Hip disorders and osteoarthritis: focus on health-related quality of life, assesssment and intervention

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2014

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Hip disorders and osteoarthritis: focus on health-related quality of life, assessment and intervention

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Akademisk avhandling

som med, vederbörligt tillstånd av Medicinska Fakulteten vid Lunds Universitet, för avläggande av doktorsexamen i medicinsk vetenskap, kommer att offentligt försvaras i sal H01, Health Sciences Center, Baravägen 3, Lund, torsdagen den 10 april 2014 klockan 9.00.

Fakultetsopponent

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LUND UNIVERSITY

Department of Health Sciences,

Division of Physiotherapy

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Document name

DOCTORAL DISSERTATION

Date of issue: April 10,2014

Sponsoring organization

Title and subtitle

Hip disorders and osteoarthritis: focus on health-related quality of life assessment and intervention

The overall aim of this work was to investigate the consequences of hip disorders and hip osteoarthritis (OA) on health-related quality of life (HRQL), physical function and self-efficacy.

The condition, hip OA, is often associated with significant pain and has a strong impact on physical function and quality of life. The prevalence of hip disorders was 32% and among the individuals reporting hip disorders, 86% experienced pain, 32% stiffness and 20% weakness and 92% of those with hip disorders also reported disorders in other joints (Paper I). In individuals with hip OA, better physical function and better self-efficacy were associated with higher perceived health-related quality of life (HRQL) (Paper II). A new instrument for assessing movement quality, the Body Awareness Movement Quality (BAS MQ) was examined. The inter-rater reliability and validity were acceptable in a group of individuals with hip OA (Paper III). Eighty-nine individuals were randomized either to Tai Chi for Arthritis, Hip School or a control group. Within group-differences showed a significant improvement between baseline and the 6-months follow-up in physical function in both intervention group and the Tai Chi group also improved significantly in self-efficacy. No significant differences, regarding physical function, self-efficacy or HRQL, were seen at 6- or 12-months follow-up when comparing the groups (Paper IV).

Key words :Hip disorder, osteoarthritis, health-related quality of life, physical function, Tai Chi, patient education

Classification system and/or index terms (if any)

Supplementary bibliographical information

Language

English

ISSN and key title 1652-8220

ISBN 978-91-87651-58-8

Recipient's notes

Number of pages 106

Price

Security classification

Hip disorders and osteoarthritis: focus on health-related quality of life, assessment and intervention

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Lund, University, Faculty of Medicine Doctoral Dissertation Series 2014:34
ISBN 978-91-87651-58-8
ISSN 1652-8220

Printed in Sweden by Media-Tryck, Lund University, Lund, Sweden
Lund 2014

Contents

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Louise, Jeanette, Amelie och Axel

Abstract

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Svensk sammanfattning

De övergripande syftena med dessa studier var att undersöka vilka konsekvenser höftbesvär och höftledsartros har på hälsorelaterad livskvalité, fysisk förmåga och tilltro till den egna förmågan

Höftledsartros är ofta förknippad med svår smärta och påverkar både fysiska funktion och livskvalité. Förekomsten av höftbesvär, i en befolkningsgrupp i södra Sverige, var 32%, och hos de som uppgav höftproblem upplevde 86% smärta, 32% upplevde stelhet och 20% upplevde svaghet. Av dem som upplevde höftbesvär hade 92% besvär även från andra leder (Paper I).

Hos personer med höftledsartros, var bättre fysisk funktion och bättre tilltro till egen förmåga associerade till bättre upplevd hälsorelaterad livskvalité (Paper II).

Ett nytt test för att bedöma rörelsekvalité, Body Awareness Movement Quality (BAS MQ) har utvärderats. Inter-bedömare reliabilitet och validitet var acceptabla för personer med höftledsartros (Paper III)

Åttionio personer med höftledartros lottades till antingen Tai Chi för artros, Höftskola eller till en kontrollgrupp. Vid jämförelse inom grupperna uppmättes en förbättring efter 6 månader, med avseende på fysisk funktion i båda behandlingsgrupperna. Gruppen som deltog i Tai Chi förbättrades även med avseende på tilltro till egen förmåga. Vid uppföljning efter 6 och 12 månader kunde inga skillnader i fysisk funktion, tilltro till egen förmåga eller hälsorelaterad livskvalité uppmätas mellan de tre grupperna. (Paper IV)

List of papers

Paper I

Sundén A. Johnsson B. Lohmander S. Ekdahl C.

Prevalence of self-reported hip disorders, relations to age, gender, pain, stiffness, weakness and other joint disorders

Advances in Physiotherapy. 2005;7:108-113

Paper II

Sundén A, Ekdahl C, Magnusson SP, Johnsson B, Gyllensten AL.

Physical function and self-efficacy – important aspects of health-related quality of life in individuals with hip osteoarthritis

European Journal of Physiotherapy, 2013;15:151–159

Paper III

Sundén A, Ekdahl C, Horstman V, Gyllensten AL.

Development and evaluation of the Body Awareness Scale Movement Quality

(BAS MQ).

Submitted 20131111

Paper IV

Sundén A, Gyllensten AL, Horstman V, Ekdahl C, Ekvall Hansson E.

Tai Chi and Hip school for patients with hip-osteoarthritis: a randomized controlled trial with 6- and 12-months follow-up.

In manuscript

Thesis at a glance

Paper I

Prevalence of self-reported hip disorders, relations to age, gender, pain, stiffness, weakness and other joint disorders

Sundén A. Johnsson B. Lohmander S. Ekdahl C.

Advances in Physiotherapy, 2005;7:108-113

Objectives: To estimate the prevalence and characteristics, (pain, stiffness, weakness), of self-reported hip disorders in an adult population-based sample. The objectives were also to estimate self-reported disorders in other joints.

Participants: A random sample of 2600 individuals aged 38–77 years from a general population in two defined primary health care districts in Sweden (Figure 1).

Methods: A population-based survey using a mailed questionnaire.

Results: The prevalence of reported hip disorders was 32% and increased with age from 18% among males 38-47 years to 42% among females 48-67 years. Among the individuals reporting hip disorders (n=692) 86% experienced pain, 32% stiffness and 20% weakness, and 58% had consulted medical care for their hip disorders; 92% of the individuals with reported hip disorders also reported problems in other joints.

Conclusion: Disorders related to the hip region are common in a population-based sample. Pain was the most frequent symptom and females more frequently than males reported symptoms from other joints. To a great extent individuals reporting hip symptoms also have symptoms in other joints.

Paper II

Physical function and self-efficacy – important aspects of health-related quality of life in individuals with hip osteoarthritis

Sundén A, Ekdahl C, Magnusson SP, Johnsson B, Gyllensten AL.

European Journal of Physiotherapy, 2013;15:151-159.

Objectives: The objectives were to investigate the associations between Health-related Quality of Life (HRQL), physical function and self-efficacy (the sense of being able to perform specific tasks), in individuals with X-ray-verified hip osteoarthritis. The aim was also to determine factors explaining good perceived HRQL.

Participants: Eighty-nine individuals with X-ray-verified hip osteoarthritis in the age group 40-75 years participated in this study. The study group predominantly consisted of females, n=61, 69% (males n=28), and the mean age was 62.5 years, range 39-76. The recruitment was performed through advertisement in the daily press (Figure 1).

Methods: The study employed a descriptive cross-sectional design. Two experienced physiotherapists made all the assessment; one conducted the assessment with Body Awareness Scale- Movement Quality (BASMQ) and the other conducted the Six Minute Walk Test (6MWT) and handed out the questionnaires.

Results: The main findings showed that Health-related quality of life (HRQL) the physical part, had a significant correlation with observed physical function, self-reported physical function and self-efficacy. HRQL, the mental part, showed a significant correlation to self-efficacy.

Conclusion: Results of the current study indicated that physical ability and self-efficacy are of great importance for HRQL in subjects with hip OA. Better physical function and better self-efficacy are associated with higher perceived HRQL. This important knowledge about factors affecting both mental and physical aspects should be taken in consideration when planning the rehabilitation programs promoting quality of life for patients with hip OA.

Paper III

Development and evaluation of the Body Awareness Scale Movement Quality (BAS MQ)

Sundén A, Ekdahl C, Horstman V, Gyllensten AL.

Submitted

Objectives: The objectives were to investigate the psychometric properties of the Body Awareness Scale Movement Quality (BAS MQ) focusing on factor structure, validity and reliability and to explore whether BAS MQ could discriminate between healthy individuals and patients. BAS MQ assesses both limitations and resources concerning functional ability and quality of movements.

Participants: The total sample in the study (n=172) consisted of individuals with hip osteoarthritis (OA) (n=132), individuals with psychiatric disorders (n=33) and healthy individuals (n=7) (Figure 1).

Methods: A factor analysis of the BAS MQ was performed for the toal group. Inter-rater reliability was tested in a group of individuals with hip OA (n=24). Concurrent validity was tested in a group of individuals with hip OA (n=89). The Medical Outcomes Study 36-item Short-form Health Survey (SF-36), the Six Minutes' Walk test (6MWT) and the Hip Osteoarthritis Outcomes Score (HOOS) were chosen in the validation process.

Results: The factor analysis revealed three factors which together explained 60.8% of the total variance of BAS MQ. The inter-rater reliability was considered good or very good with a Kappa value of 0.72. Significant correlations between BAS MQ and SF-36, HOOS and 6 MWT in the subjects with hip OA confirmed the validity. The BAS MQ was able to discriminate between healthy individuals and individuals with physical and psychiatric limitations.

Conclusion: Results of the study revealed that BAS MQ has a satisfactory factor structure. The inter-rater reliability and validity were acceptable in a group of individuals with hip OA. BAS MQ could be a useful assessment tool for physiotherapists when evaluating the quality of everyday movements in different patient groups.

Paper IV

Tai Chi and Hip school for patients with hip-osteoarthritis: a randomized controlled trial with a 6- and 12-months follow-up.

Sundén A, Miller M, Horstman V, Ekdahl C, Ekvall Hansson E, Gyllensten AL
In manuscript

Objectives: The aim of the study was to compare the effects of two interventions, Hip school and Tai Chi for arthritis, with a control group, in terms of Health-related quality of life, self-efficacy and physical function in subjects with hip OA.

Participants: Eighty-nine individuals with X-ray-verified hip osteoarthritis in the span 40–75 years of age participated in this study (Figure 1 and 2).

Methods: After an advertisement in a local paper, over 300 volunteers applied to participate in the study. All 300 received information about the study by mail or telephone. One hundred volunteers fulfilled the inclusion criteria: X-ray-verified hip OA, 40-75 years of age, no walking aid and no joint replacements in the hips or knees. A total of 89 subjects attended the baseline appointment and were randomized to one of the three groups.

Results: No significant differences were seen neither at 6-or 12-months follow-up when comparing the groups. Within group-differences between intervention groups Hip School and Tai Chi, showed a significant improvement between baseline and the 6-months follow-up in BAS MQ CB (Tai Chi p=0.02, Hip School p=0.008) and BAS MQ Total (Tai Chi p=0.008, Hip School p= 0.035). The Tai Chi group also improved significantly in HOOS QOL (p=0.05) and ASES SEF (p=0.026) between baseline and the 6-months follow-up.

Conclusion: The results revealed statistically significant improvement within the intervention groups in physical function, self-efficacy and quality of life between baseline and 6-months follow-up. No statistically significant differences in physical function, self-efficacy or HRQL were found between the groups after 6 or 12 months.

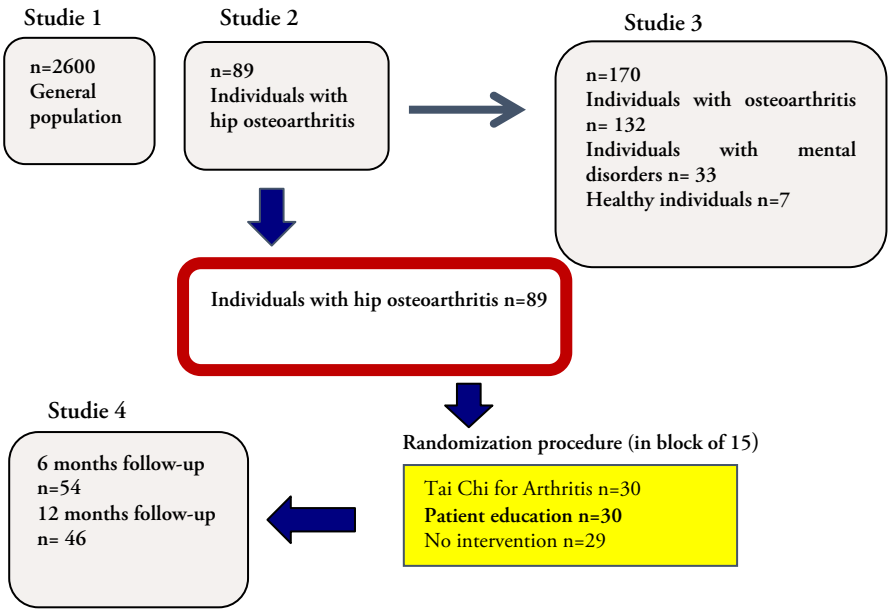

Figure 1
Flowchart of individuals in Paper I-Paper IV

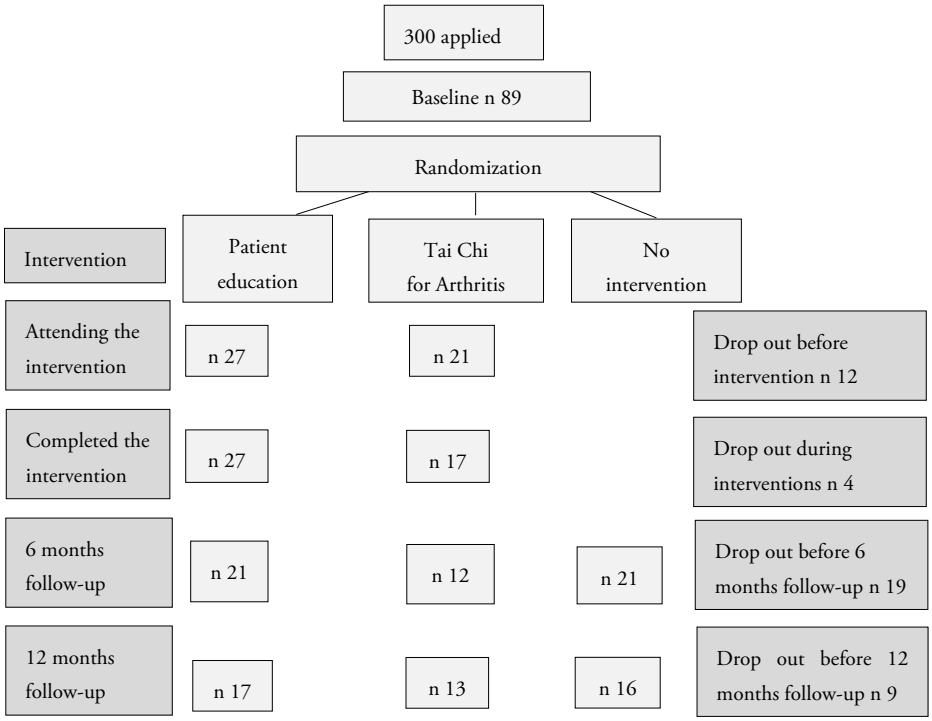

Figure 2
Flowchart of individuals in Paper IV

Definitions and abbreviations

ADL	Activities of Daily Living
ASES	Arthritis Self-Efficacy Scale
BAS-H	Body Awareness Scale Health
BAS MQ	Body Awareness Scale Movement Quality
BMI	Body Mass Index
HOOS	Hip Osteoarthritis Outcomes Score
HRQL	Health-related Quality of Life
ICF	International Classification of Functioning Disability and Health
OA	Osteoarthritis
ROM	Range Of Motion
6MWT	Six Minute Walk Test
SF-36	The Medical Outcomes Study 36-Item Short Form Health Survey
THR	Total Hip replacement
VAS	Visual Analog Scale
WHO	World Health Organization

Introduction

Musculoskeletal disorders

Non-inflammatory musculoskeletal disorders, disorders affecting joints, muscles and adherent tissues, are among the most common conditions managed in primary health care and are major causes of absence from work and early retirement with disability pension. In a Dutch study from 2003 74.5% of the population aged 25 years and over reported pain from the musculoskeletal system during the previous 12 months. In the age group 55-64 years 45% reported pain from the neck/shoulder and 35% reported pain from the hip or knee during the previous 12 months. Hip pain was reported by 6.9% of men in the age group 45-64 years and 11.1% in the age group 65+ and by 15.2% of the women in the age group 45-64 years and by 21.2 % in the age group 65+ (Picavet et al., 2003).There are many negative consequences of musculoskeletal pain in our society such as an extensive demands on the health care system, increased use of analgetic and anti-inflammatory medication, limitations in activities of daily life, sick leave or being work disabled (Picavet et al., 2003). An overview of musculoskeletal pain from 2003 showed a prevalence of pain from the hip region of 5.2% to 22.4% (Picavet et al., 2003).

The total cost for society due to musculoskeletal disorders is enormous and for the individual musculoskeletal disorders and symptoms affect many components of the International Classification of Functioning, Disability and Health (ICF) such as stiffness, weakness or pain (body structure), gait disability (activity) and difficulty to keep up ones social activities (participation) (Figure 3) (WHO, 2001).

Osteoarthritis

One of the most common causes of disability in the world is osteoarthritis (OA) (Egloff et al., 2012). OA is, in developed countries, one of the ten most disabling diseases (WHO, 2014). OA is in individuals over 65 years of age the most common chronic joint condition (Williams et al., 2006). The process of OA from a pathological change to disability may be influenced by both personal and environmental factors (Wang et al., 2005). The exact cause of the disease is unknown but the aetiology is multifactorial including increased mechanical stress, ligament derangement, cartilage degradation,

subchondral bone changes and muscular impairment (Egloff et al., 2012). OA is a disease of the whole joint, including bone, cartilage, capsule, ligaments, tendons and muscles, and occurs when there is an imbalance between destructive forces and repair mechanisms in the joint. All joints represent a connective unit between two bones and several joints that connect serially act as a kinematic chain. This chain allows motion and provides stability. (Egloff et al., 21012). Non physiological loading patterns on one of the joints in a kinematic chain will influence the adjacent joint as well. OA is most common in weight bearing joints such as the knees and hips and in the joints of the hand but can occur in all synovial joints. Pain has been shown to be a major obstacle to walking and other physical activity. About 80% of adults with osteoarthritis have movement limitations 25% have problems with major activities of daily living and 11% need help with daily personal care (Ma et al., 2013).

Generalized OA (GOA) is a term used to describe a disease where three or more joints or group of joints are affected (Williams et al., 2006). GOA is more common in women and is more frequent in increasing age (Nelson et al., 2014)

The prevalence of osteoarthritis increases with age. The proportion of elderly individuals in the high income societies is increasing and will lead to an increase of socioeconomic costs due to consequences of osteoarthritis. Because the social and personal impact of this disease is enormous - interventions that offer even small improvement regarding the onset and progression of OA may result in significant alleviation for many individuals and thus society (Ma, et al., 2013).

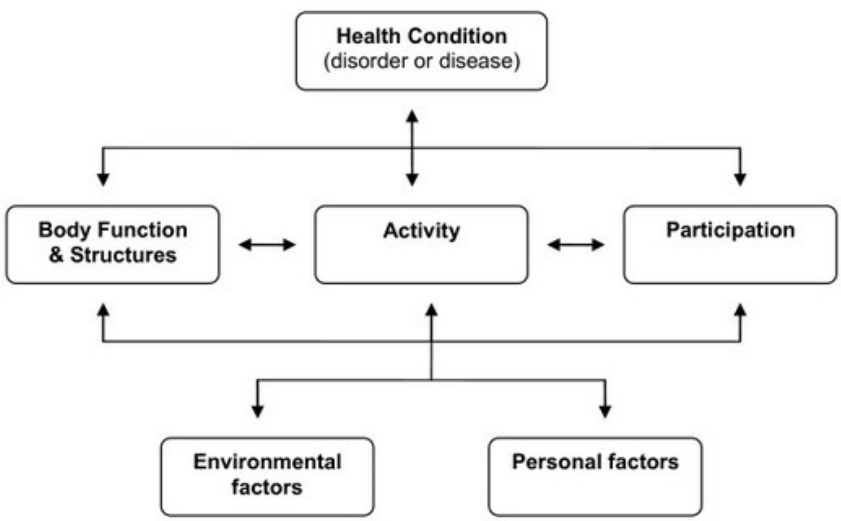

Figure 3
The International Classification of Functioning, Disability and Health. Permission to print in thesis, WHO 2014

Prevalence and incidence

WHO estimates the prevalence of OA to be 9.6% in men and 18% in women worldwide (WHO, 2014). Among the individuals with OA, 80% have movement limitations and 25% are unable to perform their major daily activities (WHO, 2014). In a study from 2008 the prevalence of OA (hip, knee or hand), in Norway was estimated to 12.8% (women 14.7%, men 10.5%) (Grothle, et al., 2008) In a review from 2008 the prevalence of hip OA was estimated to 27% (25.7% in men and 26.% in women) in the age group ≥45 years (Lawrence et al., 2008). Due to the increasing number of elderly the estimated prevalence of arthritis will increase.

The prevalence of hip OA varies, ranging from 0.9% to 27% in Europe and North America (Dagenais et al., 2009) and is estimated to 5.5% in Norway (Grotle et al., 2008). In United States the incidence of OA is estimated to 100 000 new cases per year (Egloff 2012).

Risk factors

Causes of the disease are often an interaction of, both systemic factors and local factors (Williams et al., 2006). Risk factors for the onset and the progression of the disease are e.g. older age, gender, genetic predisposition, obesity, joint congruency, joint injuries, malalignment, anatomic abnormalities, and increased mechanical stress (Egloff et al., 2012, Felson. 2013). OA may also evolve after e.g. intra articular fractures, ligament lesions and systematic or diseases such as rheumatoid arthritis (Egloff et al., 2012).

Inflammation is present in joints with OA but the role of this inflammation is still not fully explained (Felson, 2012. Berenbaum, 2013).

Symptoms and consequences of osteoarthritis

Pain

Pain is the main cause why patients seek medical care (Mandle 2011). The mechanisms underlying the pain are complex (Mandl 2011). Pain in OA is often viewed as peripherally nociceptive pain. Stimuli from the damaged joint stimulate peripheral nerve endings, triggering neural pathway which results in pain perception (Mandl, 2011). The cartilage is aneural but peripheral nociceptors are located in periosteum, subchondral bone, ligaments, synovial capsule and muscles fascia. In patients with OA, a low-grade synovial inflammation may be present and can correlate with pain severity (Mandl, 2011).Swelling due to an inflammation may restrict joint range of motion (ROM) (Williams et al., 2006). A higher generalized sensitivity i.e. decreased pressure pain threshold (PPTs) was found in individuals with severe hip OA compared to healthy controls (Kosek et al., 2013). The fact that the individuals with hip OA also had high periarticular sensitivity to threshold pressure pain may indicate a generalized higher

sensitivity to pain (Kosek et al., 2013) which may lead to chronic widespread pain or fibromyalgia (Yarnitsky, 2010).

Physical function

Physical inactivity due to e.g. movement-associated pain and decreased range of motion (ROM) may lead to muscle weakness. This may result in an inability to stabilise a joint and may lead to joint laxity and/or joint damage. Muscle weakness may be one of the first symptoms in OA (Egloff 2012). Individuals with hip OA or knee OA were significantly less active (movement-related activity) individuals with no OA. The individuals with OA also perceive limitations in activity but these perceived limitations are not directly related to the actual possibility to perform physical activity (de Groot el al., 2007). Depending on which joint that is affected by OA the degree of disability varies. Adults, in the US, with OA are significantly less physically active than the recommendations for individuals with arthritis (Rosemann, et al., 2008, Shih et al., 2006).

Fear of physical activity was found to be a predictor of outcome in a study of individuals with knee OA (Fitzgerald, et al., 2012) Despite the fact that individuals with hip OA do not often experience instability of the affected joint, compared to individuals with knee OA, fear of movement may occur due to pain and muscle weakness.

Health-related Quality of Life

The World Health Organization (WHO) conceives of health as being “A state of complete physical, mental and social wellbeing, not merely the absence of disease or infirmity" (WHO, 2003).

Arthritis affects both physical and psychological dimensions of health and measures of HRQL reveal a broad panorama of the impact that the disease has on a person´s health status. Individuals with osteoarthritis or with rheumatoid arthritis (RA) showed poorer HRQL than healthy individuals (Dominick et al., 2004). Maintaining quality of life is one of the goals in treatment of individuals with chronic diseases and it has been established in previous studies that patients with non-traumatic hip or knee disorders have decreased HRQL (van der Waal et al., 2005). Individuals with OA reported poor health-related quality of life and particular individuals with hip OA who reported major limitations in daily activities and poor health status (Grothle et al., 2008)

Self-efficacy

Self-efficacy is a person’s belief that he/she can attain a specific goal. Individuals with a strong self-efficacy have better opportunities to cope. Self-efficacy is not a specific coping strategy but a mediator to coping behaviours (Bandura 1977). High levels of self-efficacy were shown to be a predictor of decreased disability in individuals with OA of the knee, hip or both (Benyon et al., 2010). Self-efficacy can have a significant impact on symptoms such as anxiety, stress reactions and pain that affect the quality of life and the development of chronic dysfunction as well as the beliefs of possibilities to participate in

society No relationship was revealed between problem solving and pain severity (Benyon et al., 2010). Individuals with OA who have low self-efficacy will have more disability after six months (Benyon et al., 2010).

A high level of self-efficacy has been found to be associated with decreased pain, increased activity and higher quality of life in individuals with knee OA (Van Liew et al., 2013). Self-efficacy was not related to engagement in physical exercise but low self-efficacy was related to a worse physical dysfunction (Van Liew et al., 2013).

Assessment

For grading the severity of radiographic features in OA the Kellgren and Lawrence grading system is useful for definition of hip OA (Reijman et al., 2004). Radiographic stage of OA is not associated with clinical symptoms in individuals with hip OA (Nilsdotter, et al., 2001), and there is a poor correlation between radiographic findings and pain severity in individuals with OA (Mandl, 2011).

The American College of Rheumatology (ACR) have developed a classification of clinical criteria for OA of the hip (Altman et al., 1991). For assessment of physical function there is no golden standard. Using the ICF model (Figure 3) physical function can by classified as *Activities* (WHO, 2001). Measurements of physical function and changes after intervention of individuals with hip OA are essential in clinical practice and in research. Measurement of physical function can be both self-reported and performance-based. Both types of measures are seen as complementary rather than competing when evaluating function outcomes in people with OA (Dobson et al., 2012). Performance-based measures assess the individual's ability to perform a certain task and self-reported measures assesse that which the individual perceives he or she can do (Dobson et al., 2012). Performance-based tests can be single-activity measures or multi-activity measures. Walk-tests, a single-activity test, can be of two types: those over short distance (<100 m) and those over a longer distance (>100m) (Dobson et al., 2012).

Currently there is no gold standard for the assessment of physical function in individuals with OA. WHO advocates that instruments developed and used for the assessment of body functions and activities should be of relevance to the patient and put in the perspective of the subject´s perceived participation (International Classification of Functioning, Disability and Health, (ICF) (WHO).

The assessment instruments used in this thesis are:

HOOS

The Hip Osteoarthritis Outcomes Score (HOOS Swedish version L.K 1.1), is a disease-specific, self-reported measurement for assessing patients´ options and limitations associated with their hip problems. The questionnaire consists of 39 items in 5 subscales, pain (P, 9 items), other symptoms including stiffness (S, 5 items), activity limitations

daily living (ADL, 17 items), activity limitations recreation and sport (SP, 4 items) and hip-related quality of life (QOL, 4 items). All items in each subscale are scored from zero to four (no, mild, moderate, extreme difficulties). The summed score from each subscale is calculated and transformed into a 0-to-100 scale from worst to best. Acceptable validity and reliability for the HOOS has been found for hip OA patients (Nilsdotter et al., 2003). In a review from 2010, 8 questionnaires were found for evaluation of hip OA and/or Total Hip replacement (THR) (Thorborg et al., 2010).

SF-36

The Medical Outcomes Study 36-Item Short Form Health Survey (SF-36) is a questionnaire designed to assess HRQL and has been used in several studies and countries for various chronic diseases, including hip OA. It is one of the most commonly used generic HRQL instruments. SF-36 has two summary scales: a Physical Component Scale, PCS, with four subscales: physical functioning (PF,10 items), role limitation owing to physical health problems (RP, 4 items), bodily pain (BP, 2 items), general health perception (GH, 5 items) and a Mental Component Scale, MCS, with four subscales: vitality (VT, 4 items), social functioning (SF, 2 items), role limitation owing to emotional problems (RE, 3 items) and mental health (MH, 5 items). The scores on all subscales range from 0 to 100, with higher scores indicating better health states (Sullivan et al., 2002). SF-36 has been shown to be sensitive to variation in health status and possesses high levels of reliability and validity. Good validity has been shown for patients with arthritis (Linde et al., 2008).

ASES

The Arthritis Self-efficacy Scale (ASES), developed by Lorig et al, measures the patient's self-recorded judgment of what he/she can do regardless of the degree of functional limitations or skill (Lorig et al, 1989). The items ask for the subject's sense of being able to perform specific tasks in a given situation. The ASES is a self-report questionnaire, consisting of 20 items (3 subscales and one total score) which measures: a person's self-perceived ability to control pain, (SEP, 5 items), self-efficacy to perform functions in daily living, (SEF, 9 items) and the self-efficacy to control other symptoms related to chronic disease, (SEOS, 6 items). Each item ranges from 10=very uncertain to 100 = very certain to accomplish the described task. A higher score indicates better self-efficacy. The questions reflect several aspects of self-efficacy both physical function and the ability to deal with other problems related to having a joint disease.The Swedish version of the ASES was found to have an acceptable validity and reliability for individuals with chronic pain and individuals with rheumatic diseases (Lorig et al, 1989, Lomi et al., 1992).

BAS-MQ

The Body Awareness Scale Movement Quality (BAS-MQ) is a physiotherapeutic assessment focusing on body awareness and quality of movements. The test assess quality of everyday functional movements and movement behavior, through observation from a

structured movement test. BAS MQ has been developed as a synthesis of the BAS and the BAS-H, to assess both movement quality and movement pathology. The BAS MQ is a standardized, user-friendly, quick assessment scale, easy to perform and requiring little in the way of equipment and may be a useful instrument for assessing the total movement pattern in individuals with decreased movement function. The BAS MQ assessment of the quality of movements is unique and will provide additional information for the benefit of treatment strategies. This may give the possibility for more targeted treatment interventions aimed at reducing the consequences of a disease and the consequences of a harmful use of the body. The instrument BAS MQ may be useful when analyzing the neuromuscular control of daily movements and not only the frequency or time as often in assessments of movement. The assessment consists of 23 items, rated in a five-step scale, ranging from 0-4 (0= optimal performance, 4 = unable to perform the task). Three sub-scales have been identified: stability in function factor (SF, 9 items), coordination and breathing factor (CB, 8 items) and relational and awareness factor (RA, 6 items). A BAS-MQ Total score can be calculated. The stability in function factor tests the postural stability, to step up on a chair, to stomp, the flexibility in the balance line, weight transfer, to balance on one leg, to sit down on the floor and getting up, to lie down on the floor and getting up, and the ability to jump. The coordination and breathing factor tests the orientation to the movement center, centering of movements, the spread of respiration, the respiration integration, the muscle tension, the turning coordination, the gait coordination and the movement control. The third subscale, relational and awareness factor, tests the subject's motor activity, the relation to a mirror, the eye contact, the handshake, personal space and the presence. Test-retest reliability and validity, for an earlier version of BAS MQ, have been found to be acceptable for a group of patients with hip osteoarthritis (Gyllensten et al., 1999, 2004).

6MWT

The Six Minute Walk Test (6MWT) was used to measure walking capacity. Timed walking tests are used to evaluate functional exercise performance and measure the ability to carry-out the activities of daily life. The participants were asked to walk at their own maximum pace during the six minutes without running. The manual stated that the testing was to be interrupted if threatening symptoms appeared. The information to the participants before and during the test was standardized (ATS, 2002). The total distance was measured in meters. The reliability and validity of the 6MWT have been found be high in healthy elderly individuals and in patients with various diseases (Kervio et al., 2003).

VAS

Visual Analogue Scale is a commonly used instrument for evaluation of pain. The scale consists of a 100 mm horizontal line anchored with two labels: no pain and worst pain imaginable. The instructions to the individual are to mark on the line with a vertical line

the perceived pain level. The VAS has been used in or studies for evaluation of pain level and disability in individuals with OA (Boonstra et al., 2008, Kroon et al., 2014).

Treatment options

To date no medical cure for OA exists. The treatment options focus on treating symptoms and on postponing end-stage OA. Osteoarthritis Research Society International (OARSI), European League Against Rheumatism (EULAR) and, The National Board of Health and Welfare in Sweden (SoS) recommendations for management of OA include a combination of non-pharmacological interventions, e.g. education, self-management, exercises and weight reduction. (Fernandez et al., 2013, The National Board of Health and Welfare 2012, Zhang et al., 2010, Lohmander et al., 2007) (Figure 4). In end-stage hip OA surgical intervention involving a joint replacement is preferred. Only 17% of the individuals with hip OA had surgery 11-28 years after diagnosis (Franklin, et al., 2011). Surgical interventions should only take place if other treatments have failed to relieve symptoms (Egloff et al., 2012). Placebo has been shown to be superior to untreated controls for subjective outcome of pain, function and stiffness (Zhang et al., 2008).

In a review from 2014, 17 different Clinical Practice Guidelines (CPGs) for the management of OA were analysed. A majority of the included CPGs recommend: Transcutaneous Electric Nerve Stimulation (TENS), acupuncture, patient education, aerobic exercises, behavioural approaches combined with therapeutic exercises and weight control (Brosseau et al., 2014).

The American College of Rheumatology (ACR) recommends for individuals with hip OA land-based and aquatic exercise, participation in self-management programs, manual therapy, psychosocial intervention and walking aids. The expert panel in their study from 2012 did not find any studies of Tai Chi for individuals with hip OA, only for knee OA. Due to this, the management recommendations from ACR do not include Tai Chi (Hochberg et al., 2012).

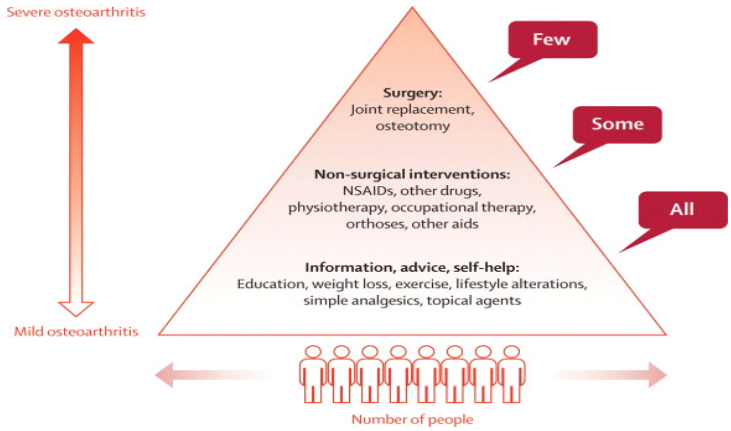

Figure 4
Management of osteoarthritis. Width of pyramid corresponds to number of people that need each treatment. Reprinted with permission from the authors and from The Lancet (Lohmander, Roos, 2007).

Patient education

The results from recent studies have produced a more complex view of OA treatment which ranges from surgery to patient education and exercise. International and national recommendations emphasize that education and information should form an integral part of the management of any chronic disease. In an overview from 2008, 34 clinical practice guidelines (CPG) were identified (Misso et al., 2008). The Swedish Rheumatism Association and the Better management of patients with Osteoarthritis project (BOA) currently advocate the dissemination of these recommendations into the health-care system via patient and health care staff education (The Swedish Rheumatism association, 2013, BOA, 2013). More than 300 health-care units in Sweden offer patient education for patients with osteoarthritis (BOA, 2013). A hip school patient education program was introduced in Säffle, Sweden, already in 1984 by physiotherapist Maria Klässbo. The aims of the Hip School were to provide self-help, reduce fear, promote physical activity and prevent/reduce hip dysfunction. The first results were presented in 2003 and showed reduction in pain, sleeping disturbances and activity limitations after six months in the group receiving hip school intervention but no significant changes were found in the control group (Klässbo et al., 2003). Patient education has also been shown to improve self-perceived health, self-efficacy and physical function, and to reduce pain in persons with OA (Hansson et al., 2010, Skou et al., 2012). Poulsen et al. showed in 2013 that patient education in combination with manual therapy, for individuals with hip OA, reduced pain, improved self-reported ADL and QoL compared to a control group receiving a minimal intervention of home stretching (Poulsen et al., 2013).

Exercise

Strengthening exercises and water-based exercises are associated with decreased pain in individuals with hip OA (Zhang, et al., 2010). Both global strengthening (muscles not surrounding the affected joint) and segmental strengthening (muscles surrounding the affected joint) improved function and quality of life and decreased pain compared to a control group (Vignon et al., 2006)

Exercise programs should be functional and task-oriented with the aim of enabling the individuals to meet the physical demands of every-day living (Pisters et al., 2010). Physical function has been shown to relate to Quality of Well Being (QWB) but exercise was not related to QWB (Van Liew et al., 2013).

Neuromuscular training aims to improve sensorimotor control and functional stability. The long-term results of a prospective cohort study showed remarkably low incidence of OA after 15 years, in individuals with ACL who were treated using supervised neuromuscular rehabilitation (Egloff et al., 2102). This indicates the importance of improved muscles strength and neuromuscular control to absorb altered joint load (Egloff et al., 2012). In a study of the feasibility of neuromuscular training for individuals with severe knee and hip OA Ageberg found that the pain level decreased or were unchanged even with progression of the training level (Ageberg et al., 2010).

Tai Chi as a form of exercise in OA, originates from China. It is a part of a system called Martial Arts, where it is referred to as the soft martial art. Tai Chi is mostly used in the form of the "solo exercise", the actual movement form. Tai Chi is tightly knitted to traditional Chinese medicine and philosophy and has been used to promote health and as a tool to improve lower extremity strength (Wolfson et al 1996, www.nccam.nih.gov/health/taichi). There are several different schools or styles of Tai Chi. Most Tai Chi styles are slow and gentle and consist of continuous movements of every part of the body. Nowadays Tai Chi is regarded as a form of exercise. The movements incorporate both elements of strengthening, balance, postural alignment and concentration and the exercise is of moderate intensity (Field, 2011). Tai Chi as a group therapy might encourage contact and social interaction. In the west the most common Tai Chi form is the Yang style. The Yang style has inspired the treatment modality of Basic Body Awareness Therapy. The Sun style is the Tai Chi style used to create the Tai Chi for Arthritis (TCA) concept. The TCA form is easy to learn and has been scientifically examined in randomised studies focusing on its effects on pain, balance, strength and fitness in elderly women with osteoarthritis. After 12 weeks the arthritis symptoms were ameliorated, as well as balance and fitness improved compared to the control group (Song et al 2003). A review from 2011 showed that exercise programs based on Tai Chi, aerobic and general exercise gave better results than hydrotherapy (Escalente, 2011). Yan et al., showed in a review from 2013 decreased pain and stiffness and improved physical function in individuals with OA after a 12-week Tai Chi training (Yan et al., 2013). In a randomized clinical trial (RCT) from 2007 the effect of Tai Chi in older individuals with knee OA were examined and the results showed a sustained

improvement in physical function for 24 weeks, after a 12 week intervention compared to a wait-list control group (Fransen et al., 2007).

Tai Chi exercises for older people resulted in a lower incident ratio of falls and a significantly decreased risk of falls compared to other training interventions (Wu, 2002). Song showed that older women with OA could perform Tai Chi for 12 weeks and gained an improvement in arthritic symptoms, balance and physical function (Song et al., 2003).

In a review from 2008 Lee et al., found evidence suggesting that Tai Chi may be used for pain control in patients with knee OA (Lee et al., 2008).

A meta-analysis from 2013 showed moderate evidence for improvement of pain, physical function and stiffness and strong evidence for improvement of the physical component of quality of life in individuals with knee OA (Lauche et al., 2013). Positive results on quality of life were also found in a meta-analysis of RCT:s for patients with chronic conditions including OA (Wang, 2012).

Long-term Tai Chi training has also shown to have positive effects on joint sense (Tsang et al., 2003) and balance (Tsang et al., 2004).

To our knowledge, Tai Chi for patients with hip OA has not been studied in Sweden

Main conclusions

- Disorders related to the hip region are common in a population-based sample. Individuals reporting hip symptoms frequently have symptoms from other joints. Pain was the most common symptom and females more frequently than males reported symptoms from other joints. (Paper I)
- Good physical ability and good self-efficacy are important for HRQL in individuals with hip OA. (Paper II)
- HRQL had a significant correlation with both observed physical function and self-reported physical function in individuals with hip OA.(Paper II)
- The factor structure of BAS MQ identified three factors namely "Stability in function factor", "Coordination and breathing factor" and the "Relational and awareness factor". (Paper III)
- The results showed a significant difference between the groups of healthy individuals and the group of individuals with movement limitations, here hip OA or psychiatric disorders when assessed by the BAS MQ. (Paper III)
- The inter-rater reliability between two physiotherapists, using BAS-MQ, assessing individuals with hip osteoarthritis was found to be good. (Paper III)
- The concurrent validity for BAS MQ was found to be acceptable using the instruments SF-36, HOOS and 6MWT in a sample of individuals with hip OA. (Paper III)
- Within group-differences between intervention groups showed a significant improvement between baseline and the 6-months follow-up in physical function, BAS MQ CB and BAS MQ Total. The Tai Chi group also improved significantly between base-line and the 6-months follow-up, in physical function, HOOS QOL, and self-efficacy, ASES SEF. No significant differences were seen at neither at 6-or 12-months follow-up when comparing the intervention groups, Tai Chi for Arthritis and Hip School to a control group regarding physical function, HRQL or self-efficacy. (Paper IV)

General discussion

The aim of Paper I was to determine the prevalence of hip disorders in the general population. The response rate was high and the overall prevalence of reported hip disorders was found to be 32%. This prevalence was higher than in another Swedish study where the prevalence was 5% for females and 5.5% for males in the age group 20-74 years (Bergman et al., 2001). In the younger age groups the prevalence in Paper I was higher in females than in males but in the oldest age group no significant difference was found between the age groups. The results also revealed that disorders from the hip are very common and that 92% of the individuals with self-reported hip disorders also reported disorder from other joints. The high prevalence of disorders from the low back and the knee might indicate that problems from one joint affect adjacent joints in the lower extremity. The high occurrence of problems reported from other joints might also indicate that problems of the hip may suggest a more widespread joint disorder. Bergman et al. found that the prevalence of disorder from the hip was higher in those with chronic widespread pain than in those with chronic regional pain (Bergman et al., 2001). We cannot exclude that some of the individuals with reported hip disorders experienced early signs of hip OA. At an early stage efforts should be made to identify those individuals with joint disorders who might develop OA, and to investigate who will need therapeutic intervention to reduce symptoms and consequences of the disease. As in many other diseases, the most efficient prevention effort in OA may well be to focus on patients with early symptoms of disease in whom worsening pain and disability could be delayed or prevented.

In Paper II the aim was to investigate the associations of health-related quality of life, physical function and self-efficacy. The HRQL was lower in the hip OA group than in the general Swedish population, comparing both females and males. Individuals with hip OA both in the younger age group ≥ 65 years and in the older age group < 65 years had reduced HRQL compared to similar age groups in the general Swedish population. Of those with hip OA individuals with better self-efficacy were found to have better self-reported and performed physical activity. These results are in line with results in a study of patients with back pain where self-efficacy proved to be a strong predictor of disability (Woby et al., 2007). In Paper IV the results showed an increased self-efficacy in the group participating in the Tai Chi for Arthritis. Further studies should focus on what rehabilitation efforts that promotes self-efficacy since high self-efficacy has been shown to be a predictor of decreased disability in individuals with OA (Benyon et al., 2010). The treatment strategies for individuals with OA ought to be directed not only towards the

symptoms of the disease, but also to the individual's possibilities to gain perceived control over the consequences of the disease including the HRQL.

In Paper III .the aim was to develop and evaluate the BAS MQ for psychometric properties, and to investigate if the BAS MQ could discriminate between groups of individuals with hip OA, psychiatric disorders and healthy subjects. To evaluate the validity of BAS MQ for patients with hip OA we used two other performance based instrument: HOOS and 6MWT. We also used one HRQL instrument: the SF-36. The hypothesis was that there will be a low to moderate correlation between BAS MQ and HOOS, 6MWT and SF36. The BAS MQ compared to the other performance based instrument, is an assessment tool used to evaluate the quality of every day movements. The results revealed significant differences between the groups of individuals with hip OA and the healthy individuals with regard to the Stability and Function factor (SF) and the Coordination and Breathing factor (CB) of BAS MQ. To our knowledge this the first study where quality in everyday movements is evaluated in individuals with hip OA. The two factors SF and CB assess movements, movement control and body awareness. Body awareness has shown to be decreased in individuals with musculoskeletal pain disorders (Gyllensten at al., 1999). In individuals with hip OA, pain and decreased ROM may lead to altered movements and a decreased movement control. In the Relational and Awareness factor (RA) no significant differences were found between those with hip OA and the healthy individuals. In individuals with mental disorders the results showed deviations in this factor. This is in line with earlier research, with individuals with psychiatric disorders, that indicates a difficulty in being in contact with one´s own body in movements as well as being in contact with other people, in this case, the assessor (Gyllensten et al. 1999).

In Paper IV the aim was to assess the effect of two interventions, patient education and Tai Chi for Arthritis, on physical function, HRQL, self-efficacy in individuals with hip OA. This is to our knowledge the first time Tai Chi is used in research to evaluated influence on symptoms and function in individuals with hip OA in Sweden. Tai Chi has been shown to reduce pain and stiffness and for improving physical function in individuals with knee OA (Yan et al., 2013). At the first follow-up after 6 months both groups showed improvement in movement quality, BAS MQ, and the Tai Chi group also showed improvement in self- efficacy. The lack of significant improvement between the groups may be explained by methodological issues such as group size and inclusion criteria. Further studies should focus on individuals with symptomatic OA in all stages of the disease. The smooth and slow concept of movement in the Tai Chi for Arthritis may be an alternative to other exercise methods but need further research. The Hip School we used in Paper IV is similar to the patient education used in BOA at more than 300 health care units in Sweden and is continuously evaluated (BOA, 2013).

Acknowledgement

I would like to express my sincere gratitude to everybody involved throughout this project.

The individuals with hip OA who participated in this investigation-for answering all the questionnaires and for performing all the tests.

Charlotte Ekdahl, Eva Ekvall Hansson my supervisors and Amanda Gyllensten Lundvik my co-advisor for your support and encouragement, your constructive criticism, and your in-depth knowledge that you generously shared with me.

Birgitta Johnsson Thyrenius my co-author and mentor for your generous support, for believing in me and for your never ending encouragement during all this years.

Stefan Lohmander, Peter Magnusson, Mike Miller and Vibeke Horstman my co-authors for valuable advice with statistics, constructive criticism when writing the manuscripts and help with language reviews.

Ulrich Moritz, our professor emeritus for all encouragement and for showing us the importance of research in field of physical therapy.

Maria Nilsson Ovesson my co-worker for her fantastic help with performing the BAS MQ test in my studies.

Ylva Hedin, Karin Wikforss for conducting the Hip School and the Tai Chi for Arthritis groups.

All the graduate students at the Department of Physical Therapy for many stimulating scientific discussions.

Maria Klässbo for being a pioneer in the field of patient education for individuals' with osteoarthritis, and for being a source for inspiration for me.

Susanne Brokop my colleague and dear friend for many discussions of important things in life and for many good laughs.

My co-workers at the department of physiotherapy Annika Astermark, Gisela Broomé, Anna-Maria Drake, Frida Ek, Eva Hornej, Anne Link, Madeleine Kjell, Gertrud Nilsson, Inga-Lill Larsson, Fredrik Offerlind, Lotta Persson, Anders Pålsson, Helena Steneloo, Kerstin Stigmar, Katarina Sjödahl Hammarlund, Åsa Tornberg, Jeanette Unge and Anita Wisén, for being the best colleagues one can have.

All the members of "Vitalkapacitet" for all your support during all years.

Lena-Karin Erlandsson, Inger Hallström for all your support and encouragement.

Christina Nerbrand for help with contacts in Region Skåne.

Allan Crozier for linguistic revisions.

Per Nyberg for help with statistics

All my wonderful friends in Lund and Torekov for being there.

Marianne Lundius Gernandt, Annika Lundius and their families for support and friendship during many years

Anna Lundell my niece, for being such a strong and lovely person.

Ingrid and Bertil Sundén, my parents and Madeleine Lundell my sister for never ending love and support.

Louise, Jeanette, Amelie and Axel, my wonderful children for all your love and for letting me love you.

This research was supported financially by grants from the Swedish Association against Rheumatism, the Ann-Mari and Ragnar Hemborg Foundation, the Emy Thulin Foundation, the Stig Radner Foundation, the Stig Thunes Foundation and the Faculty of Medicine, Lund University.

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