

# **Occupation-focused and occupation-based interventions for community-dwelling older people**

Intervention effects in relation to facets of occupational engagement and cost effectiveness

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Umeå 2015

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ISBN: 978-91-7601-218-5  
ISSN: 0346-6612  
E-version available at <http://umu.diva-portal.org/>  
Printed by Print & Media, Umeå, Sweden, 2015

**“I wish it need not have happened in my time”**

**“So do I, and so do all who live to see such times. But that is not for them to decide. All we have to decide is what to do with the time that is given to us”**

**J.R.R. Tolkien**

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# **ABSTRACT**

## **Background**

Occupation-focused and occupation-based interventions can potentially promote occupational engagement among community-dwelling older people, but there is limited evidence to identify the most effective and cost-effective interventions. For independent-living older people, there is a lack of evidence to determine if occupation-focused and occupation-based interventions have an effect on their occupational engagement. For older people who need assistance because of bathing disabilities, there is limited evidence of the effects of occupation-focused and occupation-based interventions on their occupational engagement or for reducing or omitting their need for assistance. Finally, there is limited evidence to determine if occupation-focused and occupation-based interventions implemented for community-dwelling older people are cost effective.

## **Aim**

The aim of this thesis was to evaluate the effects and cost effectiveness of occupation-focused and occupation-based interventions for two groups of community-dwelling older people, independent-living, community-dwelling older people and older people with bathing disabilities.

## **Method**

Studies I and II were based on an exploratory randomized controlled trial. One hundred and seventy seven persons, 77–82 years, single living, and without need for home help were randomized to a no-intervention control group or to one of three occupational therapy interventions focused on promoting occupational engagement: an individual intervention, an activity group or a discussion group. In study I, effect sizes for leisure engagement and ability to perform activities of daily living (ADL) tasks were estimated for each intervention in relation to the control group to identify the most effective intervention at 3 and 12 months after baseline. In study II, the effects on quality adjusted life years (QALYs) and the total costs for the intervention, social services provided by the municipality and health care were used evaluate cost-effectiveness.

Study III was a quasi-experimental clinical trial and included 95 persons, 65+, who had applied for municipality-based home help with bathing. For participants in the intervention group, occupational therapists implemented occupation-focused and occupation-based interventions. No occupational therapy intervention was implemented for those in the control group, but they were allocated home help services if judged to need it based on an assessment by a municipality care manager. Evaluations of ADL ability, self-rated health and allocated home help were implemented at baseline and after 15 weeks.



Study IV involved the use of decision-modeling based on a five state Markov model that included levels of dependency in ADLs, place of residency and death. Probabilities for transitions between states in the model, QoL scores and societal costs for each state were derived from previous research. Overall, the model was based on research indicating that more severe levels of dependency reduced QALY scores and increased societal costs. Previous trials have provided evidence that an occupation-focused and occupation-based intervention implemented to reduce bathing disabilities increased the probability of independence of home help. The Markov model was used to evaluate cost-effectiveness over 8 years for an intervention compared to no intervention.

## **Results**

The results of study I indicated that each intervention had a small positive effect on minimizing a decline in leisure engagement and/or ADL, but no intervention was clearly superior. In study II, the results indicated that the interventions delivered in a group format positively affected self-rated health. The discussion group was the most cost-effective intervention. The results of study III indicated that the intervention had no effect on ADL ability or self-rated health. There was, however, a large difference in the allocation of home help at follow up, indicating that the intervention was effective in reducing dependency on home help for bathing. The results of study IV indicated that compared to no intervention, the intervention resulted in a positive accumulation of QALYs and lower costs for every year during the entire 8 year period.

## **Conclusion**

This thesis provides evidence to support the implementation of occupation-focused and occupation-based interventions for independent-living, community-dwelling older people in order to reduce their decline in occupational engagement and improve their self-rated health; the interventions also have the potential to be cost effective. This thesis also provides evidence that an occupation-focused and occupation-based intervention implemented for older people with bathing disabilities was effective in promoting independence from home help for bathing. Finally, an occupation-focused and occupation-based intervention that increased the probability of being independent of home help for bathing had a positive impact on the long term accumulation of QALYs and reduced societal costs and, therefore, can be considered very cost effective.

## **Keywords**

Activities of daily living, Bathing disabilities, Cost effectiveness, Effect size, Health promotion, Occupational therapy, Leisure engagement, Reablement, Self-rated health, Successful aging, QALY

# SVENSK SAMMANFATTNING

## Bakgrund

Aktivitetsfokuserade och aktivitetsbaserade interventioner har potential att främja aktivitetsengagemang bland äldre personer men det finns begränsade belägg för att bedöma vilka interventioner som är mest effektiva och kostnadseffektiva. För äldre, utan behov av hemtjänst, boende i ordinärt boende, finns idag begränsade forskningsbelägg för att konstatera om aktivitetsfokuserade och aktivitetsbaserade interventioner har effekt på olika aspekter av aktivitetsengagemang. För äldre som är beroende av hjälp i samband med dusch finns begränsade belägg för effekter av aktivitetsfokuserade och aktivitetsbaserade interventioner. Det finns vidare begränsade belägg för att bedöma om aktivitetsfokuserade och aktivitetsbaserade interventioner implementerade för äldre boende i ordinärt boende är kostnadseffektiva.

## Syfte

Syftet med denna avhandling var att utvärdera effekter av aktivitetsfokuserade och aktivitetsbaserade interventioner implementerade för två grupper av äldre personer, äldre som bor i ordinärt boende oberoende av hemtjänst och äldre med svårigheter att duscha självständigt.

## Metod

Studie I och II baserades på en exploratorisk, randomiserad kontrollerad studie. Etthundrasjuttiosju deltagare, 77-82 år, ensamboende och oberoende av hemtjänst randomiserades till en kontrollgrupp eller en av tre arbetsterapiinterventioner som fokuserade på att främja aktivitetsengagemang, en individuell grupp, en aktivitetsgrupp och en diskussionsgrupp. För studie I beräknades storleken av effekter på fritidsengagemang och förmåga att utföra vardagsaktiviteter (ADL) för varje interventionsgrupp i relation till kontrollgruppen för att identifiera vilken intervention som var mest effektiv efter 3 och 12 månader efter studiens början. För studie II baserades en kostnadseffektivitetsanalys för respektive intervention på effekter på kvalitetsjusterade levnadsår (QALYs) och den totala kostnaden för interventionen, kommunal omsorg och hälso och sjukvårdskostnader.

Studie III var en quasi-experimental klinisk studie som inkluderade nittiofem personer, 65+, som ansökte om hjälp från hemtjänst i samband med aktiviteten dusch. För deltagare i interventionsgruppen implementerade arbetsterapeuter aktivitetsfokuserade och aktivitetsbaserade interventioner. För deltagare i kontrollgruppen implementerades ingen intervention men deltagaren beviljades hemtjänst

baserat på en bedömning av biståndshandläggare. En utvärdering av ADL förmåga, självskattad hälsa, och beviljad hemtjänst genomfördes vid studiens början och efter 15 veckor.

Studie IV baserades på en Markov model som inkluderade fem tillstånd, definierat i relation till olika grader av beroende i ADL, boende (t.ex., ordinärt, särskilt boende) och död. Sannolikheter för transitioner mellan de olika tillstånden, uppskattad grad av självskattad hälsa samt kostnader för respektive tillstånd baserades på uppgifter från tidigare forskning. Tidigare forskning gav även belägg för att aktivitetsfokuserade och aktivitetsbaserade interventioner som implementerats för att minska äldre personers svårigheter att duscha ökar sannolikheten för oberoende av hemtjänst. Markov modellen användes för att utvärdera kostnadseffektivitet över 8 år för en intervention i relation till ingen intervention

## Resultat

Resultaten från studie I indikerar att varje intervention bromsade en nedgång i fritidsengagemang och/eller ADL förmåga i relation till kontrollgruppen, men ingen av interventionerna var tydligt mer effektiv. Studie II visade att grupp-baserade interventioner var effektiva i att främja självskattad hälsa och att diskussionsgruppen var den mest kostnadseffektiva interventionen. Resultaten av studie III gav inga belägg att aktivitetsfokuserade och aktivitetsbaserade interventioner hade någon effekt på ADL förmåga eller självskattad hälsa. Vid uppföljningen var det stor skillnad i omfattning av beviljad hemtjänst, vilket kan tolkas som att interventionen var effektiv gällande att minska beroende av hemtjänst för att duscha. Resultaten från studie IV tyder på att interventionen gav positiva effekter på det totala antalet QALYs och minskade samhällskostnader för varje år under uppföljningsperioden, jämfört med ingen intervention.

## Slutsats

Denna avhandling ger belägg som stödjer att aktivitetsfokuserade och aktivitetsbaserade interventioner som implementeras för äldre som lever oberoende av hemtjänst, har potential att minska en försämring i aktivitetsengagemang, förbättra självskattad hälsa, samt har potential att vara kostnadseffektiva. Avhandlingen ger också stöd för att aktivitetsfokuserade och aktivitetsbaserade interventioner som implementeras för äldre med svårigheter att duscha självständigt är effektiva för att främja oberoende av hemtjänst. Slutligen, en aktivitetsfokuserad och aktivitetsbaserad intervention som ökar sannolikheten för att bli oberoende av hemtjänst för att duscha, har positiva effekter på den långsiktiga utvecklingen av QALYs och samhällskostnader, och kan därmed anses vara mycket kostnadseffektiv.

## ABBREVIATIONS

ADL	Activities of daily living
AG	Activity group (studies I and II)
CG	Control group (studies I and II)
CI	Confidence interval
DG	Discussion group (studies I and II)
EQ-5D	EuroQol five Dimensions
HRQoL	Health related quality of life
IADL	Instrumental activities of daily living
ICF	International Classification of Functioning, Disability and Health
IG	Individual group (studies I and II)
ITT	Intention-to-treat analysis
MNPS	Modified Norling Pettersson Selander Interest Checklist
MOHO	Model of Human Occupation
OTIPM	Occupational Therapy Intervention Process Model
OR	Odds ratio
PADL	Personal activities of daily living
PCP	Comprehensive Preventive Corrective Proactive model
TP	Transition probability
QoL	Quality of life
QALY	Quality adjusted life years
SD	Standard deviation
SF-12	Short Form 12
SF-6D	Short Form 6 Dimensions
SOC	Selection Optimization Compensation model
WHO	World Health Organization

## ORIGINAL PAPERS

- I            Zingmark M., Fisher A., Rocklöv J., Nilsson I. Occupation-focused interventions for well older people – an exploratory randomized controlled trial. *Scandinavian Journal of Occupational Therapy*, 2014;21;447-457.
- II           Zingmark M., Nilsson I., Fisher A., Lindholm L. Occupation-focused health promotion for well older people – a cost-effectiveness analysis. (Submitted).
- III          Zingmark M., Bernspång B. Meeting the needs of elderly with bathing disabilities. *Australian Occupational Therapy Journal*, 2011;58;164-171.
- IV          Zingmark M., Nilsson I., Norström F., Sahlén K-G., Lindholm L. Recovery from bathing disabilities among older people – modelling long term cost-effectiveness of an occupational therapy intervention. (Manuscript).

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## **Preface**

In 1999, the municipality I lived and worked in, Östersund, decided to implement rehabilitation services in a person's home. Politicians and leaders had understood the potential value of providing older people with rehabilitation services led by occupational therapists and physiotherapists. The potential value was twofold: from an individual perspective in terms of improving health and well-being by supporting people to remain active and independent; and from a societal perspective, in terms of a more efficient use of resources, because the cost for rehabilitation was expected to be lower than the expected costs for services provided by the municipality such as home help and special housing. How come they believed in the potential value of rehabilitation?

Some years earlier, one occupational therapist and one physiotherapist implemented a 1-year in-home rehabilitation project focused on individual interventions, support and supervision for home help staff, and support to spouses and other close persons. They showed that early rehabilitation resulted in several positive effects related to improved functioning and independence among clients and satisfaction among clients, spouses and staff. In addition, the cost for home help were markedly reduced in the district the project was implemented. Altogether, knowledge learned from this 1-year project provided the politicians with sufficient information to decide rehabilitation at home was an investment for the future.

I was encouraged by the will expressed in the municipality, to develop a new type of service, with sufficient resources to implement individually-tailored interventions focused on supporting older people to remain active and independent. It needs to be mentioned that, at this time, this stood in sharp contrast to what many Swedish occupational therapists experienced when they worked with a lack of resources that limited their possibilities to implement interventions beyond solving acute problems often by providing compensatory technical equipment. Based on my own experiences, I was interested in learning more about how interventions for older people with restricted possibilities to engage in occupations could further be developed and evaluated.

It was clear from the very beginning that the new rehabilitation-at-home service was not a fixed concept about how the service should be implemented, but rather a service that was continuously developing. An important part of that development process was an ongoing dialogue within and between different professions, and at different levels of the organization. A vital factor in this process was repeated small scale evaluations intended to capture and describe the effects of the rehabilitation services provided. These evaluations were important as a

## Introduction

means for providing feedback to politicians and to occupational therapists and physiotherapists to identify what worked well and to identify what could be improved.

Somewhere in this ongoing process of development and evaluation, my interest for research was awakened and I engaged in, and led several small scale research projects. Finally, I had the chance to become a doctoral student with an interest in learning more about occupational therapy interventions for older people and how these interventions can be evaluated. I hope that this thesis, will further contribute to the development of occupation-focused and occupation-based services that are implemented to promote occupational engagement among older people.

## Rationale

In Sweden, as in many other countries, the demographic profile will change substantially during the decades to come. There will be increasing numbers of older people and, therefore, the health and well-being of older people is an important societal issue (1-3). In order to support successful aging (4), there is a need for promotion of health and active engagement in life among older people as it is reflected in health care policies globally (2, 3). The promotion of health and active engagement in life is also considered an area that may have an impact on reducing the expected increase in costs for health and social care as a consequence of more older people becoming in need of such services (5, 6).

In order to implement policies aimed at supporting successful aging among older people, decision makers need to consider which types of interventions are effective and should be implemented. Due to limited resources, not all interventions that are effective can be implemented. Therefore, choices will inevitably be needed to determine which interventions to implement (7). In Sweden, such choices are guided by a set of principles stating that (i) all humans have equal worth and rights, (ii) resources should be prioritized to those with the greatest needs and (iii) there should be a reasonable balance between the cost and effects of an intervention (8). The overarching principle is that all humans have equal worth and rights, and from that perspective, further work is needed to identify those with the greatest needs and to evaluate the effects and cost effectiveness of different interventions. In this thesis, the main focus is on evaluation of effects and cost-effectiveness of occupational therapy interventions for older people.

A central goal of occupational therapy implemented for older people is to promote engagement in occupation (9-11) and thereby promote health and well-being (12). Overall, the goal for occupational therapy is closely related to some aspects highlighted in policies on active and healthy aging (2, 3). However, occupational therapy interventions can be implemented in various formats, with various designs and with different groups of older people. Occupational therapy can also be implemented in close collaboration with other professions, focusing on occupation and other aspects related to health and functioning. Since various interventions, not only occupational therapy, can be designed to address issues related to occupation, I will use the concepts occupation-focused and occupation-based interventions (13).

Knowledge about the effects of occupation-focused and occupation-based interventions is needed to identify those interventions that are most effective to promote engagement in occupation. From the perspective of



decision makers, there is also a need to gain knowledge about the cost effectiveness of interventions in order to determine how resources should be allocated to achieve the largest benefits for health in the population. Different trial designs must be implemented to determine *if* an intervention has an effect, how *large* the effect is and to interpret the *clinical relevance* of the intervention effect. In this thesis I address such questions by focusing on occupation-focused and occupation-based interventions implemented for two groups of community-dwelling older people.

## INTRODUCTION

Within occupational therapy, different terms (e.g., activity, task, occupation) are used to denote what people do (14, 15). In this thesis, *activity* is used on a general level to describe doing (e.g., performance of social or physical activities) and *task* is used to specify what is done (e.g., visit friends, swim). The specific feature of the concept *occupation* is that it refers to the performance of tasks and participation in activities that are subjectively meaningful and provides a source of motivation for the individual (14-16). *Occupational performance* refers to the process of doing tasks (14). *Occupational participation* refers to the involvement in life situations through occupation (15) and includes subjective experiences of being involved in occupation (10, 15, 16). In this thesis, I will use *occupational engagement* as an overarching concept referring to engagement in occupation (9-11); it is closely related to occupational performance and occupational participation. Occupational engagement is a subjective experience that can be understood as a complex interplay between the person, environment and the task (15, 17-19).

Old age is a period in life during which occupational engagement is likely to be challenged (20), for example by activity limitations and participation restrictions. Therefore, it is important to develop occupation-focused and occupation-based interventions that are designed to address problems related to occupational engagement (14, 15). To identify which interventions that should be implemented, there is a need to evaluate interventions in relation to their effectiveness on occupational engagement and to determine their cost effectiveness.

The focus of this thesis is on the effects and cost effectiveness of occupation-focused and occupation-based interventions implemented for two groups of community-dwelling older people: independent-living older people and older people with bathing disabilities (dependency in bathing). One randomized controlled trial (RCT) (studies I and II), a quasi-experimental trial (study III) and one study using decision modeling (21) (study IV) form the basis for this thesis. The outcomes that were evaluated are: ability to perform activities of daily living (ADL) tasks (studies I and III), leisure engagement (study I), self-rated health (studies II, III and IV), allocated home care (study III) and cost effectiveness (studies II and IV).

## Theoretical background

To provide a background for this thesis, I will introduce, in the following section, some facts about the changing demographic development,

concepts and theories that are relevant to the understanding of successful aging and the link between health and occupational engagement.

## Demographic development

During the 20<sup>th</sup> century, life expectancy has increased dramatically due to progress in health care and social welfare (1). Life expectancy is increasing around the globe (22) and, in 2016, there will, for the first time in history, be more older people than children. Between 2010 to 2050, the number of older people will almost triple to approximately 1.5 billion or 16% of the world's population. This development is a positive effect related to societal development. Older people today can expect to live longer and experience more healthy life years in relation to earlier generations (3). However, many countries are likely to face a situation in which there will be increasingly higher demands on health care and social services when the growing number of older people begin experiencing decline in their health (22). In addition, during the same period, in which the number of older people is expected to increase, the ratio of people in "productive ages" (25–64 years) in relation to retired people will fall from approximately 4 to 2 in 2050 (1). This demographic development is expected to become a societal challenge in Sweden, as in many other countries, impacting the entire welfare system including financing, recruitment of staff and prioritization, and calling for the development of preventive and health-promoting interventions (5). In the process of developing such interventions, systematic evaluations are important to identify effective and cost-effective interventions.

While aging can be considered a life-long process, the scope of this thesis concerns aging beyond 65 years. For many people, old age covers a significant period of life, and during this period it is reasonable to assume that the early years of old age are different from the later years. To identify such differences, the concepts the 3<sup>rd</sup> age, including 60- and 70-year-old people, and the 4<sup>th</sup> age, including octogenarians (80+), have been used (23, 24). The 3<sup>rd</sup> age is characterized as a period of relatively good health without major activity limitations or participation restrictions, while in the 4<sup>th</sup> age, health decline and disability become more prevalent (24). Therefore, it seems as if the transition between the 3<sup>rd</sup> and 4<sup>th</sup> ages is a critical period in the aging process, and also a period during which preventive and health-promoting interventions are needed.

## Successful aging

Over the years, successful aging is a concept that has been widely used, conceptualized and discussed (23, 25-28). Havighurst (4), proposed the need to identify components that were important to achieve "successful aging" in terms of life satisfaction and happiness. The main characteristics

of successful aging include an absence or low probability of disease, freedom from disability, continued development, active engagement in life and a subjectively positive experience of the aging process (26, 27). The concept of successful aging has been criticized because commonly used definitions are too narrow and fail to reflect the subjective experience of older people (29). For example, based on strict criteria that include an absence of disease and freedom from disability, most older people would not be considered to age successfully (30, 31). In contrast, when identified by older people themselves, the experience of aging successfully involves multiple components (e.g., physical, functional, social, spiritual, psychological) (29, 31, 32). Furthermore, successful aging has been described in terms of positive adaptation (30), having good health and an active engagement in life (30, 33, 34). Rather than a unidimensional construct (e.g., a strict focus on disability), some authors have proposed that there is a need to consider multiple dimensions and include both psychosocial and biomedical perspectives (27, 35).

While there is a continued need to explore and to define the concept of successful aging, for example in terms of how disability and adaptation can be included to represent the perspectives of older people in a valid way (27, 32), the concept includes components that can serve as a guide for the promotion of health and well-being among older people. I will use the concept successful aging as a guide to focus on those components that are related to occupational engagement<sup>1</sup> such as engagement in meaningful activities (36) and active engagement in life (26, 29, 37). Since occupational engagement is one important aspect of successful aging, I will introduce some theories that provide a background for understanding how occupational engagement may develop and transform during the aging process.

### *Social theories of aging*

According to *activity theory*, the person's level of activity and engagement in different life roles is assumed to be important for life satisfaction (4, 38). Based on this assumption, successful aging can be achieved if older people maintain high levels of engagement in activities and social relations.

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<sup>1</sup> In theories on aging and successful aging, concepts similar to occupational engagement are used. In the presentation of these concepts I have used the term activity to be consistent with the original authors. It should be noted however that in some instances (e.g., in the continuity theory) (36), activity refers to the performance and participation in tasks that are subjectively meaningful and therefore is very similar to what I define as occupation.

A development of activity theory is seen in *continuity theory* that focuses on continuity as a main strategy for coping and adapting when adverse events occur (e.g., disability) (36). According to continuity theory, older people who experience adverse events tend to maintain values, lifestyles and relationships based on preferences developed throughout their lives (36, 39). Values refer to what a person has learned to appreciate throughout life. Thereby, values serve as a guide for what the person wishes to fulfill by his or her lifestyle in terms of the activities and the relationships in which she or he engages.

Somewhat in contrast to activity and continuity theories, *disengagement theory* suggests that during old age there is a mutual and gradual withdrawal between the society and the older person (40, 41). However, rather than a mere reduction in the activities and social roles one engages, disengagement refers to an adapted engagement in fewer activities and social roles in a more narrow context compared to earlier life. It is assumed that the older person anticipates and participates in the process of disengagement that ultimately leads to a more individualized and selective pattern of activities and social interaction. Disengagement theory specifically relates to a transformed pattern of interaction, but does not assume or support anything about the quality and amount of activity (40).

A development from disengagement theory can be seen in Tornstam's theory on *gerotranscendens* (42) that emphasizes a process of introspective development towards maturation and wisdom. To some extent, gerotranscendence is similar to what Erikson described as ego integrity at the 8<sup>th</sup> stage of man (43), but in contrast, Tornstam described gerotranscendence as a forward-looking process rather than a reflection on previous life. Similar to disengagement theory, Tornstam described ongoing human development in old age as a process during which the meaning of and engagement in activities and social relationships are likely to change. However, in both disengagement theory and gerotranscendence, engagement in activity remains important, with a special emphasis on the subjective experience in relation to activity and social interaction.

Even though some theories provide somewhat conflicting perspectives (e.g., maintained engagement in activity vs. disengagement), it has been suggested that a single theory is insufficient to understand the development of occupational engagement during old age (44). Rather, the above described theories provide complimentary perspectives to understand the development of occupational engagement during old age (44). While different life events may challenge older people (20), it is important to consider how individual strategies as well as environmental factors can support the individual in maintaining or adapting his or her occupational engagement (23-26, 28, 29). While the theories described

above highlight the importance of occupational engagement for successful aging, there are also frameworks that can help us understand how older people can maintain their engagement in occupation despite age-related challenges and/or adapt their occupational engagement to altered life conditions.

### *Theories for the promotion of successful aging*

One such framework is the Selection, Optimization, Compensation (SOC) model (23, 24). The SOC encompasses the identification of vital goals (*Selection*); how skills and resources can be maintained, improved or acquired in order to achieve those vital goals (*Optimization*); and how different strategies can compensate for lack of skill or resources in order to maintain a desired level of functioning (*Compensation*). In addition, the importance of contextual factors, such as social networks and environmental factors, are acknowledged as a means to optimize the level of occupational engagement or adapt the level of engagement to altered life conditions (24). While optimization becomes more challenging during the 4<sup>th</sup> age (24), selection and compensation become increasingly important as a means for maintaining functioning, but also to direct efforts to improve engagement in prioritized domains. For example, if physical capacity decreases, leading to driving cessation, a person can compensate by using alternative transportation, optimize the skills needed to use alternative transportation or select activities that are less dependent on transportation.

Similar to the SOC, the Comprehensive Preventive Corrective Proactive (PCP) model acknowledges the importance of how older people cope with or adapt to age-related challenges (stressors) (20). The specific feature of the PCP is the focus on proactive behavioral adaptations (i.e., actions taken to address future challenges). The basic idea is that age-related challenges (morbidity, disability and social loss) are common and, therefore, actions can be taken in advance in order to reduce risks and be better prepared for challenges that may occur. Examples of such proactive behaviors are engagement in healthy lifestyles (e.g., eating a healthy diet, exercising, engaging in meaningful occupation) and planning for the future (e.g., relocating to an accessible living environment). In addition to proactive actions, the PCP also includes a focus on addressing current challenges (e.g., finding new roles after social loss or modifying the environment to compensate for disability) (20). Both the SOC and the PCP describe individual strategies as well as contextual factors that have the potential to optimize a person's occupational engagement despite age-related challenges.

## Theoretical perspectives on health

As indicated in the previous section, some components in the concept successful aging are closely related to functioning and health (25). Health is a broad concept that can encompass a variety of factors, from the level of body organs to the level of participation in society (45), including contextual and societal factors (e.g., social support, living environments, access to societal services, equity in health) (1, 46). Furthermore, health is considered a basic human right (47), of central importance to the development and stability of nations (48) and has been a central concern in human life throughout history (12). The World Health Organization (WHO) defines good health as “a state of complete physical, social and mental well-being, and not merely the absence of disease or infirmity” (48). Clearly, health is a complex concept that can be understood from several perspectives. Below, I will summarize some theoretical constructs to identify features of health that are related to occupation and, therefore, are specifically relevant in this thesis.

The International Classification of Functioning, Disability and Health (ICF) is a biopsychosocial model that provides a conceptual framework for health and health-related domains (45). The ICF emphasizes the interrelationship between different health-related domains important for functioning and health. Dysfunction in one or more of these domains is defined as disability, written within parentheses below. Body functions and structures pertain to the anatomy and physiological as well as psychological functions (Impairment); activity refers to the execution of a task or an activity (activity limitation); and participation refers to the involvement in a life situation (participation restriction). Furthermore, there is an interaction between health, functioning and contextual factors (e.g., environmental factors, personal factors) meaning that contextual factors can positively or negatively affect health and functioning. Environmental factors pertain to both the social, attitudinal and physical environment, and personal factors include aspects internal to the person such as personality, behavior and experiences. Each domain in the ICF is relevant to consider, but in this thesis, the emphasis will be on activity and participation.

Another perspective, provided by Nordenfelt, emphasizes two central components of health: the subjective experience and the ability to act and participate in society (49). Furthermore, Nordenfelt proposed that a balance between the individual's ability to act and his or her vital goals are central to the subjective experience of health. According to this idea, a person experiences health when she or he is able to act and fulfill subjectively important goals (49-51). It should be noted that the idea of pursuing subjectively meaningful goals, as an important aspect of health in old age, also is reflected in previously described theories (23, 28, 36), and in findings by Bryant et al., who explored the perceptions of health

among older people (34). Their findings indicate that the value of meaningful activities and the presence of sufficient abilities and resources needed to perform and participate in those activities was of central importance for the experience of health (34). In order to be able to engage in meaningful activities, functioning at all ICF levels (body functions, activity and participation) and contextual factors such as attitude and social support have been considered important (34).

Similar to the concept successful aging, the WHO definition of health can be criticized as somewhat utopian, only achievable for a few persons. However, the WHO definition and the ICF provide frameworks that can serve as guides for directing health-promoting actions, as well as facilitating communication concerning health-related concepts. In this thesis I consider health from an individual perspective; the specific focus is on occupational engagement as an important means of fulfilling subjectively important goals. Therefore, I will use Nordenfelts' perspective on health and, in the next section, elaborate on the concept of health from an occupational perspective.

## An occupational perspective on health

Occupation is a central feature of human life (12, 15, 52) and basically involves any type of subjectively meaningful task in which a person engages (14, 16). A central assumption in occupational therapy is that occupation has an impact on health and well-being (12, 15, 52, 53). From a positive perspective, this assumption implies that occupation may provide opportunities for stimulating and meaningful engagement in activities that lead to human development (12). From a negative perspective, lack of occupation (deprivation), unmet occupational needs (alienation), social exclusion and/or restricting some groups from occupation (marginalization, imbalance), may have a negative impact on individuals or groups of people (12, 54).

Occupational engagement has been described as a basic human need (12, 16); humans need to engage in occupation in order to meet primary needs (e.g., to get food, rest, shelter) (12). By engaging in occupation, a person also has the potential to meet needs related to meaning, purpose and social connectedness (10, 14, 16, 55). Therefore, occupational engagement can affect health and well-being in a broad sense from survival to self-fulfillment (12).

Occupational well-being provides a framework to further understand the link between health, well-being and the subjective nature of occupational engagement (10). Doble and Santha proposed that occupational well-being depends on the extent to which a person can meet his or her occupational needs (10). Considering that occupation is idiosyncratic, a multitude of occupational needs (e.g., accomplishment, affirmation,



agency, coherence, companionship, pleasure, renewal) can be met by various occupational engagements (10). For example, engaging in taking care of oneself and one's home can meet the need for accomplishment and, simultaneously, the need for affirmation can be met, evidenced by being independent (44). Occupational well-being not only relates to occupational performance; engagement in more contemplative occupation can also meet occupational needs (e.g., experiencing pleasure when reflecting over past memories and experiences) (44). Furthermore, the person's pattern of occupational engagement unfolds throughout life and can be orchestrated over time in a more or less balanced pattern to meet occupational needs (10, 19).

The experience of meaning seems to be one important component in the relationship between (i) occupational engagement and (ii) health and well-being (9, 10, 16). The experience of meaning in relation to occupational engagement has been described in terms of doing, being, becoming and belonging (12, 16). Beyond occupational performance (*doing*), the experiences of engagement in occupation provides a source for self-reflection that contributes in shaping a sense of identity (*being*) and relationships to others (*belonging*) as manifested in social roles (12, 15, 16, 19). Becoming has been described as "an ever-incomplete process" (12), highlighting that throughout life there is an ongoing process, requiring that the person deals with new opportunities, challenges and demands to achieve occupational well-being. In all, the opportunity to satisfactorily engage in a mix of occupations that are subjectively meaningful, that are orchestrated in a balanced pattern over time within those contexts that are relevant for the person, provides a potential link between occupation, health and well-being (10, 12, 15, 49, 56).

Although the specific occupations engaged in, and how occupation is orchestrated, may change over time, continued occupational engagement is of central importance to how older people experience their aging process (33, 34). In fact, the maintenance of occupational engagement seems to be a marker of a positive aging process (33, 34), which is in line with theories related to successful aging (26, 38, 39) and health (49). Continuity in relation to occupational engagement seems to be an ideal, and can be understood from the perspective that age-related decline is anticipated in the future (57). While continuity in occupational engagement provides one important perspective to understand ongoing development during old age (36), there is also a need to consider how the pattern of occupation changes during the aging process and identify situations that may be critical to occupational engagement.

## Occupational transitions

Old age covers a potentially long time period during which some aspects of occupational engagement are likely to unfold in ways similar as in

younger ages, whereas other are likely to change. For example, the period after retirement can offer new opportunities to engage in tasks previously performed in leisure time, or to pursue new occupations (58). However, it has been found that orchestrating engagement in occupation may pose a challenge during the beginning of old age (59). With more time available, and less demands from working life, the balance between internal motivation and external demands can change (60), as can the intrinsic meaning of occupation (57). Such periods of change have been called occupational transitions, indicating a shift from one occupational pattern towards a new occupational pattern (15). As a consequence of a transition, a person's opportunities to meet their occupational needs may change, in turn affecting the possibility to derive occupational well-being through engagement in occupation.

The results from a study on the differences in leisure participation between older people in the 3<sup>rd</sup> and 4<sup>th</sup> ages indicated that the occurrence of an occupational transition lead to reduced engagement in more demanding instrumental activities (e.g., shopping, housekeeping), followed by more selective engagement in social and leisure activities (61). The process of reducing engagement in some occupations and engaging in other occupations can be interpreted as a selective process based on individual choice. However, reduced occupational engagement in more "active" occupation (e.g., leisure occupations that are physically challenging) may also indicate a transition that can negatively impact health and well-being. For example, there is evidence that an active lifestyle positively affects disability and morbidity (62-66) and well-being (67). Here it should be noted that an active life style goes beyond physical activity and also includes social and productive activities, as indicated by a large longitudinal study showing reduced mortality risk over the long term, (68). Furthermore, it has been found that engagement in leisure activities is positively related to self-rated health, well-being (69-72) and survival (70, 73). Considering that ongoing engagement in activity has several positive health effects, a reduction of engagement may have a negative impact on health and well-being. Therefore, the transition in the shift from the 3<sup>rd</sup> to 4<sup>th</sup> age is a period which may be critical to health and well-being.

In contrast to self-selected disengagement from occupations, a transition that clearly is critical to occupational engagement, health and well-being is the loss of independence (33, 34, 74). Older people who receive assistance with ADLs (e.g., cooking, personal care, dressing) have more negative self-perceptions of aging (75). In turn, negative perceptions about the aging process is associated to both morbidity (75) and mortality (76) indicating that efforts made to support older people to maintain independence may have important implications for various outcomes. One area which older people identify as specifically important for maintaining independence is personal activities of daily living (PADL)

(77). For example, older people who are independent in bathing have strong preferences to maintain their independence (78).

In summary, I conclude that (i) the concept successful aging provides a framework for promoting multiple aspects of health and well-being among older people (31); (ii) occupational engagement, which is of specific concern in this thesis, is one important component of successful aging (26); (iii) ongoing development of occupational engagement during old age can be understood both from the perspective of continuity (36) and as a transformation towards a more selective pattern of occupational engagement (42); (iv) a process including selection, optimization and compensation may be important in promoting occupational engagement (23); (v) proactive actions can increase an older person's readiness to respond to age-related challenges and thereby positively affect occupational engagement (20, 28); (vi) health can be seen as a balance between subjectively important goals/needs and a person's capacity/resources to fulfill those goals/needs through occupational engagement; (vii) occupational engagement has potentially positive effects on health and well-being (12, 15, 52, 53); and (viii) leisure and PADL seem to be areas of occupation that are of particular importance among older people (77) and, therefore, need to be considered when designing interventions, identifying target populations and selecting appropriate outcomes to evaluate.

## **Occupation-focused and occupation-based interventions**

With the ultimate aim of implementing effective interventions, Johnston and Case-Smith proposed using a systematic approach in developing, evaluating and refining interventions (79). For example, as a basis for understanding the need an intervention is intended to meet and how the intervention content is likely to meet that need, there is a need to establish a theoretical framework to guide the development of interventions (79, 80). The theoretical basis for understanding why occupation is important to health and well-being, and why old age is a period during which occupational engagement is likely to be challenged, was provided in the previous sections of this thesis. In the following sections, and building on that basis, I will introduce how interventions can be designed to address concerns related to occupational engagement, identify those populations that are of specific interest in this thesis and identify issues that are relevant to consider when selecting outcomes to evaluate occupational therapy interventions for older people.

## Intervention design

Overall, occupational therapy has a specific focus on enabling engagement in occupation (15). By adopting an occupation-centered perspective (13), the professional reasoning and any actions taken by the occupational therapist (e.g., assessment, intervention) can be guided towards occupation. However, occupational therapy interventions can cover a wide range of approaches and there is potentially great variability concerning the specific content of the interventions, how the interventions are implemented and the extent to which the interventions are based on an occupation-centered perspective. To understand the effectiveness of an intervention, Whyte and Hart (80) highlight the need for a clear definition of the intervention, including the focus and content of the intervention, how it is implemented concerning format (e.g., group, individual) and intensity (duration, no of sessions) (79, 80). A clear definition of the intervention is also something that is important in terms of reporting a study to facilitate interpretations of the results (81-83).

One occupation-centered framework for conceptualizing occupational therapy intervention is the Occupational Therapy Intervention Process Model (OTIPM) (14). In the OTIPM, the immediate focus on occupation is emphasized and two specific approaches are identified: an occupation-focused approach and an occupation-based approach (13, 14). An occupation-focused approach pertains to the use of assessments, interventions and evaluations that have a focus on occupation (13). The focus can be more or less proximal to occupation (e.g., a focus on task performance vs. personal factors or environmental factors), and an approach is occupation-focused only when occupation is in proximal focus. An occupation-based approach involves occupational performance as part of assessment, interventions and evaluations (13). Occupation-focused and/or occupation-based interventions address issues related to occupational engagement and can be tailored to optimize both occupational performance (14) as well as occupational participation (15).

Another central feature of occupational therapy intervention is client-centeredness, meaning that the active participation of the client (15) and the collaboration between the client and the therapist (14) are essential components of the therapeutic process. One way to establish a client-centered approach is to focus on occupations that are important for the client and to identify specific concerns that may be addressed in the intervention (14). Although a client-centered approach most often pertains to a single person, the client may also include other important persons like the family or a group of clients sharing some similarities in relation to occupational engagement (e.g., a group of older people experiencing emerging age-related activity limitations) (14, 15).

Besides using a client-centered and occupation-focused and/or occupation-based approach, occupational therapy interventions can be implemented in various formats. Some examples include a group-based format (84, 85), an individual format (86, 87) or a combined group/individual format (88, 89). Furthermore, the intensity and length of interventions can vary from short term, goal-oriented interventions with an immediate focus on occupation (87), to “lifestyle programs” including a large number of sessions, extending over several months, and including intervention components focused on occupation as well as other health-related concerns (84, 85, 88, 89).

In this thesis I focus on client-centered occupation-focused interventions and sometimes the interventions are also occupation-based.

## Defining the population and relevant interventions

Besides a clear definition of the intervention, Whyte and Hart also highlighted the need to define the population for which interventions are implemented (80). The population for which interventions are to be implemented can be defined in different ways, for example based on diagnosis (e.g., stroke, hip fracture) or impairment (e.g., cognitive deficit, spasticity), or based on the facets of occupational engagement that are in focus (e.g., ADL ability, engagement in social occupations) (80).

The population can also be defined in terms of occupational transitions. That is, within the literature on successful aging, it has been suggested that research should focus on understanding transitions that have an impact on occupational engagement, and especially those that have the potential for maintenance or improvement in occupational engagement (25).

Several transitions during old age may have an impact on occupational engagement. Development of disability is a specific and critical type of transition that requires actions (e.g., use of compensatory strategies or equipment) to maintain occupational engagement or to transform the pattern and content of occupational engagement. Thus, onset of disability is one way to define a population of older people. More specifically, disability is common among community-living older people (90), and although associated with a decline in ability to perform ADLs (91), disability is not always a progressive process.

Most older people who experience a period of disability will recover, but they remain at high risk for recurrent disability (92), indicating a need to implement interventions that are focused on health promotion. Health promotion refers to the process of enabling people to increase control over, and to improve, their health (93), for example, by supporting occupational engagement (1). The primary concern of occupation-focused

health promotion is to enhance occupational engagement, which in turn may positively affect health and well-being (10, 12).

Previous research has supported the benefits of implementing health-promoting interventions with younger older people (94, 95) at a stage when they still live and manage ADLs independently (95). Longitudinal studies have shown that the prevalence of disability increases sharply around 80 years of age (96, 97). Also, as previously discussed, there seems to be a shift in the pattern of occupational participation concerning leisure activities at about that age (61). Thus, older people without major activity limitations who are approaching their 8<sup>th</sup> decade of life is another defined population who may benefit from occupation-focused health promotion. From an occupational perspective, health promotion at the individual level can focus on the importance of occupation for health and well-being, the potential to positively affect health and well-being by identifying actions that can enhance opportunities to maintain or improve occupational engagement (98, 99).

For older people who experience disability, a specifically critical situation is related to bathing (100, 101). Bathing disabilities are associated with a high risk of disability in other ADLs (96, 101), need for informal and formal help (102), admission to a nursing home (103), and death (104). Thus, onset of bathing disability is another factor that can be used to define a population of older people. The onset of bathing disability is problematic because the ability to bathe independently is important to achieve a sense of well-being and to fulfill social expectations, and older people who are independent in bathing have strong preferences to remain independent (78, 105). Among people older than 70 years, bathing disabilities are common (96, 100), with a prevalence of 15% reporting dependency and 16% reporting difficulty with bathing (100). Even among older people who manage bathing without difficulty, performance of bathing is anticipated to be a future problem (78).

In a study by Naik et al. (100), older people with bathing disabilities reported problems with several bathing subtasks and those subtasks that were experienced most difficult were related to transfer into/from the bathing position and washing the body. The most common reasons described for experiencing bathing disabilities were fear of falling and problems with balance (100). For older people with bathing disabilities, occupation-focused and occupation-based interventions could to be designed to address problems related to performance of specific subtasks, with the ultimate aim of enhancing improved occupational performance and independence (e.g., by the provision of technical aids, practicing task performance).

### Outcome measures

Besides defining populations and potential interventions that could be implemented for these two groups of community-dwelling older people (i.e., those with bathing disabilities and those around the 8<sup>th</sup> decade who are still living independently), another important issue concerns the selection of appropriate outcome measures to evaluate intervention effects (80, 106). To evaluate an intervention, it is important that there is a logical link between what the intervention intends to affect and the outcome measure that is used to evaluate that effect (80, 106, 107). Thus, when evaluating interventions that are intended to affect occupational engagement, there is a need to select outcomes that are designed to evaluate them (106). Furthermore, evaluations of occupational engagement need to include activities that are representative of what older people do and find important, such as ADL and leisure (77, 108, 109). In this thesis, two components of occupational engagement are evaluated: ability to perform ADL tasks and leisure engagement.

While outcomes addressing occupational engagement can be considered primary outcomes (110) in occupational therapy, it is also relevant to consider other outcomes of interest, secondary outcomes, when evaluating interventions (110). For example, a central idea in occupational therapy is that there is a link between occupational engagement and health (12, 15), supporting the inclusion of secondary outcomes that captures effects on health; self-rated health is an important outcome when evaluating cost effectiveness (7, 8).

#### *ADL*

ADL is a concept that is used in relation to activities that most people do in their daily lives (111). While there is no single definition of the concept, it is common to include PADL (e.g., dressing, bathing, toileting) and instrumental activities of daily living (e.g., shopping, cooking, transportation) (IADL). ADL evaluations are often based on ordinal ranking of ability performing ADL tasks (e.g., no problem, minor problem, major problem). Ordinal data can be used to describe ADL ability on an individual level, and at a group level, to describe how many have, for example, minor problems in performing an ADL task. Ranking of ADL ability can also be done in relation to the level of assistance needed, and can be used to identify to what extent a person/population is independent or dependent in performing ADLs. Commonly used ADL measures that focus on the level of assistance in a number of ADL tasks are the Katz Index of ADL and the Barthel Index (112, 113). While ordinal data can be used to describe ADL ability, a common problem with such ADL evaluations is that they have ceiling effects and they are not sensitive enough to detect changes (114-117). These issues apply especially for people with minor activity limitations (113), or when the specific problem

is related to the quality of ADL task performance. For example, a person may be independent, but still experience problems related to the quality of task performance (e.g., increased effort or time use while performing a task). Another related problem is content validity (i.e., the extent to which a measure represents different aspects of the construct it is intended to measure). Content validity becomes an issue if only a small number of ADL tasks are included to represent the construct of ADL. One way to enhance content validity, as well as the sensitivity of an ADL measure, is to include a sufficient number of ADL tasks that range from easy to difficult to perform (115) as well as considering the quality of task performance in the scoring. In addition, to evaluate intervention effects, interval data is preferred to overcome problems related to lack of sensitivity (115).

### *Leisure*

During the last decades, participation in leisure activities among older people has increased (118), indicating that leisure is an important part of older peoples' lives. Leisure includes any type of activity the person finds meaningful and chooses to engage in (61) (e.g., social, cultural, physical activities). Leisure can be performed in solitude or together with other people, and at home or outside the home. A recent study showed that engagement in leisure and social activities is important, but also that these are occupations with which older people are somewhat dissatisfied (77). Reduced ability to engage in leisure (119), and altered patterns of leisure engagement that occur during the aging process (61), indicate that ongoing engagement in leisure may constitute a potential challenge for older people. Considering the positive effects of engagement in leisure, and that leisure is something that older people wish to enhance (77), leisure engagement is an important focus for occupational therapy evaluation and intervention for older people (120).

Different methods have been used to evaluate leisure among older people, such as time-use diaries (108, 109, 121), interest checklists (122, 123), counts of number of activities, how often activities are performed and time commitment (67). Such evaluations can be used to describe how a person orchestrates their patterns of leisure tasks, and can be used for self-reflection as well as identifying targets for intervention. It has been shown that older people spend a substantial proportion of their time awake with enjoyable occupation (121). Such information confirms that participation in leisure occupies a large amount of time, but does not provide specific information about the meaning or subjective importance of specific activities (109). A problem with focusing evaluations of leisure on, for example, the count of activities, is that such data do not provide information about the intrinsic value of each activity and the extent of occupational engagement (124). For example, if a person stops performing some activities and begins performing other activities, the



number of activities may be the same, but the inherent meaning substantially different. Therefore, other dimensions beyond performance, such as the subjective importance of participating in an activity, needs to be included so as to evaluate leisure engagement (69). While it has been suggested that it is important to include leisure as an outcome measure when evaluating occupational engagement among older people (116), to our knowledge, no previous trials have included leisure engagement as an outcome when evaluating the effects of health-promoting interventions for older people.

### *Self-rated health*

Evaluations of health cover a wide range of outcomes including, for example, disability, social health and quality of life (QoL) (113). QoL is a multidimensional concept that combines different aspects of health, e.g. physical health, mental well-being (113). It has been suggested that QoL is an important outcome in terms of successful aging (20, 31). I will use the concept self-rated health to denote that the person rates his or her subjective experience of some aspects of health (113). Self-rated health has been described in relation to ongoing engagement and independence in ADL (125) and meaning in life (125, 126), and some commonly used instruments for self-rated health also include a focus on performance of ADL (127, 128). For example, the SF-12 includes questions related to activity restrictions due to physical and mental health (127), and EQ-5D includes questions related to usual activities and self-care (128).

As I noted earlier, interval data are preferred so as to overcome problems related to lack of sensitivity, e.g., to evaluate intervention effects. Recent instrument development research suggested that such outcome measures are available for both leisure and ADL (122, 129). Also, for some instruments used to evaluate self-rated health, it is possible to convert ordinal data to interval data (130, 131).

## **Evaluation of intervention effects**

In the process of evaluating intervention effects, with the intent to further develop and refine them, different types of evaluations (79, 132), based on a range of research designs, are needed (133). Such evaluations include, for example, preliminary testing of the intervention using small scale trials, estimating effect size using exploratory trials, identifying the most effective and cost-effective interventions using large scale confirmatory trials and using clinical trials to establish effectiveness in ordinary settings (79, 132, 134). These different types of evaluations can provide (i) evidence supporting intervention effectiveness, (ii) the knowledge needed to refine intervention procedures, (iii) the possibility to identify specific populations most likely to benefit from the intervention and (iv) the

possibility to identify appropriate outcome measures (79, 132). Although not included in this thesis, evaluation of feasibility should also be considered, including both an assessment of scientific as well as practical issues related to the management of implementing a large scale trial (135).

Randomized controlled trials (RCTs) are considered the most powerful research design to evaluate the efficacy of different interventions (81, 136). A well designed and properly implemented RCT is a good strategy to ensure internal validity (i.e., to what extent it is possible to make an inference between a dependent and an independent variable, for example, to determine if there are differences in an outcome between two different intervention groups) (133). However, a full scale trial requires substantial prior knowledge (79, 132). For example, prior to implementing an RCT, to assess if the intervention seems to be sufficiently promising, exploratory trials may be needed to provide knowledge about the magnitude of intervention effects (79). Effect size measures are one way to describe the magnitude of intervention effects (137, 138). A range of methods for estimating effect sizes are available and some commonly used are Cohen's *d* and odds ratio (138). An effect size estimate is required for estimating the number of participants needed to adequately power a full scale RCT.

Although the RCT provides the most robust research design in terms of internal validity, another important issue is external validity. External validity refers to the generalizability of findings to other samples and settings (133). Despite the strength of an RCT, other research designs may be more viable to establish that intervention effects also are valid for clinical settings (external validity) (134). For example, if different interventions already have been implemented in a setting, it may be difficult to introduce randomization as an allocation procedure. In such situation, a quasi-experimental design can allow for comparisons between groups (133). However, the lack of randomization can be a source of bias that needs to be considered in the analysis and in the interpretation of results (133).

In line with evidence-based practice, different trial designs can be used for the purpose of estimating effect sizes and to establish evidence to support intervention effects (139). However, evidence that identifies one intervention as superior to competing alternatives for a specific outcome does not take into account the resources needed to implement the intervention (140). Therefore, and as indicated in Swedish guidelines, cost effectiveness also should be considered in the prioritization of which interventions to implement (8).

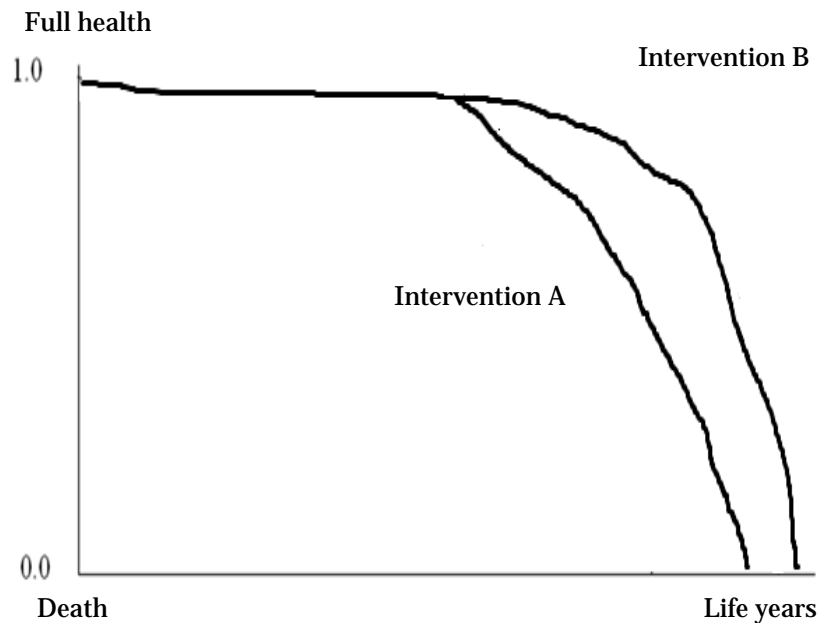
## Health economic evaluation

In any public organization responsible for providing health and social care, resources are limited while individual health needs and the number of possible interventions is numerous. The implementation of any one intervention requires resources (e.g., salaries, equipment) which must be financed within the budgetary limits. Therefore, the possibility to implement another intervention, albeit effective, may be restricted and choices will inevitably be needed to determine which of different alternative interventions to implement (7).

Health economic evaluation refers to a set of methods that can be used to identify the most efficient use of resources by considering both the health effects and the use of resources (7). While different health economic evaluation methods are available (e.g. cost analysis, cost-benefit analysis) the specific interest in this thesis is on cost-effectiveness analysis. Cost-effectiveness analysis can be used to identify the most cost-effective intervention and provide evidence that supplements evidence for primary outcomes. While primary outcomes often are specific and should have a close link to the intervention under investigation (106), it is difficult to compare cost-effectiveness of different interventions without a common measure of effect. To address that issue, the concept quality adjusted life years (QALYs) was developed as a combined measure of self-rated health and time (7). Self-rated health is usually anchored on a scale in which 1 indicates full health and zero is equal to death. To estimate QALYs, data for self-rated health and a time interval are combined (e.g., 1 year in full health is equal to one QALY). When QALYs are used as an outcome, the analysis is sometimes named cost-utility analysis, but for simplicity, I will use the concept cost-effectiveness analysis throughout this thesis. **Figure 1** illustrates an example of how self-rated health could develop over time in relation to two different interventions, A and B. As a result of B, a higher level of self-rated health is maintained compared to A. Another result of B is postponed mortality. The higher level of self-rated health and postponed mortality leads to incremental QALY gains for B compared to A.

While the use of QALYs provides a method to evaluate the accumulated effects on self-rated health, a central issue in the calculation of QALYs is the time period covered by the evaluation. Data for a cost-effectiveness analysis can be included as part of the data collection in a clinical trial (7). However, due to practical reasons (e.g., attrition, costs, logistical issues), a single trial can seldom provide all evidence needed to evaluate long-term cost-effectiveness (21). A common situation is that trial-based evaluations of effectiveness and cost-effectiveness have a short time span for follow-ups. This situation becomes especially problematic when the effects of an intervention potentially extend beyond the period of the trial. In such cases, there is a risk that only the full costs for implementing the

intervention are included; whereas, the long term effects and costs are not included. For example, Flood et al. included the costs for home adaptations, but not the long term effects for self-rated health and costs related to dependency (141).



**Figure 1.** An illustration of how self-rated health could develop over time in relation to intervention A versus intervention B. The QALYs gained is represented by the area between the curves.

Since data on the long term impact on both health effects and resource use are important when deciding whether or not to implement an intervention, information from other complimentary sources may be needed. Such information includes, for example, the natural progression between health states in a specific population (longitudinal cohort studies), costs related to specific health states (clinical and official registers) and data on self-rated health for different health states (clinical trials and cohort studies).

### *Decision modeling*

Decision modeling is a framework in which information from different sources are combined (7, 21). Decision modeling is based on the probability that a specific event will occur (21). For example, based on cohort studies, the natural progression between different health states in a specific population can be identified. Commonly used approaches used

to display the progression between health states are the decision tree and the Markov model (21). By modeling the progression between health states, and how the progression is affected by an intervention, the time horizon can be extended over a sufficiently long time period to capture relevant health effects and use of resources. In **Table 1** a hypothetical progression between states of dependency in a cohort of 100 persons is shown. Based on **Table 1**, probabilities for transitions between health states can be calculated (e.g., the probability for a transition from mild to moderate dependency after 1 year is 6%). Based on clinical data and official registers, a QoL score (i.e., a value for self-rated health) and an estimated cost (e.g., for health and municipality care) can be linked to each health state (21). An intervention that affects the probabilities for transitions between one or more health states (e.g., as a reduction of the risk of progression from mild to moderate dependency) will have an impact on QALYs and costs. By considering the accumulated effects on QALYs and costs, it is possible to model the long-term cost effectiveness.

**Table 1.** A Hypothetical Progression Between States of Dependency Over 6 Years Illustrated by a Cohort Including 100 Persons, All in the State Mild Dependency in the Beginning of Year 1.

Year	Mild dependency	Moderate dependency	Severe dependency	Total dependency	Dead
0	100				
1	90	6	2	1	1
2	80	10	5	3	2
3	70	14	8	5	3
4	60	18	11	7	4
5	50	22	14	9	5
6	40	26	18	10	6

## Health economic evaluation within occupational therapy

Within occupational therapy, as in any other profession, there is a need to implement interventions that are effective and delivered in an efficient and cost-effective manner (142). Occupational therapy interventions have the potential to positively affect occupational engagement and support older people to remain independent. Interventions that have an effect on occupational engagement and reduced dependency are also likely to have economic implications since disability and dependency has a major impact on societal costs (143). Despite the need for health economic evaluations of occupational therapy interventions, it was recently demonstrated, that in relation to other medical professions, there are few published health economic evaluations within occupational therapy (144). This lack of health economic evaluations is not only a problem in terms of insufficient evidence related to the most cost effective use of resources

(8), it also places occupational therapy behind other professions who have demonstrated cost-effectiveness of their interventions.

Therefore, there is a need for health economic evaluations to identify the most cost-effective occupational therapy interventions and to better position occupational therapy in relation to other professions. In order to do that, health economic evaluation needs to be included in the development–evaluation–implementation process (132).

## **Evidence to support occupation-focused interventions**

Systematic reviews provide general support for the effectiveness of occupational therapy interventions for older people (70, 114, 145-148). There are, however, some difficulties in interpreting such reviews since many different occupational therapy interventions are included, interventions have been implemented for differing populations and different outcome measures have been used (149). Because this thesis focuses on occupation-focused and occupation-based interventions implemented for two groups of community-dwelling older people, the following section provides a summary of existing evidence relevant in relation to these two populations.

## **Interventions for independent-living older people**

Health promotion for independent-living older people has involved implementing a variety of interventions that have focused on different aspects of health (94, 150-152). Despite extensive research within the field of health promotion for older people, few trials have had a specific focus on occupational engagement. Trials that have specifically included a focus on occupation (84, 85, 88, 89, 153) vary substantially concerning the focus of intervention, format, length and which outcomes that have been evaluated. One of the most cited occupational therapy studies is the Well Elderly program, a large scale RCT also known as Lifestyle Redesign, which was conducted in 1994-1996 (88, 98). The Well Elderly program resulted in significant effects on a range of outcomes related to health, function and quality of life and it was found to be cost effective (89, 154). A few other trials have implemented similar programs (84, 85, 153) that had positive effects on outcomes related to self-rated health. However, none of these trials provided evidence of positive effects on occupational engagement. In some trials such outcomes were not included (84, 85, 155), while in other trials, positive effects on occupational engagement (ADL performance) were not found (88, 153, 156).

Occupation-focused and occupation-based interventions implemented for older people with some reported difficulties in ADL have indicated that an individual goal-oriented intervention has the potential to improve one component of occupational engagement, ADL task performance (87, 157). For older people with some reported difficulties in ADL, there is also evidence that a multi-professional occupation-focused and occupation-based intervention had an impact on mortality (158) and was cost effective (159).

While the promotion of health through occupational engagement has a firm theoretical base within occupational therapy (10, 12), the evidence base is limited. Besides, when implemented for older people with identified problems in ADL, it remains unclear if occupation-focused and occupation-based health promotion affects occupational engagement. Furthermore, interventions have so far been implemented during a relatively extensive time period (i.e., 6 months or more) while the results from a recent multi-professional intervention indicated that health promotion implemented over a short time period may be effective (160). In addition, the evidence of cost-effectiveness is limited to evaluation of a combined group/individual intervention. Taken together, there is a need to further evaluate occupation-focused and occupation-based health-promoting interventions in order to explore if interventions implemented over a short time period have a positive effect on occupational engagement and self-rated health, and which interventions are most cost effective.

## Interventions for older people dependent on support

Interventions for older people who are dependent on support are seldom implemented by a single profession (e.g., occupational therapists); instead, services are often multidisciplinary (161-163). During the past 2 decades, municipality-based rehabilitation services for community-dwelling older people have been developed in several countries, and have been referred to using different terminology, for example reablement (163, 164), restorative care (162) or everyday rehabilitation (165). The term everyday rehabilitation is the term most often used in Scandinavia and, therefore, also in this thesis. Overall, everyday rehabilitation involves multi-professional interventions implemented for older people at risk of becoming dependent on home care, and are focused on optimizing functioning in daily activities and maintenance of independence in daily living (162, 165). Specifically how the everyday rehabilitation service is organized and how services are implemented varies, but a central feature is that both occupational therapy and physiotherapy are included (163, 166). The existing evidence consistently supports the effects of everyday rehabilitation for improving independence and reducing need of support from home care services (161, 164, 166, 167). While a reduced need of support of home care is a positive outcome, there is also a need to better

understand if such interventions improve outcomes for the individual (e.g., self-rated health, occupational performance) (164). For self-rated health, reviews has shown that everyday rehabilitation results in improved outcomes compared to conventional home care (161, 164). For occupational performance, is has been shown that everyday rehabilitation results in reduced dependency in PADL (166) and IADL (166, 168).

Considering cost effectiveness, several studies have claimed that everyday rehabilitation is cost effective in relation to conventional home care (161, 164, 166, 169). However, it has been common to only consider whether use of societal services has been affected as a result of everyday rehabilitation; whereas, effects on self-rated health have not been included in the calculation of cost effectiveness. For example, it has been shown that the costs for home care and health care were significantly lower for 2 years (167) and the cost for home care for up to 5 years (169) as a result of everyday rehabilitation. Somewhat in contrast, Glendinning (163) reported that everyday rehabilitation had no effect on costs, but self-rated health improved and, therefore, everyday rehabilitation could be considered cost effective.

However, evaluations of intervention effects within the context of everyday rehabilitation make it difficult to determine which effects are specifically a result of occupational therapy interventions (161). To further enhance the evidence base for occupational therapy interventions within the context of everyday rehabilitation for community-dwelling older people, there is a need to evaluate specific interventions to determine their effects on occupational engagement and self-rated health and to evaluate if interventions are cost effective.

Of specific interest in this thesis are interventions for older people with or at risk for disability in bathing. A review of Boniface (161) found that for occupational therapy implemented within the context of social services, interventions were mainly focused on self-care, and involved the implementation of adaptive occupation, including the provision of technical aids. Some previous intervention studies have specifically focused on occupational performance in bathing (170); whereas, other studies have had a more general approach to disability prevention, but they included a focus on bathing (157, 168).

Occupation-based interventions focused on the use of assistive devices while performing bathing-related tasks have been shown to be effective in improving ADL ability (170, 171). A multi-professional intervention targeting older people at risk for disability was effective in improving clients' abilities in ADL, including bathing (157). Furthermore, it has been shown that for older people seeking help for self-care, a larger proportion of participants regained independence in bathing as a result of everyday rehabilitation (168). The existing evidence has indicated that occupational



therapy and other occupation-focused and occupation-based interventions have positive effects on ADL ability and independence of home help when implemented for older people with bathing disabilities. However the interventions studied had either a very specific focus related to adaptive equipment (170, 171), or were multi-professional, without specifically describing the intervention components that were related to bathing (168). For community-dwelling older people with bathing disabilities in Sweden, there is no evidence to support the effects of occupational therapy interventions. There also is no evidence supporting the cost effectiveness for occupation-focused and occupation-based interventions implemented for community-dwelling older people with bathing disabilities.

## Summary

In line with public policy and from the perspective of older people, occupational engagement is one important component of successful aging and has the potential to contribute to health and well-being. During old age, several transitions that can affect the possibility of maintaining occupational engagement are likely to occur. Therefore, there is a need to develop, implement and evaluate interventions that focus on occupational engagement at times of critical transitions related to disability. There also is a need to study the effects of interventions that are designed to promote occupational engagement and thereby prevent and/or reduce disability. In this thesis, interventions for two specific groups of community-dwelling older people are evaluated; independent-living older people and older people with bathing disabilities.

More specifically, for independent-living, community-dwelling older people there is a need to evaluate occupation-focused and occupation-based interventions in terms of their effects on outcomes related to occupational engagement and self-rated health (studies I and II). For older people with bathing disabilities, there is a need to evaluate occupation-focused and occupation-based interventions in terms of their effects on ADL, self-rated health and independence of home help (study III). Furthermore, there is a need to include cost effectiveness analysis in all evaluations in order to identify which occupation-focused and occupation-based interventions provide the most efficient use of resources (studies II and IV).

## **AIMS OF THE THESIS**

The aim of this thesis was to evaluate the effects on occupational engagement and self-rated health and the cost effectiveness of occupation-based and/or occupation-focused interventions among two groups of older people: independent-living, community-dwelling older people and older people with bathing disabilities. Furthermore, the aim was to evaluate cost-effectiveness of the interventions.

### **Questions**

1. What are the leisure engagement effect sizes for three different occupational therapy interventions implemented for independent-living, community-dwelling older people? (Study I)
2. What are the ADL effect sizes for three different occupational therapy interventions implemented for independent-living, community-dwelling older people? (Study I)
3. Which occupational therapy intervention implemented for independent-living, community-dwelling older people is most cost effective when evaluated as cost per quality adjusted life years (QALYs)? (Study II)
4. What are the effects of an occupational therapy intervention for older people with bathing disabilities in relation to ADL, self-rated health and allocated home help? (Study III)
5. Is an occupation-focused and occupation-based intervention implemented to minimize bathing disabilities for older people cost effective in the long term when evaluated as cost per QALY? (Study IV)

## METHODS

### Study design and context

Studies I and II were focused on independent-living, community-dwelling older people potentially at risk for restrictions in occupational engagement because it has been suggested that health-promoting interventions should be implemented for older people at risk for functional decline (172). The population was identified based on their age (77-82 years), since the years around 80 years has been identified as a time period during which altered patterns of occupational engagement occurs (61) and restrictions in occupational engagement become more prevalent (96, 97). Studies I and II were based on a single-blind, four group, RCT.

Studies III and IV were focused on community-dwelling older people with bathing disabilities because they represent a group at high risk for further disability and loss of independence (100, 101). For example, bathing disabilities are associated with a high risk of disability in other activities of daily living (ADLs) (96, 101), amount of informal and formal help needed (173), admission to a nursing home (103) and death (104). Bathing disabilities are common among older people (reported prevalence of 31–34%) (96, 100), indicating a need for interventions to reduce bathing disabilities. Study III was based on a municipality-based trial, with a quasi-experimental design, and included older people who applied for home help with bathing from their municipality. Study IV was based on decision-analytic modeling.

The RCT on which studies I and II was based was designed in accordance with the CONSORT guidelines (82, 110). For studies II and IV, in which we conducted cost-effectiveness analyses, we followed the recommendations provided in the CHEERS statement (83). An overview of studies I–IV, including the quantitative methods used to evaluate effects (studies I, III) and cost-effectiveness (studies I, IV) of occupation-focused and occupation-based interventions are presented in **Table 2**.

**Table 2.** Overview of Studies Including Trial Design, Aim, Population, Intervention, Outcomes, and Analysis

Study	I	II	III	IV
Design	Single blinded, 4 group RCT		Quasi experimental 2 groups	Decision-analytic modeling Markov model
Aim	Evaluate three different occupational therapy interventions to estimate effect sizes for leisure engagement and ADL, and to identify the most effective intervention	Evaluate cost-effectiveness of three different occupational therapy interventions	Evaluate effects of an occupational therapy intervention on ADL, self-rated health and allocated home help	Evaluate long term cost-effectiveness of an intervention implemented to minimize bathing disabilities
Population	177 community-dwelling older persons, 77–82 years, single living, without home help	177 community-dwelling older persons, 77–82 years, single living, without home help	95 community-dwelling older persons, 65+, with bathing disabilities	Community-dwelling older persons, with bathing disabilities
Intervention	Occupation-focused health promotion Individual intervention Activity group Discussion Group	Occupation-focused health promotion Individual intervention Activity group Discussion Group	Occupation-based occupational therapy	Occupation-based single (occupational therapy) or multi-professional intervention
Control	No intervention	No intervention	Municipality-based home help	Municipality-based home help
Outcomes	MNPS ADL Taxonomy	SF-6D Program costs Health and municipality costs Incremental cost/QALY	ADL Taxonomy EQ-5D Allocated home help	Program costs Societal costs Incremental cost/QALY
Analysis	Parametric statistics Standardized effect sizes	Cost-effectiveness analysis	Parametric statistics Nonparametric statistics Chi <sup>2</sup> test	Cost-effectiveness analysis

## **Ethical considerations**

Throughout the research process, we paid close attention to ethical issues (174). All participants in studies I, II and III were given written and verbal information about the respective study, and were informed of their right to decline participation at any time without consequences to their right and access to other societal services. During a telephone contact with the primary investigator, each participant had the chance to ask questions about the study in which he or she might participate, and was finally asked if he or she agreed to participate. Written informed consent was obtained from participants in studies I, II and III. The studies were approved by the Regional Ethical Board, Umeå University (Dnr: 2010-242-32M and Dnr: 06-004M). For study IV, ethical approval was not necessary.

In the preparations of studies I and II, we acknowledged that some preliminary evidence existed to support the benefits of health-promoting interventions for older people (84, 88, 89). However, no previous trial had implemented exclusively occupation-focused interventions or evaluated the effects using occupation-focused outcomes. Therefore, we limited recruitment of participants and conducted an exploratory trial. The purpose of the exploratory trial was to obtain the knowledge needed (e.g. estimates of effect sizes) to conduct a future large scale trial. The trial was registered at [www.controlled-trials.com](http://www.controlled-trials.com) (ISRCTN44231162).

Study III was conducted in a municipality context in order to compare differences in outcomes between two municipalities. Study participants received no other interventions beyond ordinary clinical routines.

In study IV we implemented decision-analytic modeling which is a framework for combining the best available information in order to guide decision making (21). From an ethical perspective, the use of decision-analytic modeling avoids some of the ethical issues that are present in a clinical trial. First, by using already existing data, no recruitment of participants is needed, thereby maximizing the benefit of the data to which previous research participants have contributed. Secondly, by modeling long term effects, it is possible to determine if an intervention is sufficiently promising to warrant implementation. If there are uncertainties regarding any parameter in the modeling approach (e.g. intervention effectiveness), these parameters can be dealt with before recruitment of research participants to a large trial. For example there may be a need to further refine intervention procedures to enhance effectiveness or to identify sensitive outcome measures. The modeling approach can also provide estimates to determine the optimal timing for the implementation of interventions. For example, if there is sufficient evidence of the effectiveness of an intervention, the implementation

should not be postponed, thereby maximizing the potential benefits of the intervention. If there remains uncertainty concerning the effectiveness of an intervention, there is a need to consider the value of additional information gained from research in relation to the cost for obtaining that information as well as the value of postponing the implementation of the intervention (21).

## Procedures for studies I and II

### Participants, recruitment, data collection and randomization

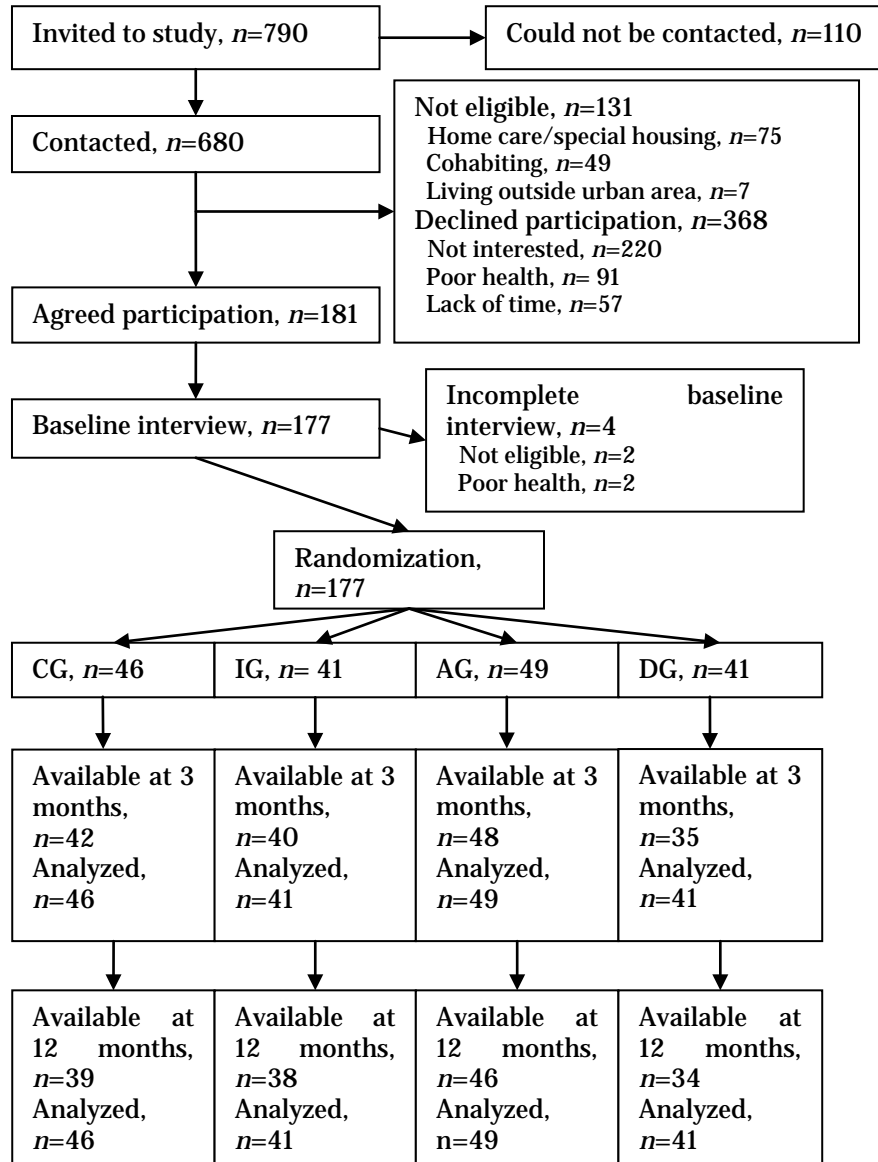
The inclusion criteria were that participants should be 77–82 years, have no home care, show no apparent cognitive or communication problems, and live alone in an urban area in northern Sweden. Recruitment was based on a list from the National Tax Board of Sweden of all people born between January 1, 1928 and December 31, 1933. In that list, 1177 persons had a marital status indicating they were single, living alone and eligible for the study. An invitation letter describing the study, how it would be conducted and stressing that participation was voluntary was sent to 790 randomly chosen potentially eligible persons. Within 2 weeks, a follow-up telephone call was made by the principal investigators (PIs) (MZ, IN), who, in a dialogue with the person, answered additional questions and did an initial evaluation to determine if the person met the inclusion criteria. In all, 181 persons consented to participate. A flow chart of recruitment is shown in **Figure 2**.

Within 2 weeks after initial contact, written informed consent and baseline data were collected during home visits by trained research assistants blind to group assignment and not otherwise involved in the study. The data collection included demographic characteristics (e.g., age, gender, education level), health characteristics (e.g., medications, diagnoses), use of municipality services (i.e., home help, special housing), use of health care (e.g., days in a hospital, visits to a health care professional), and primary outcomes (i.e., leisure engagement, ADL, self-rated health). The collection of follow-up data at 3 and 12 months followed the same procedure and included the same data as for baseline.

Recruitment of participants commenced March 2010 and initially included persons 77–78 years old. Participants from this first “wave” were randomized to three groups: control group (CG), activity group (AG) and a one-meeting discussion group (DG). Additional funding allowed the trial to be expanded to include an individual intervention group (IG) and to allow for more participants, from a wider age span, 77–82 years, to be

## Methods

recruited to all four groups. Thus, participant recruitment continued over an additional three waves, from November 2010 to March 2011. In all, participants were randomized to the CG ( $n=46$ ), IG ( $n=41$ ), AG ( $n=49$ ) or DG ( $n=41$ ). A statistician not involved in the study performed an electronic randomization and informed the principal investigators MZ and IN, who subsequently informed participants about group allocation. Interventions were implemented consecutively within 2 weeks after randomization.



**Figure 2.** Flow chart of participants in studies I and II throughout recruitment, randomization, intervention and follow-ups (CG=Control group, IG=Individual group, AG=Activity group, DG=Discussion group).



## Interventions in studies I and II

All interventions were based on concepts of health promotion and healthy aging (e.g., engagement in meaningful activities, social activities, physical activities) (1). An *occupation-focus* (13) was a central feature of all interventions. On a general level, consultation and discussions were related to the importance of occupational engagement for health and well-being (e.g., through engagement in social occupations). On a more specific level, the participants had the opportunity to bring up issues of concern and discuss strategies for how to deal with practical problems potentially restricting occupational engagement (e.g., managing transportation after driving cessation). The overall aim was to support participants to improve or maintain engagement in valued occupation despite age-related activity limitations and participation restrictions. However, the interventions were implemented using different formats and with different numbers of sessions and, thereby, each intervention could be described as an independent variable (80).

The individual intervention (IG) was based on an occupation-focused program and implemented in collaboration with the client. In addition, the individual intervention was *occupation-based* (13) and goal-oriented if and when clients identified specific occupations of concern. For example, if a participant identified transportation by bus as a potential problem in relation to maintaining social activities, a potential goal could be to independently manage bus rides to the city center to meet friends. Then, the intervention and assessments focused on (i) identifying the specific tasks that the person needed to perform in order to manage transportation by bus, (ii) identifying and implementing actions needed to enhance occupational performance (e.g., buy a ticket with the cell phone) and (iii) evaluating if the person independently managed transportation). The time frame for the interventions was a minimum of three to eight sessions over a maximum of 10 weeks.

The activity group (AG) included eight weekly occupation-focused and occupation-based group sessions, including a mix of lectures, engagement in occupation (e.g., walking with pedometer, visiting cultural events, cooking) and discussions related to occupational engagement. For example, when focusing on social occupations, a group session was introduced with a short lecture by the group leader followed by a group discussion about the importance of relations and social occupations for health and well-being. In addition to lectures and engagement in occupation, an activity diary was introduced and participants were encouraged to document their patterns of occupations over 5 days between two sessions. They then used their activity diaries as a basis for reflection and group discussion during the next session. Overall, group discussions and the use of the activity diary were intended to identify

opportunities and problems related to the engagement in occupation and to identify strategies to maintain or improve engagement in occupation.

The discussion group (DG) included one occupation-focused group session. The session was introduced with a short lecture by the group leader about healthy aging and occupational engagement. The introduction included the following questions, intended to facilitate the subsequent group discussion. *What do you do every day to stay happy and healthy? What are the most meaningful activities that fill your time? If you could add something to your life, what would it be? How would you like to spend your time?* The introduction was followed by a group discussion that concerned issues related to occupation that were reported to be important by the participants. The role of the group leader was to guide the discussion towards identifying opportunities and problems related to occupational engagement and to identify strategies to maintain or improve occupational engagement.

Participants in the control group (CG) received no intervention, but were offered a booklet about healthy aging after the final follow-up.

## Procedure study III

### Participants, recruitment and data collection

The inclusion criteria were that participants should be community-dwelling, aged 65+, and had applied for home help with bathing from their municipality. At first contact with the local care manager (who handled applications for home help), potential participants received verbal information about the study and were asked if they were willing to participate. A total of 95 older people were recruited to the intervention group ( $n=59$ ) or to the control group ( $n=36$ ). A flow chart of recruitment is shown in **Figure 3**. During recruitment, no occupation-based assessment was made to evaluate the nature of the bathing-related disability.

Participants were recruited consecutively between February, 2006 and April, 2007 from two different municipalities in northern Sweden. Municipalities were selected based on convenience and differences in ordinary clinical routines. In the municipality of the intervention group, those who applied for home help with bathing were routinely offered to meet with an occupational therapist to determine if occupational therapy intervention could support applicants to improve ADL task performance and regain/maintain independence in bathing. In the municipality of the control group, those who applied for home help with bathing were routinely interviewed by the local care manager to determine if they were

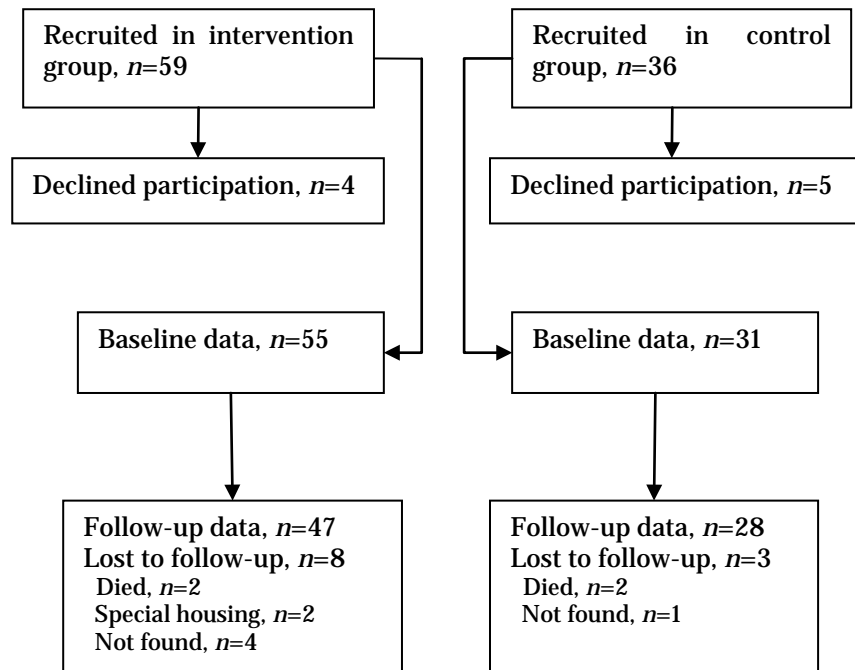
eligible for home help. Baseline data were collected during telephone interviews by the principal investigator, MZ, within 2 weeks of the time when clients were included in the study and follow-up data was collected at 15 weeks.

### Intervention in study III

Interventions reflected ordinary clinical practice that already was ongoing in each municipality. In the intervention group, the occupational therapist implemented occupation-focused and/or occupation-based assessment and intervention (13) focused on supporting safe and independent performance of subtasks of bathing (e.g., transfer to the bathroom, transfer in and out of the shower or bathtub, washing the body, dressing). Assessment and intervention was implemented in the client's home during home visits and tailored to each individual. The aim of the interventions was to support the clients to perform the relevant bathing subtasks with least possible effort and as efficiently, safely and independently as possible. The intervention was compensatory (environmental adaptations or task modifications in combination with practical training in performing tasks) or acquisitional (reacquiring or enhancing occupational performance skills) (14). If, for example, a participant reported fear or a high degree of uncertainty when moving into the shower, the occupational therapist implemented an assessment of occupational performance related to moving into the shower. If the assessment resulted in the identification of potential environmental barriers, the therapist suggested strategies to remove or overcome such barriers, and provided the participant the opportunity to practice and gradually increase his or her skills and confidence in moving into the shower. The specific content of the intervention for each participant was registered by the occupational therapist who implemented the assessment and intervention.

Based on the occupational therapy assessment and intervention, information was provided to the local municipality care manager who decided whether home help services should be granted or not. For clients in need of help, home help was allocated based on the information received from the occupational therapist.

In the control group, those clients requesting help with bathing were allocated home help if they were found eligible based on the interview by the local care manager. Clients in the control group received no occupational therapy intervention from their municipality.

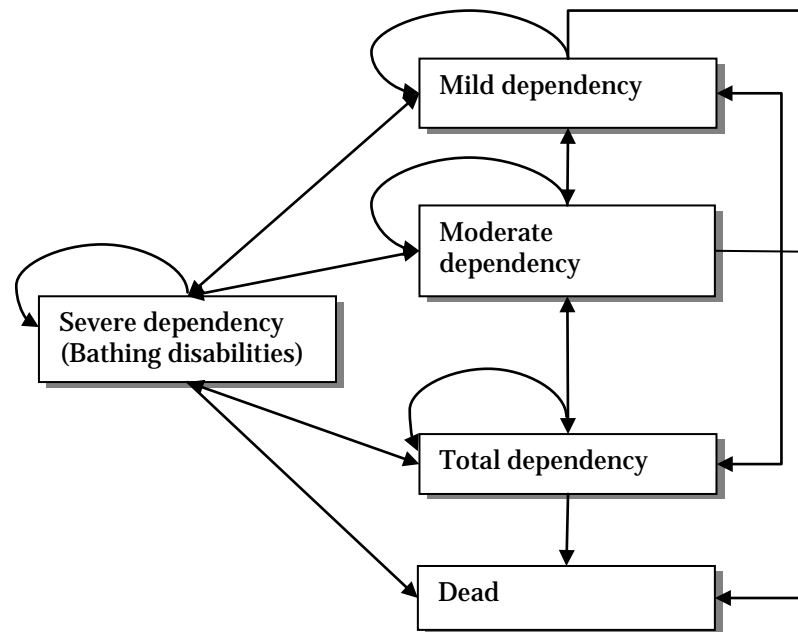


**Figure 3.** Flow chart of participants throughout recruitment, baseline data collection and follow-up in study III.

## Procedures for study IV

### Structure of the Markov model

We developed a Markov model (21) in Microsoft® Excel 2007 (21, 175) to illustrate transitions between states of dependency (**Figure 4**). For community-dwelling older people with bathing disabilities, a short term intervention implemented to minimize bathing disabilities was compared with no intervention to estimate cost/QALY. Based on data from previous studies, each state in the Markov model was assigned a score for QoL (176-180) and a societal cost (health care, home help, informal care and special accommodation, e.g., nursing home) (143) to allow analysis of long-term cost effectiveness. The accumulation of QALYs and costs was modeled over 8 years from a societal perspective.



**Figure 4.** The Markov model used in study IV to display transitions between states of dependency and death. Each arrow represents a possible transition, recovery, stability or decline between two health states over a 1 year period.

In close collaboration with a group of experienced local care managers, we sought to establish a comprehensive model that, in a valid way, represented clinically-relevant and well-defined states. The states were defined based on level of dependency (i.e., dependency of home help) and place of residency because these two aspects have been found to impact self-rated health as well as costs related to health and social care (143). Five health states were modeled: *mild dependency* included persons who are independent in personal activities of daily living (PADLs) (e.g., bathing, dressing, toileting), and dependent in a single instrumental activity of daily living (IADL) (e.g., cleaning, shopping, cooking), and need help one time per week. *Moderate dependency* included persons who are independent in PADLs, are regularly dependent in more than one IADL and need help more than one time per week. *Severe dependency* included persons who are dependent in one PADL and more than one IADL, and need help at least once per day. *Total dependency* included persons who are dependent in at least one PADL and IADLs, need help at least once per day and live in a special housing. The final state was *dead*. While the

model overall illustrates a negative process towards increasing disability, it is well known that disability, although common among older people, involves both decline and recovery (92).

Model parameters included probabilities for transitions between dependency states (**Table 3**), QoL scores and societal costs for each state (**Table 5**). The parameters were obtained from previously published research.

### *Transition probabilities*

In the modeling of the progression between the states in the Markov model, we assumed that all participants began in the severe dependency state related to their bathing disabilities, in our study defined as being dependent on home help for bathing (101). Transition probabilities referred to a cycle of 1 year, and for each year, participants could remain in the same state, recover to a state of less dependence, decline to a state of more dependence, or die. Transition probabilities were derived from a Canadian study (181). Based on a Canadian classification system for disability (182), transition probabilities for recovery, stability and decline were calculated for a cohort of 1410 persons, aged 75 or older, at risk for decline in functioning (181). Participants were followed for 4 years, and annual transition probabilities were estimated. Using the originally reported transition probabilities (181), we recalculated transitions probabilities for our five state Markov model, see **Table 3**.

**Table 3.** Transition Probabilities\* for Annual Transitions Between States of Dependency

	Mild	Moderate	Severe	Total	Dead
Mild	0.79	0.13	0.03	0.02	0.03
Moderate	0.08	0.82	0.03	0.01	0.06
Severe	0.02	0.12	0.61	0.11	0.14
Total	0.00	0.03	0.18	0.63	0.16
Dead					1.00

\* The transition probability are the probabilities for a person, over a 1-year period, to transition between states. For example, a person in the severe dependency state has a probability of 0.12 to recover to the moderate dependency state and a probability of 0.61 to remain stable in the severe state.

## Intervention in study IV

We modeled an intervention implemented to reduce bathing disabilities among older people with bathing disabilities. The intervention focused on enhanced ability to perform bathing tasks in a safe and independent manner (183). It was hypothesized that compensatory interventions (e.g., use of technical aids, modified task performance), were a central aspect

of the intervention (183). The intervention was implemented during home visits and tailored to the client's needs. Previous trials provided evidence that such interventions had a significant effect on recovery from bathing disabilities (167, 168, 170, 183). Based on those trials, we approximated an intervention effect and two alternative intervention costs (**Table 4**). In terms of the states in our Markov model, the intervention effect was implemented as a 1.4 increased probability for recovery from severe dependency to moderate dependency, based on the 1 year follow-up by Lewin (168) (**Table 4**). The effect of the intervention was implemented in the analysis as a one-time effect during the first year.

**Table 4.** Studies Used to Estimate Intervention Effects in Terms of Recovery from Bathing Disabilities

Author (ref)	Sample	Follow up	Recovery, n (%)	Increased probability for recovery
Chiu (170)	Intervention: 30 Control: 23	3 months	25 (83) 9 (39)	2.1 (bathing)
Zingmark (183)	Intervention: 46 Control: 28	3 months	32 (70) 7 (25)	2.8 (bathing)
Lewin (168)	Intervention: 375 Control: 375	3 months	272 (73) 137(37)	2.0 (personal care*)
Lewin (168)	Intervention: 375 Control: 375	1 year	308 (82) 224 (60)	1.4 (personal care*)
Lewin (167)	Intervention: 201 Control: 246	2 years	178 (89) 161 (65)	1.4 (personal care*)
Intervention characteristics				
Zingmark (183)	Older people who applied for home care for bathing. Interventions implemented by occupational therapists; on average three home visits. Focus on supporting the person to gradually increase her or his ability to safely and independently perform subtasks related to bathing. Seventy percent of the interventions focused on a modified task performance, for example by the use of technical aids.			
Chiu (170)	Older stroke patients with an identified need of a bathing device. Additional support from occupational therapists in using prescribed assistive devices post discharge from hospital (two to three home visits). Interventions included demonstration, information and opportunity to practice how to use assistive devices. Information and support was given both to the older person and potential caregivers.			
Lewin (168)	Older people referred to a home care service for help with for personal care*. Multi-professional intervention aimed at enhancing engagement and independence in everyday activities, implemented during a maximum of 12 weeks. Individually-tailored intervention based on clients' goals including, for example, use of assistive devices, exercise to enhance mobility, fall prevention, nutrition and disease self-management.			
Lewin (167)	Same as above.			

\*Most common reason for personal care was bathing.

## Outcomes

### Leisure engagement

Leisure engagement was measured using the Modified NPS interest checklist (MNPS) (122) that covers 20 leisure activities. For each activity, the participants answered if they were interested in the activity, performed the activity, wanted to perform it, and if the activity was important for their well-being. In this study, leisure engagement was based on a composite of the performance, motivation and importance for well-being ratings. The MNPS has been used to evaluate leisure engagement among older people and has demonstrated validity and reliability (72, 122).

### ADL

#### *Study I*

In study I, ADL ability was evaluated using the ADL Taxonomy that covers 12 activity domains related to PADL and IADL (184). Each activity domain is comprised of hierarchically ordered tasks with a total 47 ADL tasks. The participants reported if each task was performed independently or not. The participants also rated their quality of ADL task performance in relation to the use of technical aids, extra amount of time, physical effort and/or safety risk. For tasks that were not performed independently, the participants rated their need for assistance. Previous research has shown that the ADL Taxonomy is valid and reliable to use with older people (111).

#### *Study III*

In study III, selected activity domains of the ADL Taxonomy were used to evaluate ADL ability (184). Four activity domains that were related to bathing (i.e., mobility, dressing, personal hygiene, grooming), including 19 tasks, were evaluated. Specifically for this study, the participants rated their abilities to perform each task (i.e., perform easily, perform with slight difficulty, perform with severe difficulty, cannot perform).



## Self-rated health

### *Study II*

In study II, we used SF-12 (Short Form Health Survey) which is a questionnaire covering physical health and mental well-being (127). The SF-12, developed from the SF-36, has established validity and reliability for use in older populations (185) and has similar responsiveness to change as does the SF-36 (186). Based on data from the SF-12, a preference-based score for general health, SF-6D, can be derived for use in health economic evaluations (130). For general health based on SF-6D, a score of 0.03 to 0.04 has been considered a minimally important difference (187, 188).

### *Study III*

In study III, the EQ-5D questionnaire was used to assess health-related quality of life (HRQoL) (128). EQ-5D covers five domains (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) each of which has three levels of severity (no problems, some or moderate problems, extreme problems). EQ-5D generates 343 possible health states and each health state can be transformed to a single index score for HRQoL. In this study, the transformation of health states to HRQoL was based on the tariff presented by Dolan, Gudex, Kind, and Williams (131). EQ-5D is valid and reliable for use with older people (189).

### *Study IV*

For approximations of self-rated health for each health state in study IV, previous studies indicated that a decline in ADL (177) and loss of independence (179) has a negative impact on self-rated health. Because of a lack of data derived from the specific population under investigation in this study, we searched the literature in order to assign each state in our Markov model an approximate score for self-rated health. For the state *mild dependency*, we used unpublished baseline data from an ongoing trial including 177 well older people (176). For the state *moderate dependency*, we made an approximation reflecting a decline in PADL and IADL (177, 178). Based on previously published data on decrements in QoL due to major loss of independence (179) and move to a nursing home (179, 180), we approximated QoL scores for the states *severe dependency* and *total dependency*. QoL scores are shown in **Table 5**. The QoL scores were multiplied by the time spent in each health state to derive a quality adjusted life year (QALY) (7) (e.g., 1 year spent in the state moderate dependency yields 0.6 QALYs).

**Table 5.** Estimates of Annual Total Costs (€), Including Health Care, Home Care, Informal Care and Special Accommodation (143), and QoL Scores for Each State in the Markov Model

Markov state	Total costs (€)	QoL scores
Mild dependency	2864	0.77
Moderate dependency	8593	0.60
Severe dependency	22915	0.47
Total dependency	68746	0.41
Dead	0	0.00

## Allocated home help

For study III, data for allocated home help were collected at baseline and at 15 weeks from local care managers in each municipality. The information included the amount of home help allocated and when decisions were made.

## Costs

### *Study II*

Program costs were related to the implementation of the intervention programs and included salaries (all groups), rooms for group sessions (AG and DG), costs for activities and materials (all groups), travel expenses for the participants (AG and DG) and travel expenses for the interveners (IG). The cost for salaries were based on the gross mean income for occupational therapists in Sweden, 25 €/h and the number of hours during which the interventions were implemented. In the IG, the time to document each contact was estimated to be 15 min, and the travel time was estimated to be 15 min/home visit. In the AG and the DG, each meeting included 1 h of preparation. As preparation, the interveners received 20 hours of training that included readings, lectures about healthy aging and health promotion, and an introduction to the features of the specific intervention program they would implement.

Data for use of municipality and health care were collected at baseline and each follow-up. Municipality costs included home help (h/mo) and special housing (number of days). Unit costs (homecare 47 €/h, special housing 177 €/day) were derived from [www.kolada.se](http://www.kolada.se), a database for Swedish municipalities and county councils. Health care costs were based on unit costs from the local county council and included days in a hospital (852 €/day), visits to a doctor (221 €/visit) and visits to other health care professionals (nurse, physiotherapist, occupational therapist) (81 €/visit).

### *Study IV*

The intervention cost was based on salaries and the cost for prescribed technical aids. The main analysis was based on an occupational therapy intervention in which it was hypothesized that the intervention, on average, included three home visits for a total of 2 hours (183). An alternative intervention cost reflecting a multi-professional intervention (168) was used for a sensitivity analysis, see below. The multi-professional intervention included home visits implemented by a team (an occupational therapist, a physiotherapist, and a nurse) and was delivered over a time period of 12 weeks. We hypothesized that, on average, this intervention included 12 home visits. For both the occupational therapy intervention and multi-professional intervention, we approximated the time for travel to home visits and administration (i.e., documentation, planning) to be 30 min per home visit. Salaries were based on the gross mean income for occupational therapists in Sweden in 2013, 28.5 €/h. Costs for technical aids was estimated to 26 € per person (183).

In order to estimate societal costs for each state, we used data from a recent trial demonstrating that the level of dependency in PADL and IADL has a strong impact on total costs, including health care, home help, informal care and special accommodation (143), see **Table 5**.

## **Analyses**

### **Studies I and II**

In studies I and II, the analyses were based on an intention to treat approach, i.e. all participants were analyzed on the basis of the group to which they were randomized. Based on the assumption that older people are expected to decline over time as a result of the aging process, we used the mean change between each assessment as an imputation method to handle missing data for leisure engagement, ADL ability, scores for general health and costs (190).

#### *Leisure engagement*

We used Rasch measurement methods to convert ordinal data from the MNPS interest checklist to linear measures of leisure engagement (122). The MNPS is a relatively new tool that is used to identify the level of leisure engagement in older people. Because cutoff and normative values are under development, but have not yet been established, operationalized bases for interpreting the measures are not yet available. Nevertheless, a frame of reference for understanding the results based on

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the likelihood of a person reporting high versus low engagement can be described. That is, a person engaging in all but two of the least common leisure items would have a leisure engagement measure of 3.6 logits while a person engaging in only the two most common leisure items would have a leisure engagement measure of -3.4 logits.

### *ADL*

We used Rasch measurement methods to convert ordinal ADL Taxonomy data to linear measures of ADL ability (191). Linear measure based on the ADL Taxonomy is also relatively new. Therefore, because cutoff and normative values also are under development, but have not yet been established, operationalized bases for interpreting the measures is not yet possible. Nevertheless, a frame of reference for understanding the results based on the likelihood of a person reporting high versus low ADL ability can be described. That is, person able to do all but the most difficult ADL items with no difficulties will have an ADL engagement measure of 3.6 logits, while a person able to do only the easiest ADL item will have a ADL engagement measure of -3.1.

### *Self-rated health*

Based on our data from the SF-12, we used the QualityMetric Health Outcomes™ Scoring Software 4.0 (QualityMetric, Lincoln, RI) to obtain a score for general health (SF-6D) (130). For general health, based on SF-6D, a score of 0.03 to 0.04 has been considered a minimally important difference (187, 188).

### *Calculation of QALYs*

Data on general health was used for further calculations of QALYs. We approximated that any change in scores for general health between two assessments was linear. QALYs gained at the 3 month evaluation was calculated as the difference in scores for general health between baseline and 3 months divided by 2 (linear change) times the length of the interval 0.25 (3 months = 0.25 year) (7).

### *Costs*

In the AG and DG, the costs related to salaries were estimated based on the number of sessions. Additionally, costs for activities were based on reports from the interveners. In the IG, estimates of costs were based on reports from the interveners concerning the time used and the costs for

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any activities. Total costs were calculated for each group and the average cost per participant was used in the cost-effectiveness analysis.

Municipality costs were zero at baseline because of the inclusion criteria, i.e., live in ordinary housing, no home care. At both follow-ups, municipality costs were based on the present situation, at the time of data collection. As for QALYs, we approximated that the change in municipality costs between baseline and follow-ups was linear.

All health care contacts were reported retrospectively for the prior 12 months and we assumed that health care contacts were evenly distributed over the year. For estimates of health care costs at 3 months, we divided data from 3 months by 4 (i.e., a quarter of a year) and then multiplied by the unit cost (e.g., 221 €/visit to a doctor). For estimates of health care costs at 12 months, the total number of days in a hospital and visits to health care professionals were multiplied by their unit costs.

### *Effect sizes*

We calculated standardized between-group effect sizes, Cohen's *d*, to evaluate if the effect sizes for leisure engagement, ADL ability and general health were small (0.2), moderate (0.5) or large (0.8) (137). All effects below 0.2 were regarded as negligible. Because the standard deviations (*SDs*) varied across groups, we used the pooled *SDs* (e.g., T1 and T2) based on all four groups. Statistical analyses were performed using PASW Statistics, version 20.0 (SPSS, Chicago, IL).

### *Statistical analysis of between group differences*

Leisure engagement, ADL ability, general health, municipality costs and health care costs were analyzed using linear regression models. We evaluated if there were significant differences (i) between each intervention group and the CG at baseline, and (ii) in how much the intervention groups changed in relation to the CG between baseline and each follow-up. A *p*-value  $\leq 0.05$  was considered statistically significant. Statistical analyses were performed using PASW Statistics, version 22.0 (SPSS, Chicago, IL).

For the cost-effectiveness analysis, differences in QALYs gained and costs were calculated for each intervention group in relation to the CG. Based on significant differences in scores for general health, and costs between each intervention group and the CG at 3 and 12 months, an incremental cost-effectiveness ratio (ICER) was calculated (7). More specifically, the incremental cost between two groups was divided by the incremental QALYs gained between those two groups. ICER represents the additional

cost per additional QALY gained. Results were interpreted in relation to established thresholds indicating a cost <11000 € as a low cost/QALY; <55000 € as a moderate cost/QALY and costs >55000 € as a high cost/QALY (192).

### *Sensitivity analysis in study II*

In order to examine the stability of the regression model and our results, we performed one-way sensitivity analyses (7). Baseline values for general health and health care costs were included as covariates to account for variations at baseline. Municipality costs were not included as a covariate because those costs were zero in all groups at baseline. The results of the sensitivity analyses are presented as adjusted values for QALYs, costs and ICER.

## Study III

To evaluate baseline differences between groups, age and HRQoL were evaluated with student's *t*-tests. All other participant characteristics and diagnoses were evaluated with chi<sup>2</sup>-tests. For ADL ability, each task was evaluated with Mann Whitney *U* (193).

To evaluate if ADL ability for each task changed significantly from baseline to follow up, each group was analyzed by the use of Wilcoxon signed ranks tests. Also at follow-up, to evaluate between-group differences in ADL ability, each task was evaluated using Mann Whitney *U*.

To evaluate if HRQoL changed significantly different between groups, the difference between baseline and follow-up EQ-5D score was analyzed with *t*-tests.

To evaluate differences in the allocation of home help, we used logistic regression in order to adjust for potential confounders. The outcome was binary (i.e., home help: yes/no), and in addition to group as an explanatory variable, we selected covariates based on participant characteristics and outcome variables with a *p*-value ≤0.10 (193).

Statistical analyses were performed using PASW Statistics, version 22.0 (SPSS, Chicago, IL) and a *p* ≤ .05 was regarded as statistically significant.

## Study IV

We applied the software Microsoft® Excel (175) to analyze the Markov model. In previous trials that had implemented interventions to minimize

bathing disabilities, the mean age of participants was 82 years (168, 183). The average life expectancy at 82 years, derived from Statistics Sweden (194), was 8 years. Therefore, the analysis included a time period of 8 years. QALY scores and societal costs were discounted at 3% per year. The main analysis included the cost for the occupational therapy intervention (1190 SEK, 128 €). For the two alternatives, i.e. intervention vs. no intervention, we calculated the accumulation of QALYs and societal costs over 8 years to establish an incremental cost-effectiveness ratio (ICER) (7).

### *Sensitivity analysis*

In order to acknowledge the uncertainty of our parameter estimates, we conducted a sensitivity analysis. We hypothesized that a reduced intervention effect and an increased intervention cost would reflect real-world variations that could affect cost effectiveness. Instead of a 40% increase in the probability of recovery from severe dependency to moderate dependency, as assumed in the main analysis, we assumed a 20% increase of recovery in relation to no intervention in the sensitivity analysis. Secondly, we assumed a higher intervention cost reflecting a multi-professional intervention (5086 SEK, 546 €). We performed the sensitivity analysis for each of the assumptions separately and both assumptions combined.

## RESULTS

### Studies I and II

#### *Baseline characteristics*

A total of 177 older people were recruited and randomized to the CG ( $n=46$ ), the IG ( $n=41$ ), the AG ( $n=49$ ) or the DG ( $n=41$ ). There were no significant differences between groups in demographic characteristics ( $p \geq 0.22$ ) (**Table 6**), any of our outcomes ( $p \geq 0.08$ ) (**Table 7**) or costs for health care during the previous year ( $p \geq 0.19$ ) (**Table 9**).

Most participants were engaged in several leisure activities (i.e., mean=8, range=1–14), and the most commonly performed activities were outdoor activities (88%) and cultural activities (95%). Nearly all participants,  $\geq 97\%$ , were independent in IADLs such as cooking, washing clothes, and cleaning. Participants reported few ambulatory problems and 73% used no mobility devices when walking outdoors. Furthermore, participants reported some pain (83%), severe pain (35%), high blood pressure (55%), hearing difficulties (54%) and sleeping problems (43%). Sixty five percent used three or more medications and 26% reported a hospital stay during the last year. Despite these health problems, 80% rated their health as good or better.

**Table 6.** Baseline Demographic Characteristics for the Control Group (CG), the Individual Intervention (IG), the Activity Group (AG) and the Discussion Group (DG)

Characteristics	CG ( $n=46$ )	IG ( $n=41$ )	AG ( $n=49$ )	DG ( $n=41$ )
Age (range)	79 (77–82)	80 (77–82)	79 (77–82)	79 (77–82)
Women, %	82.6	82.9	81.6	82.9
Post high school education, %	26.7	31.7	30.6	42.5
Living in apartment, %	80.4	78.0	79.6	85.4
Brisk walker 100 m, %	93.5	87.8	89.8	90.2
$\geq 3$ medications/day, %	60.9	61.0	75.5	60.0
Self-reported health conditions ( <i>SD</i> )	6.1 (3.5)	6.6 (3.4)	6.5 (3.4)	6.0 (3.4)



### *Implementation of interventions*

Of those participants allocated to the IG, thirty nine (95%) participated in the intervention, eight participants established goals and seven engaged in occupation-based interventions. On average, the individual intervention included 3.6 (2–6) contacts with the intervener over a total of 3.5 (2.5–6.3) hours. Of those participants allocated to the AG, 47 (96%) participated in one or more meetings, 38 clients (77%) attended at least four of the meetings and 21 participants (43%) attended all meetings. Of those allocated to the DG, 37 participants (90%) attended the meeting. In all, there were six AG and five DG groups.

### *Drop-outs*

Of the 177 participants initially randomized, 165 (93%) were available for re-evaluation at 3 months and 157 (89%) at 12 months. There were no significant baseline differences in leisure engagement, ADL ability, general health or health care costs during the year before the trial between those who remained in the study and those who had dropped out at 3 months ( $n=19$ ) ( $p \geq 0.32$ ) and 12 months ( $n=19$ ) ( $p \geq 0.08$ ).

## Leisure engagement

Between baseline and 3 months, all groups showed a decline in leisure engagement. The effect sizes indicated that all interventions slightly reduced the decline in leisure engagement compared to the CG (**Table 7**). In terms of Cohen's  $d$ , the effect size for the DG was small and negligible in the IG and the AG. There were no significant differences in how any of the intervention groups changed in relation to the CG ( $p \geq 0.10$ ).

All four groups also declined between baseline and 12 months. The rate of decline in leisure engagement followed a similar pattern in the AG, DG and CG, and the effect of the AG and the DG to reduce the decline was negligible. The effect size indicated that the IG reduced the decline in leisure engagement, and the effect size was small. There was a significant difference in how the DG changed in relation to the CG ( $p=0.03$ ). For the AG and DG, the difference was not significant in relation to the CG ( $p \geq 0.52$ ).

## ADL

Between baseline and 3 months, the IG and DG remained stable while both the AG and CG declined slightly. The effect sizes indicated that the IG and the DG had a small effect in maintaining ADL ability (**Table 7**).

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There were no significant differences in how any of the intervention groups changed in relation to the CG ( $p \geq 0.09$ ).

All four groups declined between baseline and 12 months. The effect sizes indicated that all three interventions reduced the decline in ADL ability compared to the CG, although the AG had a slightly higher effect size; all effect sizes for the three interventions were small. There were no significant differences in how any of the intervention groups changed in relation to the CG ( $p \geq 0.06$ ).

### General health

Between baseline and 3 months, the CG and IG remained stable while both the AG and the DG groups showed improvements. The effect sizes indicated that the AG and the DG had a small effect in improving general health in relation to the CG (**Table 7**). There was a significant difference in how the AG and the DG changed in relation to the CG ( $p \leq 0.04$ ).

Between baseline and 12 months, the CG improved slightly, the IG and the AG declined slightly, and the DG showed an improvement compared to the CG (**Table 7**). The effect sizes indicated that the IG had a small negative effect and the DG had a small positive effect in relation to the CG; the differences were not significant ( $p \geq 0.06$ ).

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**Table 7.** Baseline (T1) and Outcomes for the Control Group (CG), the Individual Intervention (IG), the Activity Group (AG) and the Discussion Group (DG) Participants at 3 (T2) and 12 (T3) Months

Outcome	T1 Mean $\pm$ SD	T2 Mean $\pm$ SD	T3 Mean $\pm$ SD	Change T1–T2	Effect size*	<i>p</i> - value**	Change T1–T3	Effect size*	<i>p</i> - value**
Leisure engagement									
CG	-0.62(.67)	-1.17(.88)	-1.26(.68)	-0.55 (.55)			-0.64(.72)		
IG	-0.90(.67)	-1.34(.58)	-1.20(.66)	-0.44(.67)	0.14	0.39	-0.30(.67)	0.41	0.03
AG	-0.82(.94)	-1.21(.97)	-1.56(.89)	-0.39(.81)	0.19	0.23	-0.74(.84)	-0.12	0.52
DG	-0.71(.70)	-1.04(.93)	-1.29(.93)	-0.33(.58)	0.27	0.10	-0.58(.74)	0.07	0.68
ADL									
CG	2.32(.54)	2.16(.73)	2.03(.51)	-0.16(.61)			-0.29(.51)		
IG	2.35(.56)	2.36(.74)	2.22(.62)	0.01(.51)	0.29	0.11	-0.13(.51)	0.30	0.13
AG	2.37(.51)	2.29(.61)	2.27(.59)	-0.08(.51)	0.16	0.41	-0.10(.56)	0.38	0.06
DG	2.36(.37)	2.39(.48)	2.23(.42)	0.03(.36)	0.31	0.09	-0.13(.38)	0.30	0.13
General health									
CG	0.76(.11)	0.77(.14)	0.78(.12)	0.01(.13)			0.02(.12)		
IG	0.78(.14)	0.78(.14)	0.77(.13)	0.00(.09)	-0.08	0.93	-0.01(.10)	-0.23	0.47
AG	0.78(.14)	0.83(.10)	0.77(.12)	0.05(.14)	0.31	0.04	-0.01(.15)	-0.15	0.58
DG	0.74(.12)	0.80(.12)	0.80(.13)	0.06(.12)	0.38	0.03	0.06(.14)	0.31	0.06

\*Effects sizes (Cohen's *d*) were calculated based on the between group difference over time, in relation to the CG, divided by the pooled standard deviation across all groups, T1 and T2 or T1 and T3.

\*\*A value of  $p \leq 0.05$  indicates a significant difference in relation to the control group as evaluated by linear regression models.

## Costs

### *Program costs*

The IG included 90 home visits and 45 telephone contacts for a total time of 134 hours. The AG consisted of 48 group meetings for a total of 120 hours and the DG consisted of five group meetings for a total of 15 hours. A specification of intervention costs is shown in **Table 8**. For each participant, the average cost for the intervention was estimated to 166 € in the IG, 158 € in the AG and 30 € in the DG.

**Table 8.** Intervention Costs (€) for the Individual Intervention (IG), the Activity Group (AG) and the Discussion Group (DG)

Unit	IG (n=41)	AG (n=49)	DG (n=41)
Salaries*	6340	3547	887
Rented rooms	0	1431	128
Activities and material	261	1613	83
Travel participants	0	1153	144
Travel interveners	186	0	0
Total intervention costs	6787	7744	1242

\*Includes time for education, intervention and administration (documentation, planning).

### *Municipality costs*

Between baseline and 3 months, municipality costs had increased in the CG, IG and AG. In the DG, there were no municipality costs and in the IG and AG there was a tendency towards lower municipality costs in relation to the CG (**Table 9**). There were no significant differences in how municipality costs had changed between groups at 3 months ( $p \geq .13$ ) (**Table 10**).

At 12 months, municipality costs had increased in all groups. There was a tendency towards lower costs in the AG and DG compared to the CG. There were no significant differences in how municipality costs had changed between groups at 12 months ( $p \geq .07$ ).

### *Health care costs*

Between baseline and 3 months, there were differences in how health care costs changed (**Table 9**). For the AG and the DG, there was a tendency towards lower health care costs in relation to the CG and, for the DG, the difference was significant ( $p = .02$ ) (**Table 10**).

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Between baseline and 12 months, there was a tendency towards lower health-care costs for all intervention groups in relation to the CG, and for the DG, the difference was significant ( $p=.04$ ).

**Table 9.** Municipality Costs and Health Care Costs (€) at Baseline and Follow-ups For the Control Group (CG), the Individual Intervention (IG), the Activity Group (AG) and the Discussion Group (DG)

Costs	Baseline	<i>p</i> -value	3 months	<i>p</i> -value	12 months	<i>p</i> -value
Mean (SD)						
Municipality costs						
CG	0	n.a.	184 (1109)		132 (387)	
IG	0	n.a.	45 (157)	0.26	82 (351)	0.41
AG	0	n.a.	44 (176)	0.23	53 (204)	0.17
DG	0	n.a.	0	0.13	22 (88)	0.07
Health care costs						
CG	3207 (5143) <sup>a</sup>		1113 (2368)		4984 (13746)	
IG	2164 (3858) <sup>a</sup>	0.46	953 (2277)	0.69	2539 (4147)	0.18
AG	2984 (10646) <sup>a</sup>	0.87	555 (1769)	0.14	3336 (8346)	0.28
DG	1354 (2752) <sup>a</sup>	0.19	188 (280)	0.02	1234 (1868)	0.04

*P*-values indicates if differences were significantly different between each intervention group in relation to the CG, a  $p \leq 0.05$  was considered statistically significant. Between group differences were analyzed using linear regression models.

<sup>a</sup> Refers to the health care cost during the year before commencement of the trial.

### Total costs

Considering the total cost in each group (including the cost for interventions in the IG, AG and DG, respectively; municipality costs; and health care costs), the AG and DG showed a tendency towards lower health-care costs in relation to the CG. For the DG, the difference was significant ( $p=.02$ ) (**Table 10**). At 12 months, there was a tendency towards lower health-care costs for all intervention groups in relation to the CG, and for the DG, the difference was significant ( $p=.03$ ).

**Table 10.** Incremental QALYs and Costs (€) at 3 Months (T2) and 12 Months (T3) for the Individual Intervention (IG), the Activity Group (AG) and the Discussion Group (DG) in Relation to the Control Group (CG)

QALYs and Costs	(M)	Difference T1-T2		(M)	Difference T1-T3	
		95% CI	p-value		95% CI	p-value
QALYs gained						
IG	.000	-.006-.007	0.93	-.010	-.037-.017	0.47
AG	.006	.000-.012	0.04	-.007	-.033-.019	0.58
DG	.007	.000-.013	0.03	.027	-.001-.054	0.06
Municipality Cost						
IG	-145	-399-105	0.26	-51	-174-72	0.41
AG	-146	-385-93	0.23	-82	-199-36	0.17
DG	-191	-441-59	0.13	-114	-237-9	0.07
Health Care Cost						
IG	-166	-981-648	0.69	-2542	-6225-1141	0.18
AG	-580	-1358-199	0.14	-1932	-5452-1588	0.28
DG	-962	-1776- -147	0.02	-3953	-7636- -271	0.04
Total Cost						
IG	-139	-1064-787	0.77	-2421	-6139-1297	0.20
AG	-562	-1446-294	0.21	-1850	-5404-1704	0.31
DG	-1122	-2048- -196	0.02	-4036	-7754- -318	0.03

## Cost-effectiveness analysis

### *QALYs gained*

Based on differences in general health between baseline and 3 months, the incremental QALYs gained in relation to the CG were 0.006 in the AG ( $p=.04$ ) and 0.007 in the DG ( $p=.03$ ) (**Table 10**). The results for QALYs gained, municipality, health care and total costs, shown in **Table 10**, provide a basis for estimates of the cost effectiveness of each intervention.

The IG showed no effect on QALYs gained, and although the IG showed a tendency towards lower costs in relation to the CG, the differences were not significant. Therefore, we concluded that the IG was not cost effective.

The AG showed a significant effect on QALYs gained at 3 months and a tendency towards lower cost at both follow-ups, but these latter

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differences were not significant. Therefore, we concluded that the AG was potentially cost effective at 3 months, but not at 12 months.

The DG showed an effect on QALYs gained at 3 months that was significant, and at 12 months, the effect on QALYs gained approached significance. The DG showed significantly lower costs for health care and total costs at both follow-ups. Therefore, we concluded that the DG was the most cost-effective intervention at 3 months, with an incremental QALY gain of 0.007 and a total of 1100 € lower costs in relation to the CG. Furthermore, the DG was potentially cost effective at 12 months.

## Sensitivity analysis

Overall, the adjusted values for QALYs gained and costs followed a similar pattern as found for the unadjusted analyses, indicating that the regression model was stable. However, some adjusted values had an impact on the estimates of cost effectiveness and ICER. When QALYs gained at 3 months were adjusted for general health at baseline, the adjusted QALYs indicated that the AG was more effective than the DG, 0.007 versus 0.005 QALYs gained. In both AG and DG, the difference was significant in relation to the CG ( $p \leq .05$ ). When considering baseline costs, the adjusted analysis showed that the total cost in the AG was 394 € higher than in the DG. Considering the incremental total cost for the AG in relation to DG, the ICER was 197000 €/QALY gained. However, the difference in total costs for the AG in relation to the CG was not significant ( $p = .21$ ). If the estimate of ICER is based on the difference in intervention costs only, ICER was 64000 €/QALY gained for the AG.

## Study III

At baseline, there were no significant differences between groups regarding participant characteristics, diagnoses or HRQoL, **Table 11**. For ADL ability, two tasks were significantly different between groups. For the task *walk outside*, a larger proportion of participants in the intervention group rated a higher degree of difficulty at baseline,  $p = 0.02$ . For the task *wash body*, a larger proportion of participants in the control group reported more severe problems at baseline,  $p = 0.02$ , **Table 11**. For all other ADL tasks, there were no significant differences between groups,  $p \geq 0.22$ .

In the intervention group, intervention details, registered by the interveners, was available for 44 clients. On average, the intervention included three home visits for a total duration of 2 hours. The interventions were primarily compensatory; 60% received assistive devices and/or environmental adaptations. The most commonly used

## Results

strategies were graded activity and an encouraging approach. Graded activity included actions in which the therapist adjusted his or her level of support to the client and gradually altered or withdrew this support depending on the ability of the client. An encouraging approach included actions in which the therapist provided emotional support and reassurance so that the client should feel encouraged in performing different tasks.

**Table 11.** Participant Characteristics, Diagnoses and Outcomes in the Intervention Group and Control Group at Baseline

Characteristics	Intervention group <i>n</i> =55	Control group <i>n</i> =31	<i>p</i> -value
Gender, women <i>n</i> (%)	42 (76)	20 (65)	.18
Age, mean (range)	83 (68–97)	81 (65–91)	.12
Single living, <i>n</i> (%)	44 (82)	20 (65)	.07
Living in apartment, <i>n</i> (%)	42 (76)	23 (74)	.51
Basic education, <i>n</i> (%)	48 (87)	24 (77)	.19
Diagnoses	Intervention group <i>n</i> = 44	Control group <i>n</i> =31	.40
Injuries, <i>n</i> (%)	13 (30)	9 (29)	
Musculoskeletal diseases, <i>n</i> (%)	10 (23)	6 (19)	
Circulatory diseases, <i>n</i> (%)	5 (11)	8 (26)	
Other diagnoses*, <i>n</i> (%)	16 (36)	8 (26)	
Outcomes	Intervention Group <i>n</i> =55	Control Group <i>n</i> =31	
HRQoL, mean (SD)	0.24 (0.35)	0.22 (0.35)	.80
Walk outside			
Easily <i>n</i> (%)	12 (22)	12 (43)	.02
Slight difficulty <i>n</i> (%)	20 (36)	10 (36)	
Severe difficulty <i>n</i> (%)	8 (15)	3 (11)	
Unable <i>n</i> (%)	15 (27)	3 (11)	
Wash body			
Easily	14 (26)	5 (16)	.02
Slight difficulty	16 (29)	6 (19)	
Severe difficulty	10 (18)	2(7)	
Unable	15 (27)	18 (58)	

To evaluate baseline differences between groups, continuous variables were evaluated using student's *t*-tests; whereas, all other participant characteristics and diagnoses were evaluated using chi<sup>2</sup>-tests. ADL ability was evaluated using Mann Whitney *U*.

\* Other diagnoses include infectious diseases, neoplasms, blood and immunologic diseases, diseases related to the nervous system, diseases related to the respiratory system, diseases related to the digestive system and other non-classified symptoms.

## ADL

Between baseline and follow-up, participants in the intervention group improved significantly in 13 ADL tasks; whereas, participants in the



control group improved significantly in eight tasks. Both groups showed a significant improvement in transfer in bed, transfer from bed to chair, walk in and out of house, undress, dress lower body, put on socks and shoes, and wash body. For the tasks walking inside, walking outside, getting clothes from wardrobe, wash hair, combing hair and manicuring, only participants in the intervention group showed significant improvements. For the task dress upper trunk, only participants in the control group showed a significant improvement.

For ADL ability, two tasks were significantly different between groups at follow-up. For the task wash hands and face, a larger proportion of participants in the control group rated a higher degree of difficulty,  $p=0.02$ . For the task comb hair, a larger proportion of participants in the control group rated a higher degree of difficulty,  $p=0.05$ , **Table 12**. For all other ADL tasks, there were no significant differences,  $p \geq 0.13$ .

## Health related quality of life

At follow-up, both groups had the same EQ-5D score, 0.46, **Table 12**. HRQoL had improved significantly in both groups,  $p \leq 0.001$ . In the intervention group, HRQoL increased 0.20 ( $SD=0.24$ ), and in the control group, the HRQoL increased 0.26 ( $SD=0.36$ ). The difference in improved HRQoL between groups was not significant,  $p=0.38$  (CI -0.20–0.08).

**Table 12.** HRQoL and ADL Ability in the Intervention Group and Control Group at Follow-up in Study III

Outcomes at follow-up	Intervention group $n=47$	Control group $n=28$	$p$ -value
HRQoL, mean ( $SD$ )	0.46 (0.35)	0.46 (0.33)	.94
Wash hands and face			
Easily $n$ (%)	46 (98)	73 (82)	.02
Slight difficulty $n$ (%)	1 (2)	4 (14)	
Severe difficulty $n$ (%)	0	1 (4)	
Unable $n$ (%)	0	0	
Comb hair			
Easily	44 (94)	20 (77)	.05
Slight difficulty	1 (2)	5 (20)	
Severe difficulty	1 (2)	0	
Unable	1 (2)	1 (4)	

Self-rated health was evaluated using student's  $t$ -tests. ADL ability was evaluated using Mann Whitney  $U$ .

## Allocated home help

At follow-up, 16 (32%) of the participants in the intervention group were allocated home help with bathing compared to 21 (72%) in the control group,  $p \leq 0.001$ . The time allocated for home help with bathing between

baseline and follow-up was significantly different between groups,  $p \leq .001$ . In the intervention group, the allocated time was 113 minutes ( $SD=187$ ) compared to 779 minutes ( $SD=534$ ) in the control group. In the analysis of allocated home help, three potential confounding variables were identified based on a  $p \leq 0.10$  at baseline: single living, ability to walk outside and wash body. In **Table 13**, unadjusted and adjusted odds ratios are presented for the intervention group in relation to the control group. For all adjusted analyses, the Hosmer and Lemeshow test was non-significant,  $p \geq 0.12$ , indicating that the model estimates fit the data at an acceptable level (193). Two variables, walk outside and wash body, were significant in the adjusted analyses and were combined in a final adjusted model.

**Table 13.** Odds Ratio for Being Allocated Home Help at Follow-up For the Intervention Group in Relation to the Control Group

Analysis	Odds Ratio	95% CI
Unadjusted	0.18	0.07–0.49
Adjusted single living	0.18	0.07–0.51
Adjusted walk outside	0.07	0.01–0.31
Adjusted wash body	0.23	0.08–0.67
Adjusted walk outside+wash body	0.12	0.03–0.45

## Study IV

The increased probability of recovery from severe to moderate dependency had a positive effect on QALYs and societal costs over the entire period of 8 years, **Table 14**. Reflecting a one-time intervention effect during the first year, 17% in the intervention group had recovered to moderate dependency compared to 12% in the control group. Due to increased recovery during the first year, a larger proportion of the intervention group remained in more favorable health states compared to the no intervention group throughout the entire follow-up period. For example, after 2 years, 25% in the intervention group remained in the mild or moderate health state compared to 22% in the no intervention group. The initial effect on increased recovery also had an impact on the proportional mortality in each group. For example, at each year during the 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> years, there was a 1% higher probability for a transition to the state dead in the control group. In all, the initial intervention effect at 1 year had an impact on the accumulation of QALYS as well as reduced societal costs over all years.

## QALYs

The intervention resulted in 0.052 QALYs gained over 8 years in the main analysis and 0.026 QALYs gained in the sensitivity analysis, assuming a reduced intervention effect, **Table 14**.

## Costs

The intervention resulted in 2410 € lower societal costs over 8 years in the main analysis. In all sensitivity analyses, assuming a reduced intervention effect, higher intervention costs and a combination of a reduced intervention effect and higher intervention costs, the societal costs over 8 years were reduced, **Table 14**.

## Cost-effectiveness analysis

In both the main analysis and the sensitivity analysis, the intervention resulted in a larger accumulation of QALYs gained and lower costs compared to no intervention. The intervention was cost effective both in the short term and in the long term, and dominated no intervention both in the main analysis and all sensitivity analyses.

**Table 14.** QALYs and Costs (€) at 8 Years For One Person

Analysis	No intervention		Occupational therapy		Incremental	
	QALYs	Costs	QALYs	Costs	QALYs	Costs
Main analysis	2.211	94982	2.263	92572	0.052	-2410
Sensitivity analysis*						
Reduced intervention effect	2.211	94982	2.237	93837	0.026	-1145
Increased intervention cost	2.211	94982	2.263	92969	0.052	-2013
Combined sensitivity analysis	2.211	94982	2.237	94235	0.026	-747

\*Includes a reduced intervention effect (1.2 instead of 1.4) combined with an increased intervention cost (534 € instead of 125 €).

## DISCUSSION

Considering recent and expected demographic changes, the health and well-being of the growing number of older people is an important societal issue (1-3). In relation to this concern, a central assumption in this thesis is that occupational engagement is related to health and well-being among older people (10, 12, 49), and is an important component of successful aging (20, 24, 26, 33, 34). In our studies, we evaluated the effects of occupational therapy interventions on occupational engagement, self-rated health and cost effectiveness. This thesis provides important knowledge that can guide further research and the implementation of occupation-focused and occupation-based interventions for community-dwelling older people.

### Main findings

The results of the studies we implemented provide new knowledge about the effects and cost-effectiveness of occupation-focused and occupation-based interventions implemented for two groups of community-dwelling older people: independent-living, community-dwelling older people and older people with bathing disabilities. For independent-living, community-dwelling older people, reduced decline in leisure engagement and ADL ability, compared to a control group, can be seen as an indicator that occupation-focused, and to some extent, occupation-based, interventions promoted occupational engagement (study I). Furthermore, the interventions that were implemented in a group format (i.e., discussion group or activity group) positively affected self-rated health, and the one-session discussion group was cost effective (study II). For older persons with bathing disabilities, interventions focused on enhancing quality of task performance and independence in bathing did not affect ADL ability or self-rated health, but reduced the allocation of home help with bathing (study III). Furthermore, we could show, by modeling the long term progression between states of dependency, that an occupation-focused and occupation-based intervention implemented for older people with bathing disabilities resulted in QALY gains and reduced societal costs over 8 years, and, therefore, can be considered to be very cost effective (study IV). In the following sections, I will discuss some of the factors that are important when evaluating the effects and cost effectiveness of occupation-focused and occupation-based interventions.

## Promoting occupational engagement

In all studies in this thesis, the interventions were focused on occupational engagement, but which aspects of occupational engagement, and how they were specifically addressed varied between interventions. While all interventions in the RCT (studies I and II) had a general focus on occupational engagement, each intervention involved the use of a unique format, and included different “active ingredients” (80) to address issues of concern related to occupational engagement. Therefore, each intervention can be seen as an explanatory variable in relation to any identified intervention effects.

The design of the IG (studies I and II), supported by previous research (87), was guided by an occupation-focused program intended to identify specific occupations of concern that could be addressed during the intervention. However, only a few participants identified occupations of concern and set goals. Therefore, without further subgroup analyses, it is not possible to conclude if the effects seen for leisure engagement and ADL ability were specifically related to (i) the use of an individually tailored, goal-oriented approach, (ii) the occupation-focused or occupation-based components or (iii) both.

The design of both the AG and the DG sessions (studies I and II), also supported by previous research (195, 196), involved providing information about occupational engagement and provided for opportunities to discuss and share experiences related to occupational engagement with peers and the group leader. For example, within a supportive group context, participants shared everyday problems and solutions with others rather than deal with such issues alone (196). Previous research has suggested that an increased awareness of possible ways of dealing with everyday problems can serve as a key for the individual to implement health-promoting actions that involve changes in behavior and/or the environment (196). Such, health-promoting actions can be seen both from the perspective of optimizing physical functioning (23) (e.g., by daily walks) as well as in terms of proactive actions (20) (e.g., removing slippery rugs to avoid falls) (196). In contrast to the DG, the AG also included an occupation-based component. Although the potential benefits of engaging in occupation within a group context has been supported by previous research (195), our results did not provide evidence for any additional positive effects of the occupation-based component.

In study I, we used outcome measures of leisure engagement and ability to perform ADL tasks, two facets of occupational engagement found to be important for older people (77). While previous research has provided evidence of positive effects on self-rated health (84, 85, 88, 155), outcome

measures of occupational engagement often have not been included (84, 85, 155), or when they were (i.e., ADL), no positive effects were identified (88, 153, 156). In contrast, our outcome measures enabled us to evaluate changes in the variables the interventions were designed to affect (106), and were sufficiently sensitive to be able to detect effects for occupational engagement. Therefore, our results provided the first evidence that occupation-focused and occupation-based interventions were effective in reducing a decline occupational engagement. In addition, our results (study I) revealed higher effect sizes for ADL than have been reported earlier for similar interventions implemented for similar populations (88, 156). Finally, while some authors have argued that health-promoting interventions need to be multi-component to address the needs of older people, our findings indicated that a short term, occupation-focused intervention, delivered either in an individual or a group format, is sufficient to positively affect leisure engagement and ADL.

The interventions in the RCT (studies I and II) were not specifically designed to address only leisure engagement and ADL task performance. While leisure engagement and ADL task performance are facets of occupational engagement, it should be noted that other facets of this complex phenomena (occupational engagement) could also have been considered important to evaluate (106), for example occupational well-being (10) and occupational balance (197). I will discuss other components of occupational engagement in more detail later in the Discussion.

In study III, the interventions were focused on only one area of occupational engagement, performance of bathing-related tasks. It has been shown that older people may feel unsure about the extent to which their declining abilities are part of normal aging, and whether and how they can address their problems (198). Our intervention focused on supporting participants to regain their abilities and self-confidence in performing bathing-related tasks. In that process, the experience of actually performing tasks has been described as central, both as a means to regain the ability to perform a certain task, but also as a means to gain a sense of potential for development (199). The primary outcome we used to evaluate intervention effects included evaluation of performance of ADL tasks related to bathing. Thus, the outcome measure was directly linked to what the intervention was intended to affect (106). Despite this, our results provided limited evidence to conclude that the intervention was effective in improving ADL task performance. One factor limiting our possibility to identify differences between groups may have been related to a lack of sensitivity of the outcome measure used. We used selected activity domains of the ADL Taxonomy based on ordinal scores of perceived difficulty in performing bathing-related tasks. For an outcome measure used to evaluate ADL ability to be sensitive, it has been

highlighted that quality of task performance should be considered and linear measures are preferred to ordinal scores (117).

Another limitation related to evaluating performance of bathing-related tasks (study III) was that those parts of bathing that older people with bathing disabilities have reported as difficult (i.e., transfer into/from the bathing position) (100) were not included in the ADL Taxonomy. Because the “active ingredients” of the interventions were compensatory strategies and individually-tailored gradations in task challenge so as to progressively increase the older person’s ability and confidence in performing bathing-related tasks, it is likely that interventions also targeted transferring into/from the bathtub or shower. However, our data did not provide information to determine specifically which parts of bathing were addressed in the interventions. Therefore, to further improve the interpretation of future results, it would be important to gather more detailed information, not only concerning the type therapeutic strategies used during intervention, but also which parts of the bathing task performances were addressed. In addition, to further enhance the possibility of detecting intervention effects, future trials should consider the use of more sensitive outcome measures that are designed to evaluate all relevant parts of bathing or other tasks that are in focus for the planned interventions.

Even though our results indicated that the intervention group and control group were fairly similar concerning ADL task performance (study III), there were major differences between groups concerning the proportion of participants that were allocated home help at follow-up. More frequent improvements in ADL and self-rated health among those in the intervention group provided only limited evidence that the occupational therapy interventions were effective. Thus, our results are somewhat in contrast with other trials that have demonstrated that multi-professional occupation-based interventions have a positive impact on bathing ability (157, 168). Despite this finding, our results are in line with the findings of recent studies showing that a significantly larger proportion of older people who received an multi-professional occupation-focused intervention regained independence of home help in bathing compared to those who received no intervention (167, 168).

## Occupational engagement, health and well-being

A central assumption in occupational therapy is that occupational engagement has an impact on health and well-being (10, 12, 15). The results of study II provided evidence to support the assumption that occupation-focused and occupation-based interventions have an impact on self-rated health. Previous research has found that occupational engagement, in terms of leisure and ADL, were significantly related to

self-rated health (72). While leisure engagement has been found to be a stronger predictor of self-rated health than ADL engagement among very old people (72), it was somewhat surprising that the IG, which was the most effective intervention for reducing a decline in leisure engagement, did not result in improved self-rated health. For ADL ability at 3 months, the IG and DG resulted in a reduced decline compared to the CG, but only the AG and DG were effective in improving self-rated health. Our results do not provide evidence that supports a clear link between (i) leisure engagement and ADL ability and (ii) self-rated health. Therefore, despite identified positive effects on self-rated health, further research is needed to understand the link between occupational engagement and self-rated health among independent-living, community-dwelling older people approximately 80 years of age.

Those interventions that were implemented in a group format (study II) resulted in an effect on self-rated that exceeded a minimally important difference (187, 188), and in terms of Cohen's definitions, the effect size was small (137). Another way of examining the effects on self-rated health is in terms of QALYs. Even though a QALY gain of 0.007 may seem as an intuitively small effect, the results can be understood as an effect on self-rated health equal to 1 year in full health if the intervention had been implemented to approximately 140 persons. Our findings are in line with previous research that provided evidence that occupational therapy interventions that included a combination of engagement in occupation and the opportunity to discuss issues related to occupation in a group format or a combined group/individual format positively affected self-rated health (84, 89). However, our findings also indicated that a one-session, occupation-focused discussion group was sufficient to achieve a positive effect, suggesting that longer interventions are not needed.

In study III, we found no difference in ADL task performance between the intervention and control groups, but there were large differences in dependency on home care. Considering that older people value independence in PADL (78, 105), we expected that self-rated health would differ between groups, so it was surprising that there were no differences. Our results stand in contrast to other research indicating that level of dependency is important to self-rated health (177-179), and thereby also to the assumptions guiding the approximations of QALY scores for the Markov model (study IV). One possible explanation might be that although a large proportion of the participants in the intervention group were independent of home help for bathing, they experienced other limitations related to occupational engagement that had an impact on their self-rated health. This is an assumption that we could not investigate further based on the data we had available. However, considering once again that older people with bathing disabilities are at risk for disabilities in other ADLs (96, 101), it is reasonable to assume that other concerns



related to occupational engagement could have been present among the participants. For example, it has been shown that in the context of everyday rehabilitation, single-living older people who identified social contacts as an area where improvements were needed experienced that their needs remained unmet; whereas, needs related to self-care were addressed (164).

In study IV, the results provided evidence that an intervention that increased the probability of regaining independence of home help in bathing had positive effects on self-rated health over the entire period of follow-up. The use of QALYs, a combined measure of self-rated health and time, provided an opportunity to interpret the accumulated intervention effect on self-rated health. For example, the accumulation of 0.052 QALYs for the study period of 8 years (study IV) could be translated to an effect on self-rated health equal to 5 life years in full health if the intervention had been implemented with a cohort of 100 persons. Considering the use of a decision-modeling approach (study IV), where information from a range of sources is combined (21), the results should, however, be interpreted with caution (further discussed in the Methodological considerations section).

Because occupational engagement is a complex phenomenon, it is also relevant to consider other facets, beyond leisure engagement and ADL ability, that may be related to self-rated health, for example occupational balance (197) and occupational well-being (10). Occupational balance has been described as the individual's subjective experience of having the right amount of occupations and the right variation between occupations in his or her occupational pattern (56). Occupational balance can be viewed from the perspective of areas of occupation (e.g., leisure, sleep), from the perspective of occupations with different characteristics (e.g., physical, mental) and in relation to time use (e.g., sufficient time engaged in social occupations) (56). A recent study provided preliminary evidence to support a relationship between occupational balance and self-rated health (197). Therefore, occupational balance is one component of occupational engagement that could be considered as a focus when implementing interventions and included as a variable when evaluating intervention effects. A focus on occupational balance was, to various extents, included in some of the interventions in the RCT (studies I and II), but not specifically evaluated. In the AG, participants were encouraged to record in an activity diary which occupations they engaged in during 5 typical days (108). A recent study, based on diaries from some of the participants in our RCT, revealed that the participants spent most of their time engaged in a broad variety of meaningful occupations in which they were competent, and most of the time they reported that they were alone in their own homes (108). In the AG, the diary served as a pedagogic tool for reflections on whether or not the participants were

satisfied with their present levels and patterns of occupational engagement. By identifying areas of concern, potential life style changes could be discussed to enhance occupational engagement. In the program guiding the implementation of the intervention in the IG, the activity diary was suggested as a pedagogic tool to use in a similar way as in the AG. However, the diary was only used by a few participants in the IG.

Occupational well-being is another component of occupational engagement that could be the focus of an intervention as well as an outcome measure used to evaluate intervention effects (10). The experience of occupational well-being depends on the extent to which multiple occupational needs are met (10). However, which needs are most important for occupational well-being, and how these needs are best addressed through occupational therapy intervention remains unclear. Interventions that focus on enhanced occupational performance in a few prioritized occupations, (e.g., ADL) are likely to meet the person's needs related to accomplishment, agency and affirmation. However, since ADL only has a limited impact on self-rated health (72), other occupations (e.g., leisure) may also need to be considered to address occupational needs related to companionship, pleasure and renewal.

The methods used in this thesis did not allow us to focus on understanding the link between occupational engagement and health and well-being. However, such knowledge is needed to strengthen our theoretical base for guiding further development of interventions and outcomes (79). Based on the idea that the experience of health and well-being is related to a person's possibilities to meet occupational needs (10) or vital goals (49) through a balanced pattern of occupational engagement, it is reasonable that several components of occupational engagement need to be considered both in the design of interventions as well as in evaluations. To what extent an intervention focuses on those components that are subjectively important for a person's occupational engagement, and how the specific design provides opportunities to address and evaluate those components is an area for further research.

### Matching the intervention design to the population needs

Another important factor when focusing on the effectiveness of interventions is to define the population (80). In this thesis, the identification of populations at risk for restrictions in occupational engagement was framed from the context of occupational transitions. In the following section, I will discuss issues that are related to the design and implementation of interventions because it is reasonable to assume that the effectiveness of an intervention is dependent on how well the

intervention matches the needs of the population for whom it is implemented (79).

In studies I and II, our decision to focus on independent-living, community-dwelling older people around 80 years was guided by previous research indicating that this group was at risk for restrictions in occupational engagement (61, 96, 200) and, therefore, could benefit from occupation-focused health promotion. Baseline data for the participants in studies I and II showed that, despite common health concerns related to impairments, most participants rated their health as good and were engaged in a variety of occupations. However, even over a short period of time (i.e., 3 months), we identified a decline in both leisure engagement and ADL ability. This finding indicates that the participants were in a phase of occupational transition, and that our inclusion criteria enabled us to identify a group of community-dwelling older people likely to benefit from occupation-focused health promotion.

When designing the AG and the DG (studies I and II), we considered previous research that has supported the implementation of occupation-focused, and to some extent occupation-based, health promotion implemented in a group format (84, 85). The DG was only occupation-focused; whereas, the AG also included occupation-based components. The inclusion of occupation-based intervention components in the AG was based on the premise that engagement in occupation within a group context can serve as a source for reflection (195), and thereby enable the participants to take actions to enhance their occupational engagement.

We also considered that for an intervention to be feasible and acceptable for participants (studies I and II) (132), length and intensity of the intervention are important factors to consider. In contrast to previous occupation-focused health promotion studies that were implemented over 6 months or more (84, 85, 88, 155), a recent Swedish trial provided evidence that health promotion implemented as a single home visit or four senior meetings was sufficient to yield positive effects (95). In both the AG and the DG, at least 90% participated in the intervention. In the AG, however, attendance rates dropped in relation to the increased number of sessions, and most participants did not attend all sessions, indicating that eight sessions might have required too much time commitment. When comparing the results for the AG and the DG, we concluded that the DG resulted in more positive outcomes than did the AG, indicating that a one-session occupation-focused discussion group seemed to be sufficient to positively affect occupational engagement and self-rated health for independent-living, community-dwelling older people.

When designing of the IG (studies I and II), we considered previous research that has supported the implementation of occupation-focused, individually-tailored interventions (87, 157). However, since few participants in the IG actually identified occupations of concern, it is possible that most participants were satisfied with their current levels of occupational engagement and did not find the content of the intervention relevant for their needs. The limited attendance in the AG sessions and the limited number of identified occupations of concern in the IG are potential problems in terms of treatment fidelity (201), and it could be questioned how well the design of those interventions actually matched the needs of the targeted population. Lack of treatment fidelity may also have had an impact on the possibility of detecting intervention effects because not all participants received the planned intervention (201). However, based on the data available, we are unable to determine whether or not the intervention effects we identified were affected by a lack of treatment fidelity.

Furthermore, we implemented interventions either in a group format or an individual format (studies I and II); previous researchers implemented occupation-focused health promotion in a combined group/individual format (88, 89). Even though our results provided evidence to support the effectiveness of both individual and group interventions, further research is needed. For example, the use of qualitative methods (132) may be indicated to explore feasibility and how an intervention can be optimally designed (e.g., individual, group or combined individual/group; occupation-based and/or occupation-focused) to address components of occupational engagement that contribute to health and well-being among older people. Moreover, a group-based format might be more suitable to address occupational needs related to affirmation and companionship (10, 196); whereas, an individual format might be more suitable to address occupational needs related to accomplishment.

For the participants in study III, recruitment was based on their applications for home help with bathing. If it was the case that the participants only experienced needs related to bathing, there was a clear link between the focus of the intervention and the needs in the population. If, however, the participants in study III are considered from the perspective of being in a phase of an occupational transition, engagement in occupations beyond bathing most likely were also areas of concern. That is, older people with bathing disabilities are also at risk for disabilities in other ADLs (96, 101), indicating that interventions need to be designed to address concerns related to occupational engagement beyond bathing. For example, Naik et al. (100) found that fear of falling and problems with balance were common problems for older people experiencing bathing disabilities. Such problems are likely to have an impact on other occupations (e.g., cooking, walking inside and outside the

home), potentially restricting occupational engagement. Therefore, I propose that when considering implementation of occupation-focused and occupation-based interventions for older people with bathing disabilities, the scope of the interventions should extend beyond bathing, and potential concerns related to occupational engagement should be identified by the implementation of a client-centered process that enables the participants to identify all occupations of concern.

The intervention cost had a relatively small impact on overall cost effectiveness (study IV). In contrast, the intervention effect was found to be the most influential factor on cost effectiveness, and any refinement of the intervention design that leads to improved intervention effects is also likely to further enhance cost effectiveness. For example, by refining the intervention procedures based on the theory of occupational well-being (10), the effects on self-rated health could be improved, leading to larger QALY gains. Another refinement, potentially extending effect sizes identified at 3 months (**Table 4**), could be that the intervention included additional follow ups after 3 months to ensure that participants maintained their ability in performing bathing-related tasks in a safe and independent manner.

### Promoting successful aging through occupational engagement

I have suggested that occupational engagement is one important facet of the concept of successful aging, and is central to the experience of successful aging (32). Active engagement in life, as defined by Rowe and Khan (26), concerns interpersonal relations and productive activity (i.e., reimbursed or non-reimbursed activities yielding a societal value). The interventions that were evaluated in this thesis focused to varying extents on active engagement in life and the results indicated that occupation-focused and occupation-based interventions can positively affect successful aging.

Our results provided the first evidence that occupation-focused and occupation-based interventions had small, positive effects on reducing a decline in leisure engagement and ADL ability. Based on recent qualitative studies that showed that health-promoting interventions strengthen older people in a process of making conscious choices and implementing actions concerning health-related concerns (196, 202), we can assume that similar processes may explain the impact our interventions had on occupational engagement. However, precisely how these effects were manifested in the everyday life of our participant's is not known and, therefore, requires further investigation.

Based on our results, it is not possible to conclude to what extent the interventions had an impact on successful aging. However, since it has been shown that difficulty in performing ADLs is related to an increased risk for the development of dependency in ADLs (203), our results showing a reduced decline in ADL ability (study I) were promising. Disability is clearly a potential threat to successful aging, both based on objective criteria as well as subjective experiences (31), and interventions are, therefore, needed to reduce the risk for disability. To verify if occupation-focused health promotion has an impact on disability, follow-up evaluations over a longer time period are needed.

Even though the minimization of disability is a reasonable focus for interventions that are implemented to promote successful aging, other perspectives also are important. When considering disengagement (41) and gerotranscendence (42), a narrow focus on occupational performance is not sufficient to promote successful aging. It recently was suggested that several theories are needed to understand the development of occupational engagement during old age (44), both in terms of maintaining occupational engagement, and in terms of a transformed pattern of occupational engagement. While older people may encounter different challenges to occupational engagement, it is of central importance how the individual responds to such challenges (33). For example, the design of the interventions in the RCT (studies I and II) included a focus on whether and how older people could respond to age-related challenges in order to maintain or improve occupational engagement. Although the interventions were not formally guided by the Comprehensive Preventive Corrective Proactive (PCP) model (20) or the Selection, Optimization, Compensation (SOC) model (23), these models could be used to strengthen the theoretical base in further refinements of our interventions. For example, Kahana et al. (20) suggested planning for the future (e.g., engaging in new occupations, social engagements, moving to an accessible house) as an important forward-looking strategy. Baltes and Smith (24) described the importance of identifying and selecting “smaller territories” for occupational engagement, in which optimization and compensation become important for maintaining a similar intensity of occupational engagement as compared to the past. To support older people in identifying such “territories”, it is reasonable that occupation-focused health promotion should address issues that are related to, for example, which occupations and which social engagements are important for the individual. Furthermore, interventions need to include strategies that best support older people to optimize occupational engagement even in the presence of disability (35).

The intervention in study III focused on the safe and independent performance of bathing-related tasks and the results provided evidence that the intervention positively affected independence of home help for

bathing. Older people value independence in PADLs (78, 105), and dependency in PADLs has a large impact on societal costs (143). Therefore, independence of home help for bathing clearly has a societal value in terms of both QALYs and societal costs (study IV). In relation to successful aging, the intervention can be seen as effective in promoting independence of home help for bathing. It should be noted, however, that we cannot conclude (based on our available data) that participants were independent of informal help for bathing or that they were not dependent on home help for other tasks. Future research could consider evaluating changes in need for assistance related to other tasks, ones not directly targeted during the intervention.

In addition, there are also other aspects of successful aging that are not immediately related to occupational engagement, such as low probability of disease, high cognitive and physical functional capacity, longevity, life satisfaction/well-being and finances (27). To what extent older people consider these important varies. For example, in a study by Phelan et al. (31), freedom of chronic disease and ability to care for oneself were considered very important by most participants; whereas, longevity was considered less important. There is, however, evidence indicating that occupational engagement may affect some of these factors. For example it has been shown that an active lifestyle reduces the risk for stroke (63), dementia (62) and mortality (68), and has a positive impact on cognitive functioning (62). While engagement in a variety of occupations seems to reduce the probability for disease (66), it is beyond the scope of this thesis to further elaborate the pathways by which occupational engagement may have an impact on other factors of successful aging.

Finally, successful aging, may be a hard-to-reach goal, based on strict definitions (30, 31), but can serve as a framework for identifying components that can be addressed to enhance functioning through the implementation of occupation-based and/or occupation-focused interventions (204). The promotion of successful aging is in line with international health care policies (2, 3), and our results showed that occupation-focused and occupation-based interventions can promote some aspects of successful aging in a cost-effective manner.

## Methodological considerations

In the process of developing, evaluating, refining and implementing interventions, a variety of different research methods must be used (79), and some of those have been applied in this thesis. Each study involved many different considerations related to methodology and some of these will be discussed below.

## Study designs

The studies in this thesis were based on three different designs. Each had its own advantages and disadvantages related to (i) the knowledge gained and (ii) how that knowledge can be generalized and used to guide further research in order to make decisions related to implementing interventions in practice.

### *Randomized controlled design*

An RCT is considered the most powerful research design for evaluating the efficacy of different interventions (81, 136). Since we evaluated new occupation-focused and occupation-based interventions using relatively new outcome measures (studies I and II), there was not sufficient knowledge (e.g., effect size) to ethically justify and practically design a full scale trial (79). Instead, we implemented an exploratory RCT to identify effect sizes for leisure engagement and ADL. Even though it was not a primary goal, our results also showed between group differences that were significant ( $p \leq 0.05$ ) as well as tendencies towards significance (**Tables 7 and 10**).

### *Quasi-experimental design*

Although a quasi-experimental designs lack the rigor of an RCT, such designs offer some advantages. The study III trial was conducted in ordinary clinical settings, with very small external resources. This design, therefore, represented a feasible approach for conducting clinical trials. Even though recruitment was conducted in close collaboration with local care managers in two municipalities, we lacked information needed to determine if all potentially eligible persons were invited to the trial. However, our results, related to allocated home help at follow-up, are in line with findings from other trials that implemented similar interventions for similar populations (168). This indicates that our results were likely externally valid and can be generalized to similar populations in other municipalities.

### *Decision modeling*

Decision modeling provides a framework for combining evidence from a range of sources (21). Issues related to both internal and external validity are important for the interpretation and generalizability of the results (21). Internal validity pertains to the input parameters used in the model (e.g., intervention effects, transitions probabilities, costs). Ideally, the estimates of intervention effects should be based on several RCTs. For our purpose (study IV), there were only a few conducted trials, but the results



from those showed similar trends regarding the magnitude of intervention effects (**Table 4**). Transition probabilities were based on a Canadian study and recalculated to fit our five state model. Contextual factors may have an impact on how older people transition between states of dependency/independence and, therefore, further research is needed to establish valid transition probabilities for the specific population they are intended to represent.

Any modeling approach is a simplification of a real-world scenario, and external validity pertains to the fit between the model and the real world (205). Based on previous research on the progression of disability and dependency (96, 100), and our close collaboration with local care managers in developing the Markov model, we consider our model to be externally valid. However, further research is needed to validate the model, for example, by comparing real world mortality rates with mortality rates in the model. If the model accurately reflected a real world scenario, mortality rates should be similar. A limitation of the model was that a complete representation of transitions between states of dependency/independence should have included a non-dependent state. However, for the purpose of our study, the inclusion of a non-dependent state would not have added vital information for the estimate of cost effectiveness.

## Evaluation of intervention effects

In order to establish the effectiveness of an intervention and interpret the clinical relevance, different statistical methods provide complimentary information. Each way of displaying intervention effects have their strengths and their limitations; some are discussed below.

### *Significance testing*

For none of the trials in this thesis was an estimate of the required sample size made in advance. That is, no trial was designed to be adequately powered to detect significant differences between groups and, therefore, the possibility to draw conclusions concerning the probabilities of differences are limited (206). Lack of power can lead to a type II error (i.e., falsely concluding that no difference exists when in fact there is a difference) (193, 206). Given the strong tradition significance testing has in research, I will discuss three factors that can impact on the likelihood of identifying significant differences.

First (and most important), the intervention must produce an effect, and secondly, for the identification of an effect, outcome measures need to be sufficiently sensitive. For example, for ADL ability, the results from study

I indicated that the intervention had an effect and that our measures were sensitive enough to detect differences between groups. In contrast, the results from study III indicated that the intervention had no effect on ADL ability and/or that the evaluation of ADL ability, based on ordinal scores, was not sufficiently sensitive to detect an effect. The third factor that has an impact on identifying significant differences is the sample size (193, 206). With a sufficiently large sample, the likelihood of identifying a significant difference increases, even though the effect itself may be small (206). Therefore, the reporting of  $p$ -values provides information to conclude only whether or not there was a significant difference, but is not sufficient to interpret the magnitude of intervention effect. Therefore,  $p$ -values should be complemented by estimates of effect sizes (81).

### *Interpretation of intervention effects*

An effect can be described in relation to the phenomenon of interest in a study, and the “amount of change” in that phenomenon (i.e., magnitude of intervention effect) is the effect size (138). In this thesis, different types of effect sizes (e.g., standardized, units-free, original units) were used to evaluate the magnitude of intervention effects (138). Even though effect sizes provide information about the magnitude of intervention effects, such information needs to be interpreted in relation to the population under study in order to interpret the clinical relevance of the findings.

In studies I and II, we used relatively new outcome measures of leisure engagement and ADL ability, and no reference values existed to allow for interpretations of the clinical relevance in original units (e.g., ADL ability measure). Instead, we used Cohen's  $d$  (standardized effect size) to evaluate the magnitude of intervention effects; all effect sizes were small. When using Cohen's  $d$ , it must be noted that the terms small, medium and large do not provide information that immediately can be translated to determine the clinical relevance of an effect (138). The value of  $d$  depends on the difference between groups (e.g., which will be higher if the outcome measures are more sensitive) and the standard deviation ( $SD$ ) (which will be smaller if the sample is homogeneous). For example, in a sample with very strict inclusion criteria, the variation between individuals will be limited and the  $SD$  will be smaller than in a sample with less strict inclusion criteria. Based on the equation for Cohen's  $d$  (mean difference/ $SD=d$ ), it is clear that a smaller denominator ( $SD$ ) results in a larger  $d$ . Given the population under study, independent-living, community-dwelling older people, even a small reduction in decline is a positive outcome, even though we could not precisely translate how the identified intervention effects were translated to the everyday lives of the participants.

An alternative strategy to display an intervention effect is to consider clinically minimal important difference (CMID) (187). For general health in study II, previous research provided information about the CMID, indicating that both group interventions resulted in effects that exceeded a CMID (187, 188).

In study III, the time allocated for home help is another example of effect size displayed in original units. In addition, the proportion of participants that were allocated home help with bathing at follow-up represents a units-free intervention effect. While presented as proportions in study III, another approach, used in study IV, was to calculate relative risk (units-free) (193). The relative risk was implemented in the Markov model in terms of an increased probability for recovery from severe to moderate dependency.

An estimate of cost effectiveness (original units) (II and IV) can be seen as another measure of effect size. For an intervention that resulted in additional effects as well as additional costs, the standard procedure is to calculate ICER. ICER can be interpreted in relation to established thresholds (192), indicating a low, moderate or high cost/QALY gained. This allows for interpretations of whether or not an intervention can be considered to be an efficient use of resources (140). For an intervention that leads to additional effects and lower costs (studies II and IV), the intervention was definitely cost effective and a calculation of ICER was not relevant.

In all, the different types of effect sizes applied in this thesis contributed to the knowledge base needed to interpret intervention effectiveness. An estimate of effect size is also an important component when calculating the sample size needed to adequately power a full scale RCT (193).

## Outcomes and analysis

Considering that leisure engagement is an important factor for health and well-being among older people (72, 73), a strength in the design of study I was to include leisure engagement as an outcome. Furthermore, and in contrast to previous research (114), we consider it to be a strength that our measures for both leisure engagement and ADL ability were sensitive enough to capture changes. Although initial validation of the leisure engagement measure had been done, further research is needed to explore the composition of construct of leisure engagement as evaluated in study I. We included a composite of the performance, motivation and importance for well-being ratings which may have enhanced its psychometric qualities, including sensitivity, in contrast to previously used composites based only on performance and motivation (72).

In study I and II, linear regression was chosen to evaluate if there were significant differences between each group and the control group. At baseline, there were no significant differences between groups in demographic characteristics, outcomes or health care costs during the previous year (**Tables 6, 7 and 9**), indicating that the randomization procedures ensured the groups were equal and supporting the implementation of unadjusted analyses. Whether or not the evaluation of significant baseline differences or adjusting for potential baseline differences in an RCT are needed is a topic for ongoing debate (207). The CONSORT statement, however, clearly does not recommend tests of baseline differences (81).

To allow for an intention-to-treat analysis (ITT), as suggested in the CONSORT statement (81), we imputed data when data were missing for studies I and II. Since we expected that the participants were at risk for a general decline in functioning, potentially affecting all outcomes, we used single imputations based on the mean change between two assessments (190). A similar approach was used in a recent Swedish trial (95). Considering that our sample demonstrated a decline in leisure engagement and ADL ability, our choice of imputation method was based on a logical assumption and was unlikely to have biased the results (190).

In study II, a limitation related to the estimates of health care costs was the use of a 12-month recall period. It has been shown that costs are likely to be underestimated based on such a long recall period, but since cost estimates were based on the same procedures in all groups, this methodological concern should have had no effect on differences between groups and our final conclusions (208). Moreover, our baseline data were to some extent validated by the same data we used in study IV (143). At baseline, the average cost for health care during the previous year for the entire sample (II) was 2600 €, which is fairly similar to the estimated cost for the state mild dependency, 2800 € (IV). Another limitation in study II was that only the costs for intervention, municipality and health care costs were included, and that no costs were included for informal care.

In study III we used selected activity domains of the ADL Taxonomy, an instrument that has been shown to be reliable and valid for evaluations of older people (111). However, we did not identify differences between the two groups under study at follow-up. One possible reason may have been that the intervention did not have an effect. Another possible reason is that the instrument was not sufficiently sensitive to detect differences because the data were ordinal (117) and only covered a few bathing-related tasks. The EQ-5D also is considered a sensitive outcome measure, but we did not identify differences between groups. A possible threat to the validity of baseline data was that data were collected up to 2 weeks after the time point when the participants were included in the study.

Thus, it is possible that interventions already had been implemented, causing a potential bias in the baseline data and the inability to identify differences between follow-ups. Baseline differences between groups could, in turn, have impacted on the allocation of home help at follow-up and, therefore, we implemented adjusted analyses based on potential confounding variables. The adjusted analyses revealed differences in the OR, but did not change the overall interpretation of the results.

In study IV, the estimate of cost effectiveness was dependent on several of the input parameters. For estimates of self-rated health, a common challenge in modeling studies is the identification of QoL scores for health states (205). Because of a lack of data from the specific population under investigation, we collected data from different sources to establish reasonable estimates. The QoL score for each health state (i.e., higher QoL scores for less dependent states) reflected the belief that independence in ADL is important for QoL among older people (179) and that loss of independence has a negative effect on QoL (209). The uncertainty surrounding the estimates of QoL scores in this study did not affect the overall results. That is, as long as the QoL scores are associated with levels of dependency, the intervention would result in QALY gains relative to no intervention and not have an impact on the cost-effectiveness since the intervention resulted in savings in all analyses. If, however, the intervention had led to incremental costs, the QoL scores could have an impact on ICER.

Estimates of costs (IV) were based on a Swedish study and for the state severe dependency we used the costs associated with dependency in one PADL and two to four IADLs (143). An alternative would have been to use the cost associated with dependency in one ADL and more than five IADLs, a cost twice as high as the cost we used and five times as high as the cost associated with the state moderate dependency. We choose the more conservative cost estimate to avoid inflation of the intervention effect in terms of cost savings. However, it remains clear that recovering from dependency or maintaining independence in ADL has a substantial impact on societal costs (143). In contrast to other studies, within the context of everyday rehabilitation (166, 169), a strength in our model is that societal costs also included the cost for informal care. It has been demonstrated that informal care constitutes a large proportion of the help and supervision provided for older people with disabilities (210).

## Future research

The results of this thesis provide evidence that occupation-focused and occupation-based interventions implemented for community-dwelling older people resulted in positive effects on outcomes related to occupational engagement and that they were cost-effective. The

development and evaluation of interventions can be described as a series of well-defined phases (79), but in reality, these phases cannot be strictly separated. Thus, the long term development and refinement of interventions may be regarded as an ongoing development-evaluation-implementation process (132). In order to further understand under what circumstances an intervention is effective, and what interventions will be effective when implemented in clinical practice, are concerns that will require ongoing research and monitoring. For example, which types of interventions (e.g., focus, format, content), for which populations and which outcomes best capture the effects of those interventions are among the issues that still need to be addressed both in research and practice. There are several other potential areas of further research and I will now highlight some of them.

In this thesis, only two facets of occupational engagement were considered, leisure engagement and ADL ability. Further research needs to consider other facets of occupational engagement (e.g., occupational balance, occupational well-being). A broader focus on occupational engagement pertains to both the content of interventions as well as the outcome measures used to evaluate intervention effects. The consideration of multiple aspects of occupational engagement may lead to an increased understanding of the link between (i) occupational engagement and (ii) health and well-being.

The results from study I and II provided evidence that occupation-focused and, to some extent, occupation-based health promotion implemented for independent-living, community-dwelling older people resulted in positive effects. Further research is needed to refine and identify the most feasible intervention format (i.e., individual, group or combined individual/group format). There is also a need to further explore the differential effects of interventions that are occupation-focused compared to interventions that also include occupation-based components. Full scale RCTs will then be needed to confirm the efficacy of the interventions and evaluate effectiveness in clinical and societal contexts.

Even though cost-effectiveness of the interventions in both studies II and IV could be established, further evaluations of cost-effectiveness are needed to confirm our results. Given that cost data often are skewed, and that there is great variation of health care use in a population, it is common that RCTs, powered to identify differences in primary outcomes, fail to identify differences related to costs (7). Therefore, in the design of full scale trials conducted to establish cost effectiveness, it will be important that power calculations are made not only based on the expected effects on primary outcomes, but also on clinically relevant differences in costs (211, 212). Furthermore, evaluations of cost effectiveness of occupation-focused and occupation-based interventions

should include a sufficient follow-up time frame to capture all relevant long term effects both in terms of QALYs as well as in terms of societal costs.

For older people with bathing disabilities, clinical trials are needed to validate or refute our results based on the modeling approach we used in study IV. An additional application of decision modeling is also worth mentioning. Although not a purpose of our study, decision modeling can be used to identify components in a study that could be improved before a large scale study is implemented (213). For example, in study IV, the results showed that the intervention cost had a very small impact on cost effectiveness while the intervention effect had a larger impact. To further enhance intervention procedures, intervention effects and potentially also cost effectiveness, decision modeling can be used, for example, to identify the possible benefits of implementing interventions at different states, and to estimate the cost-effectiveness of an expanded intervention with a larger effect.

## Implications for practice

The promotion of occupational engagement has a potential impact on successful aging, health and well-being among older people and, therefore, from a societal perspective, there is a need to consider the implementation of occupation-focused and occupation-based interventions in practice. In Sweden, the implementation of occupation-focused and occupation-based interventions for community-dwelling older people are most commonly observed in primary care or municipality care, two contexts in which occupational therapists work with older people. However, occupation-focused health promotion extends beyond traditional health care settings, and may include collaboration with different organizations that are involved in actions that are focused on health and well-being among older people (99). The results from this thesis provide new knowledge that can be used to further develop occupational therapy, health promotion and everyday rehabilitation for community-dwelling older people, both in traditional settings, but also in new arenas or in collaboration with other organizations. I will discuss some possibilities below.

This thesis focused on two groups of community-dwelling older people. Older people who experience activity limitations and are at risk of losing their independence in ADL (e.g., study III and IV) is a group of clients that today is identified, for example, in primary or municipality care. However, to what extent existing interventions address problems related to their occupational engagement is not known. Even though the results from study IV provided evidence to support the cost effectiveness of the

intervention, there remains a need to consider how intervention procedures could be refined to address other areas of occupational engagement beside occupational performance. Refinement of intervention procedures has the potential to further enhance intervention effects and cost effectiveness. Considering the impact of dependency on both self-rated health and societal cost, these should be considered as important areas for further research and practice, especially within the context of everyday rehabilitation

Independent-living, community-dwelling older people around 80 years is a group less likely to be identified within traditional health care settings, since most people in this group manage daily life without the need for external support. However, at this age, people are at increased risk for experiencing challenges to their occupational engagement, indicating a need for occupation-focused health promotion. The results from studies I and II indicated that this group of older people should be considered a new target group for occupation-focused health promotion. However, in which context occupation-focused health promotion is to be implemented is a topic for further discussion. For example, occupation-focused health promotion could be implemented in collaboration with voluntary organizations in the community. Another example is for a municipality to provide occupation-focused health promotion on the first occasion older people apply for municipality-based services as to promote occupational engagement.

In addition to the specific knowledge gained from each study, I also included reflections in this thesis concerning the relationships between (i) occupational engagement and (ii) health and well-being. It was beyond the scope of this thesis to investigate the link between them, but based on our results, there seems to be factors other than leisure engagement, ADL and independence of home help that influence self-rated health. Therefore, there is a need to better understand which facets of occupational engagement are important for health and well-being among those clients who receive occupational therapy. If occupational therapy follows a client-centered perspective, there is a need to focus on those areas of occupational engagement that are subjectively important, design interventions in a manner that have the potential to address concerns related to occupational engagement and use outcome measures that provide the information needed to determine if the interventions were effective. These issues are equally relevant to clinical practice; each occupational therapist can take these same factors into consideration when designing individualized intervention programs for their clients and when evaluating outcomes.

Finally, this thesis also provided knowledge for decision makers. The implementation of occupation-focused and occupation-based



## Discussion

interventions for community-dwelling older people is cost-effective, supporting the efficient use of resources in the promotion of occupational engagement, health and well-being for community-dwelling older people.

## CONCLUSIONS

Based on the studies in this thesis, the following conclusions can be drawn:

- For independent-living, community-dwelling older people, our findings provided evidence that occupation-focused and occupation-based interventions, delivered either in an individual format or two different group formats, resulted in small positive effects on occupational engagement and self-rated health, and that they were potentially cost effective in relation to a control group (studies I and II).
- An individually implemented intervention resulted in a small effect on reducing a decline in leisure engagement in the long term and a small effect on reducing a decline in ADL both in the short and long term, but this intervention was not cost effective (studies I and II).
- An eight-session activity group resulted in a small effect on reducing a decline in ADL in the long term, improved self-rated health in the short term and was potentially cost effective in the short term (studies I and II).
- A one-session discussion group resulted in a small effect on reducing a decline in leisure engagement in the short term and a small effect on reducing a decline in ADL both in the short and long term, improved self-rated health both in the short and long term, and was cost effective in the short term and potentially cost effective in the long term (studies I and II). A one-session discussion group was the most cost-effective intervention.
- For older people with bathing disabilities, our findings provided no evidence that an occupation-focused and occupation-based intervention had an effect on ADL ability or self-rated health, although there were more frequent improvements in ADL tasks in the intervention group. Furthermore, there were large differences in the number of participants that were allocated home help for bathing, indicating that the intervention was effective in reducing dependency of home help for bathing (study III).
- Based on a modeling approach, we found that an occupation-focused and occupation-based intervention that increased the probability of being independent of home help for bathing resulted in QALY gains and reduced societal cost over 8 years and the intervention could be considered very cost-effective (study IV).

## ACKNOWLEDGEMENTS

Engagement in writing a thesis is a process that would have been impossible without the support from a net of important persons.

First, I would like to thank all persons (more than 310) who participated in our studies, all occupational therapists who were involved in collecting data and implementing interventions for study I and II, all occupational therapists and all local care managers involved in study III. Without you, we had not been able to conduct the research on which this thesis is built. Thank you so much!

My main supervisor Ingeborg Nilsson. You have guided me through these years as a PhD student in a great way. You have broadened my perspectives as an occupational therapist and I feel inspired to learn more. I have always felt your support and belief in what I have been doing and I especially admire your courage for supporting me in our last study, in which we implemented a method, completely new within our field.

My supervisor Anne Fisher. You have challenged me to be thorough in my work and I would never have pushed myself as hard without your constructive criticism. I admire your continuous engagement both at a professional and at a personal level.

My supervisor Lars Lindholm. You have introduced me to the world of health economics, I have learnt a lot and I am interested in learning more. I have appreciated your encouraging way of providing support, especially during the last year of my period as a doctoral student.

Birgitta Bernspång, for introducing me to occupational therapy research and providing inspiration and support during my first study.

My co-authors, Joacim Rocklöv, Klas Göran Sahlén and Fredrik Norström for constructive collaboration in conducting some of the trials in my thesis.

My fellow PhD students within occupational therapy and physiotherapy, especially Marine Sturesson, Ellinor Larsson, Maria Sperens and Caroline Fischl for constructive discussions and good collaboration, and my roommate Eva Tengman for nice company at the office and providing great support with a multitude of issues in my research process.

Brigitte Gantschnig, for being a great friend and a colleague. It would not have been as fun without you.

## Acknowledgements

All other colleagues and staff at the department for community medicine and rehabilitation in Umeå, especially Christina Lindström and Larry Fredriksson, for helping out with unexpected emergencies.

To research colleagues throughout Sweden, for inspiring discussions on research and development of occupational therapy.

I would also like to mention Maritha Markusson, Bodil Evertsson and Nils Erik Ness for great discussions on the development of health promotion and everyday rehabilitation for older people in the Nordic countries.

To my occupational therapy and physiotherapy colleagues in Östersund for your continuous engagement in developing high quality services for the population in our municipality.

I would also like to thank my friends for support, inspiration and fun. Especially Gunilla Norling, Peter Jonsson and Anders Olofsson for being wonderful friends. To Mats Larsson, Anders Sandberg, Mattias Forssén and Kristoffer Kvarnlöf, for nice outdoor experiences and your friendship. Åsa-Sara, Johan and Rebecca Sernheim for your warm company. Some friends were not given the chance to stay with us and had to leave far too early. Maria, you were a great friend and inspired me by following your dreams.

To my parents, Barbro and Carl-Olof, for supporting me throughout my life in what I have been doing.

Last and most important my sons, Viggo, Max and Atle, I love you with all my heart, and my wife Elsiné, thank you for everything, I love you.

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Financial support has been provided by grants from The Swedish Council for Working Life and Social Research, no 2009-1300, the Unit for Research and Development, Association of Local Authorities in the county of Jämtland, the Maria Hammelin Ohlsson fund, Swedish Association of Occupational Therapists and by the Graduate School in Population Dynamics and Public Policy, Umeå University.

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