that subsidized re-employment leads to permanent full employment relatively seldom even if the health and work ability of the participant are optimal.

The strengths of this study include the prospective design with large sample size. The use of registry-based data both for sickness absence and labor market attachment is also a strength, as it eliminated problems relating to attrition, recall bias, and subjective interpretation of both health and employment status. A limitation of our study is the lack of data on the nature of the employment contracts of the participants during follow-up (ie, whether they had permanent or temporary jobs or whether the employment was full- or part-time), which may influence the relationship between sickness absence and employment outcomes (22). Another limitation relates to the trajectory classes, which is only an approximation of reality since individuals were assigned to their mostly likely classes according to their average posterior probability values. The inability to adjust for behavioral risk factors and other health variables aside from those covered in the reimbursement scheme could be another source of residual confounding, although, in Hultin et al's study (23), the association between sickness absence and unemployment persisted even after controlling for several health indicators. This study finding may not be extrapolated to unemployed population in general since our sample consisted of a selected group of long-term unemployed people ie, those participating in a state subsidized re-employment program. However, on average, they may be regarded as a representative sample of re-employed people in Finland given that they were pooled from ten towns in Finland with varying recruitment criteria.

In conclusion, sickness absence among long-term unemployed people participating in a state subsidized re-employment program predicted future poor employability ie, poor labor market attachment. The risk for poor labor market attachment was particularly marked for younger unemployed people. Sick unemployed people face a double burden by virtue of their health and labor market status, which is why it is important to provide them with adequate support, including health care and rehabilitation to enhance both their chances of re-employment and maintaining favorable labor market attachment in the long term.

Conflict of interest and funding

The authors declare no conflicts of interest. This project was supported by funding from the School of Health Sciences, University of Tampere and by the Academy of Finland (grant number 267727). MK is supported by Nordforsk, the Nordic program on health and welfare and the UK Medical Research Council (K013351). The funders had no involvement in the planning, design, writing, and decision to submit this paper.

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Received for publication: 27 December 2017