

DEPARTMENT OF NEUROBIOLOGY CARE SCIENCES AND  
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**TECHNOLOGY USE AMONG OLDER  
ADULTS WITH AND WITHOUT COGNITIVE  
IMPAIRMENT: EXPLORING RELATIONS  
WITH DAILY LIFE OCCUPATIONS AND  
NEED OF SUPPORT**

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# Technology use among older adults with and without cognitive impairment: exploring relations with daily life occupations and need of support

## THESIS FOR DOCTORAL DEGREE (Ph.D.)

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# ABSTRACT

**Introduction:** Older adults with and without cognitive impairments are likely to be limited in their performance of and engagement in daily life occupations due to challenges in everyday technology (ET) use.

**The overall aim** of this thesis was to gain knowledge of how ET use is related to daily life occupations and need of support among older adults with or without cognitive impairments.

**Methods:** This thesis draws data from two separate samples of older adults. In study I and III 67 older adults with mild cognitive impairment (MCI) or mild stage Alzheimer's Disease (AD) were included. These studies were quantitative cross-sectional studies investigating associations between performance of Activities of Daily Living (ADL) and ability to use ET and if measures of Ability to use ET and Amount of ETs perceived as relevant generated by a standardised instrument could predict overall functional level. Both study I and III used statistical analyses. In study II and IV a sample of 11 older adults that had either no known cognitive impairment, subjective cognitive impairment or dementia were included. These studies applied constructivist grounded theory methodology to explore older adults' experiences of incorporating new ET into daily life occupations and utilization of support in relation to ET use.

**Findings:** In study I, hypothesized associations between ADL performance and ability to use ET among older adults with MCI or AD were confirmed. Within study II, hindering and driving forces for incorporation of new ETs as well as how changes related to ET use impacts daily life occupations among older adults with and without cognitive impairments have been explored in depth. A good match between ET and: 1) occupational purposes, 2) a desired identity as ET user and 3) needs for feeling safe and in control were found as driving forces for incorporating ETs in to daily life activities and for satisfaction when using ETs. Within study III, both measures of Ability to use ET and Amount of relevant ETs showed potential to identify need of support at different levels in daily life among older adults with MCI or AD. In study IV utilization of support from others in relation to ET use was found to be of major importance for ET use among older adults' with and without cognitive impairments.

**Conclusion:** The findings of this thesis provide insights and new knowledge regarding how ET use is related to daily life occupation and the need of support among older adults with and without cognitive impairments by using different conceptualisations and methodologies. This knowledge is useful for facilitating older adults ET use and hence also their occupational performance and engagement both at an individual and societal level.

## LIST OF SCIENTIFIC PAPERS

- I. Ryd, C., Nygård, L., Malinowsky, C., Öhman, A., & Kottorp, A. (2015). Associations between performance of activities of daily living and everyday technology use among older adults with mild stage Alzheimer's disease or mild cognitive impairment. *Scandinavian journal of occupational therapy*, 22(1), 33-42
- II. Ryd, C., Malinowsky, C., Öhman, A., Kottorp, A. & Nygård, L. Performing and engaging in daily life occupations as everyday technology changes - experiences of older adults. (Submitted)
- III. Ryd, C., Nygård, L., Malinowsky, C., Öhman, A., & Kottorp, A. (2017). Can the everyday technology use questionnaire predict overall functional level among older adults with mild cognitive impairment or mild-stage Alzheimer's disease? - a pilot study. *Scandinavian journal of caring sciences*, 31(1), 201-209.
- IV. Ryd, C., Malinowsky, C., Öhman, A., Kottorp, A. & Nygård, L. Utilizing support in everyday technology use - experiences of older adults with and without cognitive impairment. (In manuscript)

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## LIST OF ABBREVIATIONS

ADL	Activities of Daily Living
AD	Alzheimer's Disease
AMPS	Assessment of Motor and Process Skills
BADL	Basic Activities of Daily Living
CI	Confidence Interval
ET	Everyday Technology
ETUQ	Everyday Technology Use Questionnaire
FAI	Frenchay Activities Index
GT	Grounded Theory
ICT	Information and Communication Technology
IADL	Instrumental Activities of Daily Living
MCI	Mild Cognitive Impairment
MoHO	Model of Human Occupation
OR	Odds Ratio
$R_s$	Spearman rank correlation coefficient
S-ETUQ	Short version of the Everyday Technology Questionnaire
SD	Standard deviation
SPSS	Statistical Package of Social Sciences

# **1 INTRODUCTION**

## **1.1 PERSONAL INTRODUCTION**

My clinical background as an occupational therapist (OT) lies within the area of driving assessment. In the driving assessment clinic I frequently met older adults who, due to cognitive and/or physical impairments could not meet the challenges of the occupation of driving. For such a complex and demanding occupation as driving even very subtle impairments could be enough for a person to be considered as no longer fit to drive. To see the often extensive consequences this had for the daily lives of these individuals was something that touched me. I was often frustrated that, as an occupational therapist, I had no possibility of addressing what was beyond my duties as an OT in that setting. My interest in research I have had since I was an undergraduate student and an ambition to conduct research myself has been there ever since. However, when the opportunity came to engage in the project that now constitutes this thesis, I first hesitated, since I had a really strong engagement in the area of driving. As I put some thought in to it I nevertheless realized that there are similarities between driving and using technology in occupations. They are both issues potentially with major consequences for the daily lives of older adults, and hence also areas where I as an OT can have a great impact, in my role as a researcher as well as in clinical and societal settings. What further motivated me to conduct research within this area was the problems I saw my father having in using technology. My father, who is in good health and not especially old, needed extensive support from my sister when he started using his new smartphone. Observing that situation made it evident for me that challenges in using technology are probably widespread also among those who have no impairments. And what challenges might older adults with cognitive impairments then face? My father's situation was also an example of how these challenges were handled by turning to another person for support. In my father's case getting support with technology was not a big issue but still his situation made me think of those who do not have anyone to turn to for support. What might the consequences of having problems with technology be for them? So, I am convinced that it is important to explore how older adults' daily life occupations are related to the use of technology as well as their need of support in relation to technology. My hope is that the research within this thesis can facilitate occupational engagement among older adults which I strongly believe is beneficial, both for the individuals it concerns and for the society.

## **1.2 POINT OF DEPARTURE**

The thesis is based on the view of human beings as having a fundamental need for doing things that characterize much of human life and that this doing can not be understood without considering how environment facilitates and constrain an occupation (1). Daily life occupations are within this thesis seen as the doing of work, play and activities of daily living (ADL) (1) that people are regularly involved in as well as a mean by which people experience meaning within their lives (2). The thesis also has its point of departure in technological development that in many ways has changed our daily life occupations (3-7) and focuses on

the daily life of older adults. The changes our daily life occupations have gone through due to the technological development can be exemplified by how the computer and the internet have affected the way we communicate, the way we manage our finances or buying tickets for public transport. Also, more domestic daily life occupations have changed as technological development proceeds, for example new types of cookers have been introduced with touch panels instead of knobs and completely new kinds of technological devices, such as the microwave oven, has become evident in our daily lives. This constantly ongoing development affects, and can be a challenge to, everyone who are managing their daily life occupations both within the home and in public space. There are, however, reasons to view this increased use of technology within daily life occupations as an especially important area to explore among older adults, particularly those with cognitive impairments, since they might be extra vulnerable to the increased challenges that new technology brings (8-12) and within this thesis both older adults with and without cognitive impairments are in focus. Moreover, the focus has been directed towards older adults still living in their own housing, since they are likely to encounter a great variety of technologies and have a need to manage many of their daily life occupations more or less independently. Hence, they might also have needs within their daily lives that are not being met. The thesis also has focus on two nearby but still separated aspects of daily life occupations; occupational performance and occupational engagement. Occupational performance refers to observable and perceived physical and mental abilities to perform daily life occupations (1, 13), and occupational engagement refers to having positive personal values attached to the involvement in an occupation (14).

### **1.3 DAILY LIFE OCCUPATIONS WHEN AGEING WITH OR WITHOUT COGNITIVE IMPAIRMENT**

As a person is aging daily life occupations also tend to change with regards to aspects other than technology use. The ability to perform activities of daily living (ADL) defined as the occupations people carry out in order to take care of, and maintain themselves (1), peak between at 30 and 40 years of age and then decreases gradually over the life span (13, 15). Another example is how engagement in leisure activities tends to decrease (16) and becomes less important for well-being with increased age (17). Another change associated with ageing and occupations in daily life is retirement. Within a Swedish context, retirement has been found to offer freedom and new possibilities, but potentially also a lack of meaningful occupations to engage in (18). Engagement in occupations has also been found to be positively associated with several outcomes related to health and well-being such as lowered mortality rate, ADL independence, lower levels of depression, and, decreased cognitive decline among older adults (19). Hence, being engaged in occupations has several positive effects likely to benefit individuals as well as society.

As people age, there is also an increased risk of cognitive impairments with consequences for the performance of daily life occupations (20-23). Limitations in the performance of daily life occupations are within this thesis also denoted as functional limitations. Functional limitations comprises both loss of independence but also limitations such as loss of

efficiency, increased errors or that a person requires more time perform an occupation. A large proportion of older adults with functional limitations caused by cognitive impairments are diagnosed with mild cognitive impairment (MCI) or dementia. The most common cause of dementia is Alzheimer's Disease (AD), with a prevalence worldwide of 4.0–6.4% among individuals over 60 years of age (21). The prevalence of MCI is difficult to estimate due to varying definitions of mild forms of cognitive decline and, in a systematic review, the prevalence varied between 3 and 42% (22).

A dementia disease implies a decrease in cognition that is severe enough to cause functional limitations, (24, 25) and dementia has been found to be the major contributor to functional limitations among older adults (26). Instrumental activities of daily living (IADL), such as handling finances, handling medication, and doing household work, are affected earlier in the course of the disease than more basic activities of daily living (bADL) (27, 28). MCI refers to a zone between cognitive changes of normal ageing and dementia, where a person is supposed to be independent in daily life even if the performance of daily activities may be less efficient, take more time, or include more errors (29). The absence of severe ADL impairments among people with MCI has, however, been debated, and systematic reviews have shown that persons with MCI consistently have been proven to have limited ability to perform IADLs e.g. handling finances or driving (30, 31). Such impairments have also been found to identify which persons with MCI that have an increased risk of converting to dementia (32, 33). A longitudinal study over 5 years has also found that a decrease in Amount of relevant ETs was associated with a decreasing involvement in IADLs among older adults (34). Hence, to identify limitations in ADL performance among older adults with cognitive impairments is important both for identifying individuals in need of support (35) and to correctly diagnose those with dementia or MCI (25, 29). However, identifying functional limitations might be challenging as they might be subtle among people with MCI and in the early stages of dementia (36).

In recent years, a new manual for diagnosing cognitive disorders have been implemented, the Diagnostic and Statistical Manual of Mental Disorders V (DSM V) (37). According to this, those people who have cognitive disorders are classified as either having a minor or major Neurocognitive Disorder (NCD). A minor NCD implies that someone is still independent in daily life occupations, but compensatory strategies or accommodations may be required. A major NCD implies the need of assistance in everyday activities (37). According to the DSM V, a person with dementia would fall within the category of major NCD (25, 37). The categorization and diagnosis of those who have subjective cognitive impairments or correspond with MCI-criteria is not as evident, but the greater proportion would most likely be categorized as having mild NCD, among other things depending on the level of functional limitations (29, 37). As the studies within this thesis were initiated and partly carried out before these new directions for diagnosing cognitive disorders were introduced, DSM V will not be used as a reference in this thesis. However, when generalizability or transferability of the results are estimated, overlaps and differences between new and former diagnostic criteria should be taken into account.

## 1.4 TECHNOLOGY IN THE DAILY LIFE OF OLDER ADULTS

During the 20th and 21st century, an intense technological development has characterized people's lives in the western world (7). For example, the car and the telephone were introduced and became parts of at least some citizens' daily lives about a hundred years ago. Nowadays, these technologies are more or less seen as necessities and taken for granted by most people. The development continued with, amongst other things, mass media technologies such as the radio and TV that nowadays have become items that are given in most people's homes (5-7). Also for the households, different technologies were developed such as electric cookers, refrigerators and washing machines, and these became part of the household as electricity spread and changed the living conditions primarily for women (4). In more recent years, the internet and information and communications technologies (ICTs) have had the largest impact on people's lives and have radically changed, for example, the way we communicate, manage money, work and enjoy ourselves (3, 6). With this historical perspective in mind it is evident that people's daily lives, at least in the western world, have been affected and changed as the technological development proceeds. However, it has also been suggested that the daily occupations in themselves are relatively constant but, as new technology is incorporated into them the way they are performed changes (38).

However, the relationship between persons and technology is complex as using and living with technology involves feelings, values, ideals etc. affecting the interaction with technology (39). Older adults of today have lived through several technological developmental phases that most likely have had a major impact on their daily lives. A study of technology use among older adults, with and without cognitive impairment, found that technology became increasingly relevant over time (40) indicating that there is an increasing use of technology also among older adults. However, empirical knowledge is sparse of how technology use is related to older adults' daily life occupations. A few studies have explored the associations between the use of technology and ADLs. The majority of these studies have found positive associations between ADL performance or engagement and technology use among older adults both with and without cognitive impairments (10, 41-44) but also one study found no such associations (45). Older adult's own experiences of using technology in daily life is even less studied. However one study exploring the meaning of technology among older adults with dementia found it as a key to significant occupations (46) while another study found that being referred to the internet and automated phone services had a negative effect on the daily life of 86-year olds living in Sweden (47). How older adults deal with changes as new technology becomes accessible, implemented, or expected to be implemented, within their daily life occupations has not, to my knowledge, been explored at all. In addition, older adults use significantly fewer ICTs in comparison to younger age groups (8, 11, 12). This divide in technology use between age groups is likely to be reflected as inequalities in the engagement and performance of daily life occupations of older adults (48). Hence, research that expands and deepens knowledge of the relationship between technology use and daily life occupations among older adults is needed to prevent functional limitations related to technology use among older adults.

## **1.5 ASPECTS INFLUENCING TECHNOLOGY USE AMONG OLDER ADULTS**

Older adults use less technology than others and hence the aspects that predetermine their technology use is likely to differ from those of other groups. Knowledge of what aspects that might influence technology use specifically among older adults is necessary in order to prevent restrictions in occupational engagement and performance caused by the increasing use of technology.

Expectations of gains from the use of a technology and the effort it would take to become a user have been found to have a major influence on the acceptance and usage of technology among people in general (49, 50). Several other factors have also been found to be related to technology use e. g. social influence, environmental support, experience of using technology, cognitive abilities, and anxiety (49, 51, 52). Increasing age is also associated with less technology use and has been suggested to be related to decreased cognitive abilities that comes with age (51-53). However, there are also other differences in what aspects might explain technology use among older adults compared to other age groups. Contrary to studies in other groups, expected effort using technology had no significant correlation with usage in a study exploring computer use and acceptance among older adults (54). The degree to which a person believes there is support available has been found to be a key determinant for ICT use in a variety of populations (52), but technology use among older adults seems to be even more dependent on social support than among other groups (55). In studies exploring ICT use specifically among older adults, there are several examples of how support from other persons influences their technology use. Among seniors, support from their social network was found to have a strong positive impact on internet use, lack of such support was one of the reasons for not using the internet, and when learning to use the internet the support from family and friends was preferred over support from professionals (55). Facilitating conditions, in which social support is included, has been found to be the main driving force in older adults' acceptance of computers (54). Also, interpersonal factors such as having no one to teach computing skills or answer questions have been found to constrain computer and internet use among adults over 65 years of age (56). However, no study has been found that explores older adults' own experiences of utilizing support with technology. Hence, detailed knowledge is lacking of what kind of support older adults want, and gain from as well as how to provide support in order to facilitate technology use among older adults.

Most research exploring technology use among older adults focuses on ICTs. Hence, prediction of the use of many technologies that are likely to be significant for the daily lives of older adults has not been explored sufficiently. A broader conceptualization of technology has been suggested in order to develop interventions and improve health and well-being among older adults (57). In this thesis the technologies that people commonly use in their daily life occupations will be in focus and the concept Everyday Technology (ET) will be used to denote these. ET is a concept that includes the technological objects, comprising the variety of electronic, technical and mechanical equipment people encounter in their daily lives, as well as the systems and services accessed through these objects; for example, when doing bank-related tasks online, you use a technological object (computer) to get access to the

online services and systems provided by the bank. It includes both well-known less complex technology, for example the coffee machine and stove, and recently developed and complex technology, for example the Internet and mobile phone (10, 58). As ET is a concept comprising ICTs as well as technologies within other domains, such as household appliances and technologies encountered in public space, it has the potential to be that broader concept that has been requested (57).

Studies exploring ET use among older adults have not been aimed at predicting the use of technology, but can still offer insights into what might explain technology use among older adults. Differences have been found in the amount of ETs perceived as relevant and ability to use them between older adults with and without known cognitive impairment, indicating that use of ETs is related to cognition in these groups (9, 10). However, the fact that these studies also show quite extensive overlaps between groups with different levels of cognitive impairment indicates that cognition does not solely determine technology use among older adults. But still, as technology use is likely to cause greater challenges among older adults with cognitive impairments, than those without cognitive impairments a special focus on their challenges and needs in relation to ET use is necessary. Among older adults with cognitive impairments, ET use has been explored with different aims and approaches. In a qualitative study exploring difficulties in relation to ET among older adults with dementia, several aspects were found that hindered the use of ET. Problems with remembering how to use an ET, sensitivity to stress, not knowing the potential of using an ET, and problems with knowing how to communicate with a technology are all examples of barriers to ET use (59). Another explorative study found that ET is embedded with both practical and existential meaning for older adults with dementia who live alone (46). This study also showed that older adults with dementia are driven to solve their own problems in relation to ET use, and that frequent use and a strong need of technology are facilitators for successful ET use. The issue of learning how to use ET has also been explored among older adults with dementia and MCI. One study reveals that learning and using ET is an intertwined process where the context is also interwoven (60). Another study found that older adults with AD varied greatly regarding how they viewed themselves as technology users and learners. The study also showed that there were various ways to learn and maintain knowledge related to ET use (61).

To conclude the knowledge of what aspects influence technology use among older adults, there is no consensus to be reached regarding what influences technology use among older adults. The research in the area is quite sparse and have conceptualized technology in various ways. However, we can conclude that it is a complex issue related to several aspects such as expectations, anxiety, learning, memory, meaning attached to technological objects etc. We can also be quite certain that older adults as a group are influenced by some of these aspects differently than other age groups. Especially cognition and social support are aspects that seem to have a particular association with technology use among older adults.

## **1.6 THE UTILITY OF MEASURING EVERYDAY TECHNOLOGY USE AMONG OLDER ADULTS WITH POTENTIAL FUNCTIONAL LIMITATIONS**

To identify subtle functional limitations in daily life occupations is important for the diagnosing of cognitive impairments (30, 31, 36), but also for identifying functional limitations among older adults in order to be able to intervene and offer support to those who need it. To identify needs with technology use can be an indication of need of support especially targeted at ET use, but also potentially an indication of a more general need of support in daily life, since ET is often required for the engagement in and performance of daily life occupations. As, stated previously, identifying functional limitations can be challenging when these are subtle and there are very few scales that have the potential to do so (36).

The Everyday Technology Use Questionnaire (ETUQ) investigates people's perception of their ability to use ET and the amount of ETs that are relevant to them in their daily lives (62). The ETUQ has been shown to be sensitive enough to differentiate between groups with various types of diagnoses, e.g. dementia, MCI, stroke, from those without known impairments (63). More specifically, the ETUQ has been shown to be able to distinguish older adults with mild stage AD and MCI from each other and from older adults without known cognitive impairments and also to differentiate between older adults without known cognitive impairment and older adults with subjective cognitive impairment on a group level (9, 10). This indicates that ETUQ is sensitive enough also to identify functional limitations among those who have subtle cognitive decline.

The ETUQ has been validated for use among several diagnostic groups, e.g. intellectual disabilities, acquired brain injury, dementia, and chronic obstructive pulmonary disease (64-67). Among older adults with or without cognitive impairments, psychometric properties (unidimensionality, internal scale validity, rating scale validity and person response validity) of ETUQs have been found to be acceptable (10, 67). There is evidence of that Ability to use ET, as measured by the ETUQs, is related to daily life occupations, such as ADL performance and return to work among those people with acquired brain injury (ABI) (66). There are however, no studies exploring how measures generated by the ETUQ is related to functional limitations among older adults with MCI or early stage dementia. Older adults with mild forms of cognitive decline are likely to have subtle functional limitations likely to be undetected by many ADL assessments. Hence, there is reason to explore the potential of ETUQ to detect functional limitations in those groups.

## **1.7 THE APPLICATION OF DIFFERENT CONCEPTS AND METHODOLOGIES IN THE THESIS**

Technology is nowadays a part of many, maybe even the majority, of our daily life occupations (3-7, 38) and is likely to be reflected in occupational performance and engagement to a large extent. An occupation can be seen as a dynamic system where a change in any of the components which constitutes this system, i.e. both person related and environmental components, can create a new dynamic in the occupation and new thoughts,



emotions, and/or actions might emerge as a result (1). Objects, such as technological items, can affect a person's occupational engagement and performance as well as the use of objects being affected by a person's ability or wish to perform or engage in occupations (1). Hence, using technology is an intertwined aspect of daily life occupations that can be difficult to distinguish from the occupation in which it is used. This intertwining might make measuring and exploring the role of technology in daily life occupations complex. Due to this complexity, different conceptualizations of ET use and daily life occupations were used in this thesis in order to capture various characteristics of the relationships between those. In study I and III, relationships between different aspects of the participants performance abilities, e.g. their observable and perceived mental and physical abilities (1), were explored by measuring ET use, ADL performance, and need of support.

In study II and IV, the aims were to explore older adults' own experiences of incorporating ETs into their daily life occupations and utilization of support in relation to ET. Hence, a more comprehensive approach to technology use was applied in study II and IV that aimed to capture a variety of aspects related to the engagement and performance of daily life occupations and the use of objects within these, such as the persons' volition, habits, and meanings related to both occupations and objects (1). As a consequence of the assumption of the topics in study II and IV requiring a more comprehensive view of ETs and occupations in comparison with study I and III, the participants and target population also shifted. As study I and II mainly concerned relations between different performance abilities (and motor and process ability and ability to use ET) they were expected to be related to cognitive function which study II and IV was not expected to be in the same way. Hence, the participants and target population shifted from older adults with cognitive impairments (study I and III) to older adults who varied regarding cognitive function as well as other personal characteristics (study II and IV).

## **1.8 RATIONALE OF THE THESIS**

To summarise, the rationale for conducting the research within this thesis is the technological development, which has increased the use of ETs in daily life occupations, in combination with older adults, with and without cognitive impairments, having an increased risk of being limited in their use of ET. This combination leads to a great risk of older adults also being limited in their performance of and engagement in daily life occupation. No consensus of what influences technology use among older adults has yet been met since studies of this are few and have conceptualized technology in various ways. However, cognition and social support are aspects that has shown a particular association with technology use among older adults. Empirical knowledge is also lacking about how ET use is related to the performance of daily life occupations, how the technological development has changed the daily life occupations and what drives and hinders incorporation of new ETs into daily life occupations among older adults with or without cognitive impairments. In addition knowledge of how older adults perceive the utilization of support and how the utilization is related to occupational engagement and performance is lacking. There is also a need for valid and

sensitive instruments that can discover limitations in ET use among older adults with cognitive impairments and indicate when a person is in need of support to manage daily life occupations. Filling these knowledge gaps could increase the understanding for the use of ETs in daily life occupations of older adults and the mechanisms behind the incorporation of new ET as well as how older adults' need of support in daily life occupations can be discovered and addressed. Such new knowledge could hence be used to prevent limitations in the occupational engagement and performance of older adults.



## **2 RESEARCH AIMS**

### **2.1 OVERALL AIM**

The overall aim of this thesis was to gain knowledge of how everyday technology use is related to daily life occupations and need of support among older adults with or without cognitive impairment.

#### **2.1.1 Study aims**

- 1) To investigate associations between ADL performance ability, divided into ADL motor and process ability, and perceived ability to use ET among older adults with mild stage AD or MCI. To further investigate the degree of impaired ADL performance ability and perceived ability to use ET, a secondary aim of this study was to compare the MCI group and the AD group with regard to level of ADL motor and ADL process ability and level of perceived ability to use ET.
- 2) To explore what can drive and hinder the incorporation of ETs in daily life occupations and how new ETs affect engagement in and performance of daily life occupations among older adults.
- 3) To investigate whether perceived ability to use ET, and the amount of relevant ETs, as measured by the ETUQ, has the potential to predict overall functional level among older adults with mild-stage AD or MCI.
- 4) To explore older adults' experiences of utilizing support from others when using ET in their daily life occupations, and how the utilization of support is related to their engagement in and performance of daily life occupations.



## 3 METHODS

### 3.1 STUDY DESIGNS

To gain knowledge of the probable complex relationships between ET, daily life and need of support both qualitative and quantitative approaches were used. Study I and III use cross-sectional quantitative study designs to investigate relations between ET use, activities of daily living and need of support in daily life. In study II and IV a constant comparative method according to constructivist grounded theory (GT) (68) was used to explore the older adults incorporation of ETs in daily life occupations and utilization of support from others in relation to ET use. All studies within this thesis took place in a Swedish urban or suburban context.

**Table 1:** Overview of the studies included in the thesis (note that they are not presented in numerical order here).

	Study I	Study III	Study II	Study IV
<b>Focus</b>	Investigate associations between technology use and ADL performance	Investigate whether an instrument measuring ET use could predict overall function.	Exploring incorporation of ETs into daily life occupations and consequences for occupational engagement and performance	Exploring utilization of support in ET use and consequences for occupational engagement and performance
<b>Design</b>	Quantitative, cross sectional		Qualitative, constructivist grounded theory approach	
<b>Data collection</b>	Questionnaire in semi structured interview, observation of performance of two ADL tasks and rating of overall functional level		Individual, semi-structured interviews on one or two occasions.	
<b>Participants</b>	67 older adults with AD or MCI		11 older adults with no known cognitive impairment, with subjective cognitive impairment or dementia	
<b>Instruments</b>	AMPS, S-ETUQ		FAI, S-ETUQ	
<b>Data analysis</b>	Descriptive statistics and correlational analyses.	Descriptive statistics and logistic regression analyses.	Constant comparative analyses	

## 3.2 PARTICIPANTS

This thesis comprises four studies that draw from data from two separate samples of older adults. In study I and III, 67 older adults with MCI or mild stage AD were included. In study II and IV, a sample of 11 older adults who had no known cognitive impairment, subjective cognitive impairment or dementia were included.

### 3.2.1 Sampling in studies I and III

The participants in study I and III had been diagnosed with AD at a mild stage ( $n=39$ ) by physicians according to the criteria for AD presented in the report from the National Institute of Neurological and Communicative Disorders and Stroke and the Alzheimer's Disease and Related Disorders Association (NINCDS ADRDA) (69). The participants with MCI ( $n = 28$ ) fulfilled the criteria described by Petersen (70) and Winblad et al. (29). To be considered for inclusion, potential participants had to meet the following criteria: being 55 years or older, having a need to use ET in daily life (i.e. not being completely dependent on another person) and scoring at least 18/30 on the Mini Mental State Examination (MMSE) for participants with AD and 25/30 for participants with MCI, when recruited. Individuals with visual or hearing impairments that could not be compensated for by technical aids were not included. Recruitment was carried out at three different memory clinics in the Stockholm area. Based on an earlier empirical study by Kottorp and Nygård (71) using ETUQ with similar diagnostic samples, an estimated sample size of  $n = 18$  per group is needed to secure a mean difference of 5.0 logits ( $p < 0.05$ ) with a power of 0.90. Significant differences between the group of older adults with mild stage AD and the group of older adults with MCI regarding sex, age, years of education or living conditions were not found. For information on the participants see Table 2.

**Table 2.** Characteristics of the participants in study I and III

	Older adults with mild stage AD ( $n=39$ )	Older adults with MCI ( $n=28$ )	In total ( $n=67$ )
<b>Age, M (SD)</b>	75.74 (7.4)	76.9 (7.2)	76.24 (7.3)
<b>Gender, n (%)</b>			
Female	21 (53.8)	12 (42.9)	33 (49.3)
Male	18 (46.2)	14 (57.1)	34 (50.7)
<b>Years of education, M (SD)</b>	11.1 (3.3)	12.2 (3.4)	11.7 (3.4)
<b>Living conditions, n (%)</b>			
Living alone	17 (43.6)	17 (60.7)	33 (49.3)
Cohabiting	22 (56.4)	11 (39.3)	34 (50.7)

### **3.2.2 Sampling in studies II and IV**

A variety as regards age, gender, living conditions, and cognitive function, was sought for in the recruitment and inclusion of participants in study II and IV in order to reflect a variety of experiences within the data. The inclusion criteria were age over 65 and living in ordinary housing. The characteristics of the 11 participants are presented in Table 3. Living conditions are used to describe whether the participants co-habit with a partner whether married or not. Participants without known cognitive impairments were recruited through the first authors' distant social network (participants 1- 5). Individuals with subjective memory impairments and with dementia were recruited through a day care centre for people with dementia (participant 6), a memory investigation unit (participants 7 and 8), and from a meeting point for people with Alzheimer's Disease (participant 9 -11). All of those who agreed to participate also agreed to be interviewed in their own homes.



**Table 3.** Characteristics of the participants' in study II and IV

	<b>Cognitive status</b>	<b>Gender</b>	<b>Age</b>	<b>Living conditions</b>	<b>Years of education</b> (M= 11.5)	<b>FAI*</b> (Max score:45; M = 28.4)	<b>Ability to use ET*</b> (M = 58.4)	<b>Relevant ETs*</b> (Max score: 33; M 21.7)
<b>1</b>	NCI	Female	67	Cohabiting with partner	14	39	66.6	24
<b>2</b>	NCI	Female	75	Cohabiting with partner	12	30	61.2	24
<b>3</b>	NCI	Female	77	Cohabiting with partner	15	36	53.3	17
<b>4</b>	NCI	Male	72	Cohabiting with partner	15	32	62.5	24
<b>5</b>	NCI	Male	92	Lives alone and occasionally with partner.	16	25	57.7	22
<b>6</b>	Dementia	Male	75	Lives alone.	7	12	57.0	21
<b>7</b>	SCI	Female	72	Lives alone.	8	34	59.8	25
<b>8</b>	Dementia	Male	82	Cohabiting with partner	8	29	58.0	23
<b>9</b>	Dementia	Female	83	Cohabiting with partner	8	21	52.5	18
<b>10</b>	Dementia	Male	82	Cohabiting with partner	14	25	62.0	23
<b>11</b>	SCI	Female	82	Lives alone.	10	29	52.0	18

Note: NCI=No known Cognitive Impairment; SCI=Subjective Cognitive Impairment; FAI=Frenchay Activities Index; ET = Everyday technology. \*=higher measures indicate more frequent performance of daily life activities, greater ability to use ET, and greater number of relevant ETs.

### **3.3 DATA COLLECTION**

#### **3.3.1 Data collection - study I and III**

##### *3.3.1.1 Instruments*

The instruments used in study I and III were the Assessment of Motor and Process Skills (AMPS) and the short version of the Everyday Technology Use Questionnaire (S-ETUQ).

The AMPS is a standardized observational assessment that evaluates the quality of a person's performance of personal or instrumental activities of daily living (ADL) by measuring ADL motor and process performance skills (13). The AMPS can be used by occupational therapists who have attended a training course and been calibrated as users. It has been proved to identify functional limitations in people with dementia (72-74) but knowledge of AMPS' usability among older adults with MCI is still limited. In addition to the observation of occupational performance, the AMPS also comprises an estimation of overall functional level, or with other words need for assistance in daily life, on a three-graded scale. This overall judgment of functional level/need for assistance was based on all available information on the participant and concerned needs that were met by informal and formal support, often provided by home helpers or family members, as well as unmet needs (75). The AMPS measures of motor and process ability were used in study I and the rating of overall functional level was used in study III.

The S-ETUQ is a questionnaire which covers 33 ETs and takes approximately 20 minutes to complete. The original version of ETUQ consists of over 90 ETs. The 33 ETs included in the S-ETUQ were selected from those included in the original version to represent a range of ETs, from very difficult to very easy to use, as well as both newly developed and well-known ETs, without losing the psychometric properties of the original version. The S-ETUQ generates statistically similar measures to those of the original version, which support its validity (71). Procedures in developing the original ETUQ and the S-ETUQ have been presented in more detail elsewhere (62, 67, 71).

When using the S-ETUQ, both the respondents amount of relevant ETs in daily life and their perceived ability to use them are rated by an interviewer based on the respondents' concrete descriptions of what ETs they use and how they use them. In the ETUQ, an ET is considered to be relevant if it (i) is available to the respondent, and (ii) has been previously used, is currently used, or is intended to be used by the respondent (63). Using the ETUQ requires a 1-day training course.

The S-ETUQ was conducted in a face-to-face interview administered by an occupational therapist (OT). The OT informally but systematically asked questions regarding all ETs included in the S-ETUQ, and noted whether or not each ET could be considered as relevant to the respondent (according to the definition described previously). ETs that are not relevant to the respondent were not discussed further. For each relevant ET, the respondent's perception of their own ability to use it is rated on a six-step rank category scale (63). Hence,

the S-ETUQ interviews generated measure of the respondent's perceived Ability to use ET and the Amount of ETs considered to be relevant in his or her daily life. In study I, the measures of the participants perceived difficulty were used. In study II, both the perceived Ability to use ET and the Amount of ETs perceived as relevant were used in the analyses.

#### *3.3.1.2 Data gathering procedures*

Data were collected by five experienced OTs who had been educated in using the AMPS and the S-ETUQ, and who had all been calibrated as reliable raters for both assessments. The S-ETUQ interview, the observation of ADL performance and the rating of overall function were conducted by the same OT for each participant and on the same day for most of the participants (79%). For the rest of the participants (21%), data gathering was carried out on two occasions according to the participants' individual wishes and needs. The aim was to perform the two evaluations as close together in time as possible in order to minimise the influence of time. The median number of days between the ETUQ and the AMPS evaluations was 0 (range 0–19).

If the participants agreed, data collection took place in their homes, which was the case for most (91%) of the participants. Otherwise, data collection took place in the clinic where the participants went through memory investigation. Some participants preferred to include a significant other during the S-ETUQ interview, and this was the case for significantly more participants with AD than with MCI. The role of the significant other was to provide support while the participant answered the questions. This procedure has been recommended and discussed elsewhere (62). During the AMPS observation, significant others could be present but could not provide support. The ADL tasks chosen for the observations of ADL performance were, for most participants (92%), averagely or above averagely challenging to perform (13), indicating that they were sufficiently challenging for the sample. Almost all ADL tasks (97%) that were observed required the use of some kind of ET when performing them.

#### **3.3.2 Data collection - study II and IV**

Data for study II and IV was collected through individual in-depth interviews in the participants' homes between September 2015 and June 2016. Initially, participants without known cognitive impairments were included, and thereafter those with subjective cognitive impairments or dementia. This procedure was chosen in order to facilitate the interviews for those individuals who had cognitive impairments. In accordance with GT (68), data collection started with quite open areas to explore. Hence, the initial interviews were more challenging for the participants, since they were asked to reflect quite freely on experiences in their past. As data collection and analyses progressed, the interviews became more focused, by the possibility of asking more specific questions and give examples of technologies, occupations, and ways of receiving support that had arisen in previous interviews. Hence, within the interviews with persons who experienced cognitive impairments more guidance could be offered. All interviews were undertaken by the first author and lasted between 43

and 129 minutes (on average 102 minutes). A semi-structured interview guide was used that included questions concerning the topics in both study II and IV.

For study II, the first step in the interviews was to identify occupations that were relevant to the participants and that had been somehow changed by the use of new technology. Concrete and detailed descriptions of changes were sought as well as experiences of going through these changes. If a participant did not use a technology commonly used in the altered way of performing a particular occupation, then they were encouraged to reflect on why this was so. As the study progressed, the interview guide was revised so as to explore upcoming analytical ideas by, for example, asking the participants to compare occupations in which they had chosen to incorporate new technologies to occupations where they had not incorporated new technology, and to reason about why this was so. As the data collection and analysis progressed, certain occupations were identified that provided richer descriptions than others on the topic. These occupations were: managing personal finances, photography, shopping and using public transport. If the participants in the upcoming interviews did not spontaneously talk about these occupations, the interviewer asked them to reflect on them and the technologies associated with the altered way of performing them.

For study IV, the interview guide included questions concerning the participants' use of technology within their daily life occupations, by for example asking the participants to talk about how they used a certain technology and how they had obtained it. These questions often led to descriptions of their experiences of having support from others. Also, more specific questions regarding support with technology use was included in the guide e.g. 'Why do you think you accept having support with technology X and not with technology Y?', 'How do you think a person should be to provide good support?', 'How do you experience going from being able to do this activity independently to needing help doing it?'

To estimate the participants' use of ET and engagement in daily life tasks, something that was intended to be used as background information, the short version of the Everyday Technology Use Questionnaire (S-ETUQ) and the Frenchay Activity Index (FAI) were used in conjunction with the open interviews. FAI is an interview instrument in which the respondent indicates with what frequency they perform a number of activities (76). The parts of the interviews when the standardized questionnaires were used were recorded, transcribed verbatim and coded just as the open parts of the interviews. Even if the aim in conducting these standardized questionnaires was to provide background information, they often worked as starting points for engaging in conversations topics related to the aim of the studies.

### **3.4 DATA ANALYSIS**

In study I and III different descriptive statistics, correlational analyses and logistic regression models were used to explore the relationships between ET use and the two aspects of daily life, ADL performance and overall function/need of support. In study III and IV the constant comparative method of GT (68) was used to gain knowledge of experiences of using new technologies in daily life occupations and need for support in relation to technology use.

### **3.4.1 Data analysis in study I and III**

#### *3.4.1.1 Preparatory analysis*

The first step in the data analysis in study I and III was to generate individual linear interval measures (logits) of ADL ability and the Ability to use ET to be used in the subsequent analysis. This was done by use of Rasch analysis which is psychometric tool that can convert ordinal raw scores into linear measures of a person's ability (77). For the AMPS the Rasch procedure was included in the computerized scoring program developed specifically for the instrument. More details on this procedure can be found in the instruments manual (13). The computer program generated measures of ADL process ability and ADL motor ability for each participant. The S-ETUQ raw scores were transformed into individual linear interval measures (logits) of the participants' perceived Ability to use ET by the use of the WINSTEPS computer software program version 3.69.1 (78). More details of this process have been described elsewhere (10). The Amount of relevant ETs was obtained by summarizing the number of ETs in the S-ETUQ that was specified as relevant to the participant.

#### *3.4.1.2 Primary analysis*

The primary statistical analysis was performed using the Statistical Package for Social Sciences (SPSS), version 22 (79). Variables used in the primary analysis of study I and II were:

- Ability to use ET (S-ETUQ)
- Amount of relevant ETs (S-ETUQ)
- ADL motor ability (AMPS)
- ADL process ability (AMPS)
- Overall functional level/need of assistance (AMPS)

In study I the sample was divided based on diagnoses into one group consisting of participants with MCI and another group consisting of participants with AD. Associations between ADL process and motor ability and perceived Ability to use ET were explored with the Spearman rank correlation coefficient (RS) for each group. The groups were also compared regarding ADL motor and process ability and perceived Ability to use ET use with the Mann–Whitney U-test. The level of significance was set at  $p < 0.05$ . Non-parametric tests were used, since the variables did not demonstrate a normal distribution.

In study III the sample was treated as one group. Logistic regression analyses were performed to explore how the Amount of relevant ETs and perceived Ability to use ET could predict the participants' overall functional level. The three-step scale of needed assistance was dichotomized in two ways: (i) independent participants vs. those in need of minimal, moderate or maximal assistance, and (ii) participants in need of moderate or maximal assistance vs. those who were independent or in need of minimal assistance. These two

variables were then used as outcomes in two separate logistic regression models. Details of outcome variables and predictors included in the models are presented in Table 4.

**Table 4.** Variables included in the two logistic regression models in study II

Predictor: Perceived difficulty in ET use*, M (SD)	53.3 (5.9)
Predictor: Perceived amount of relevant ETs*, M (SD)	16.4 (4.4)
Outcome in model 1: Level of needed assistance, n (%)	
Independent	9 (13.4)
Minimal, moderate, or maximal	58 (86.6)
Outcome in model 2: Level of needed assistance, n (%)	
Independent or minimal	61 (91)
Moderate or maximal	6 (9)

Note: \*higher values indicate higher levels of ability and relevance.

### 3.4.2 Data analysis of study II and IV

The analyses of the interviews in study II and IV followed the guidelines provided by Charmaz (68). All interviews were transcribed verbatim and carefully read by the first author. The data concerning the respective studies (II and IV) was then separated in the initial phase of coding. They were thereafter analysed in a similar way, and for both studies constant comparisons was implemented all through the analysis. Initially, all data potentially related to the respective aims was coded with phrases that defined what each quotation concerned. The Atlas.ti software (80) was used to facilitate initial coding. For study II, the initial coding lead to a large number of unique codes and was, therefore, in its turn coded to reveal patterns and facilitate analytical thinking, as suggested by Charmaz (68). The initial coding of study IV lead to a more manageable number of codes, and therefore, the procedure of coding initial codes was not implemented in this analysis. During initial coding memos of reflections, questions and ideas that emerged during the analysis were written as they occurred.

By comparing quotations within the initial codes, comparing the initial codes with each other as well as with previous memos, extensive analytical memos were written for each study. These memos were the origin of the codes used in further focused coding of the data. As pieces of data were sorted into the focused codes, constant comparison was made by again comparing the codes with each other, with citations and with previous memos. Out of this procedure categories emerged, and they were formulated in a new analytical memo. By constantly comparing these emerging categories with each other, as well as adjusting and

refining them, as the studies progressed, the final categories was formulated. The last stage was to compare the final categories to the data and memos to make sure they were congruent.

Within study II, analysis and data collection was done in parallel, and tentative ideas that occurred during the analyses were explored by adding questions to the interview guide or going back to participants. When the data was considered to be rich enough, i.e. did not lead to new crucial theoretical insights or new properties in the categories the sampling was ended. For study IV, the analyses was conducted after the data collection was finished.

The ordinal data generated by the standardized questionnaires S-ETUQ and FAI was analysed in order to present descriptions of the participants' activity engagement and ET use. Data from the FAI questionnaire was summarized to indicate each participant's frequency of engaging in daily life tasks. Measures of the participants Ability to use ET and Amount of relevant ETs was generated by analysing the S-ETUQ data as described previously (see page 20). The participants varied in terms of both activity engagement and ET use.

### **3.5 ETHICAL CONSIDERATIONS**

Within the studies of this thesis, the majority of the participants had diagnoses or experienced cognitive limitations that implied that they had cognitive impairments. Older adults who have cognitive impairment might have limited capacity to give informed consent (81). Hence, the procedures for giving informed consent to their participation needs to be given extra attention when they are asked to participate in research. During recruitment to the studies within this thesis, potential participants were given both verbal and written information about the studies and what participating would mean in terms of time and effort. Verbal information was given by phone and then repeated when the participant and the person collecting the data met. Before agreeing to participate by written informed consent, the participants were also informed of their right to withdraw at any time. To make it easier for the participants to comprehend the given information special effort was made to use simple language, reduce the length of the information given, and repeat information when necessary as recommended in the literature (82).

Challenges with including persons who experience impaired verbal communication or memory loss due to dementia has been highlighted in the literature. Letting conversations arise out of everyday situations is one strategy that has been suggested to facilitate interviewing people with dementia (83). Within this thesis, conversations were facilitated by conducting interviews in the participants' own homes, and conversations often started around technological objects that were visible within the participants' homes when the open interviews (study II and IV) were carried out.

The procedures when interviews (Study I - IV) or observations (Study I and III) were carried out were clearly described in the beginning of all meetings with a participants so as to meet the ethical challenges of including those with cognitive impairment in research. In order to increase the participants' feelings of safety and comfort in participating in the studies, a repetition of what was going to happen, the aim of the meeting and how long the session

might be was given at the beginning of each session regardless of this information having been given previously.

When a recording device was used, it was placed in plain sight for the participants, and they were informed every time it was turned on or off, even though the recording had already been agreed on. This procedure was to avoid participants forgetting that they were being recorded and hence also to avoid potential situations where a participant might get the perception that he or she was recorded without their permission.

The data collection in this thesis meant that the participants were observed performing ADL tasks (study I and III), to estimate their own Ability to use ET (all studies), and asked to recall and describe past events (study II and IV). Being exposed to such situations can lead to a person becoming aware of lost abilities that might be difficult to be confronted with. Such consequences might be hard to fully avoid, but were in this study eased by carefully formulating questions and getting to know each participant before conducting standardized assessments or discussing potentially sensitive topics.

Another way to facilitate participating in research for those with memory impairments is letting them engage in conversations regarding topics they enjoy talking about, even though it is not directly relevant for the study aims (83). In this thesis, that means that the data collection sessions with participants who experienced cognitive impairment took somewhat longer to conduct and had a larger proportion of topics being discussed that were not related to the study aims than the sessions with participants who had very minor or no cognitive impairments.

Ethical approval for the studies within the thesis was obtained from the regional ethical committee in Stockholm, Dnr 2010/120-31/5 (study I and III) and Dnr: 2015/562-31/5 (study II and IV).





## 4 FINDINGS

### 4.1 RELATIONS BETWEEN ET USE AND DAILY LIFE OCCUPATIONS

#### 4.1.1 Associations between ADL performance and perceived ability to use ET

In study I, the correlation coefficient ( $R_s$ ) between ADL motor ability and perceived ability to use ET among persons with MCI was 0.50 ( $p < 0.01$ ). In the group consisting of older adults with AD the association was weaker and non-significant,  $R_s = 0.22$  ( $p = 0.17$ ). The correlation coefficient between ADL process ability and perceived ability to use ET among persons with MCI was 0.44 ( $p < 0.05$ ). In the group of older adults with AD, the association was weaker, but also significant,  $R_s = 0.32$  ( $p < 0.05$ ).

Based on a visual inspection of data, a few individuals had unexpectedly high measures of perceived ability to use ET in relation to their ADL ability measures (study I). These individuals also differed from the rest of the sample by having much higher individual standard errors on their measures of perceived ability to use ET (9.74–10.17 logits) compared to the mean of the rest of the sample (2.04 logits). Hence, we decided to explore the relationship also when these potentially invalid responses were excluded. The correlation coefficient for the association between ADL motor ability and ability to use ET among persons with MCI increased from 0.50 to 0.60 ( $p < 0.01$ ) as the outliers were removed. Among older adults with AD the association between the same variables remained weak and non-significant. Correlation coefficients indicating the associations between ADL process ability and ability to use ET increased slightly and remained significant in both groups (AD group:  $R_s = 0.41$ ,  $p < 0.05$ ; MCI group:  $R_s = 0.51$ ,  $p < 0.01$ ).

#### 4.1.2 Group comparison of ADL performance, Ability to use ET and Amount of relevant ETs

Study I also showed that the participants with MCI had overall higher measures of both ADL motor and process ability and perceived ability to use ET compared with the participants with mild AD. The groups differed significantly regarding ADL process ability ( $p < 0.001$ ) and perceived ability to use ET ( $p < 0.05$ ), but not regarding ADL motor ability ( $p = 0.166$ ). The groups also differed significantly regarding the amount of ETs perceived as being relevant ( $p < 0.001$ ). The MCI group perceived on average 18 of the 33 items (SD 4.25; range 9–25) in S-ETUQ as being relevant compared with the AD group who perceived on average 15 of 33 items (SD 3.95; range 7–25) as relevant.

#### 4.1.3 Incorporation of ET into daily life occupations

In the analysis of study II, three categories emerged which all, in different ways, comprised the concept of matching. The degree of match within these categories was essential for the choice of incorporating a new technology into an occupation, and for the satisfaction when engaging in and performing occupations altered by new technology.

***Matching of occupational purposes and technology*** - Occupational purpose refers to everything the participants expressed as reasons for engaging in an occupation. The occupations brought up in the interviews varied regarding how important it was for the participants to achieve their purposes. If the technology's utility matched with a highly relevant occupational purpose, it was more likely to be used than if it matched a less relevant purpose. As a new technology became a part of an occupation, it could generate new occupational purposes, but it could also have the consequence of diminishing previous occupational purposes. In addition, for the technology and occupation to have a good match, it could be important that the match concerned multiple occupational purposes. The participants could combine parts of their previous performance with the altered performance using new technology to keep fulfilling multiple purposes which facilitated their occupational engagement and performance.

***Striving towards being the right type of technology user*** - The choice of incorporating a technology into an occupation was also related to how well using it matched with the kind of technology user that the participants' strived to be. The participants strived towards feeling and showing themselves competent and towards avoiding embarrassment related to their ET use. It was also important for the participants to avoid what they perceived as exaggerated ET use rather the technology needed to have a practical benefit in an occupation. It was more likely for the participants to experience embarrassment or feelings of incompetence when being challenged by the use of domestic ET than it was being challenged using ICTs.

***Feeling safe and in control when using technology within occupations*** - When a technology matched the participants' needs for control and safety within an occupation, this worked as a driving force for using it, and when it did not, ET use was prevented or this led to the occupation being performed with a feeling of discomfort. Feeling insecure using technology could also lead to the use of strategies aiming to increase security and control. Feelings of lack of control or insecurity often decreased as the participants got used to an ET.

## **4.2 TECHNOLOGY USE AND SUPPORT**

### **4.2.1 ET use as predictor of need of support in daily life**

In study III, a logistic regression model aimed at discriminating between individuals who were independent and those who were in need of minimal, moderate or maximal assistance (model 1) was used. The Amount of relevant ETs had a significant effect on the outcome, but the perceived Ability to use ET did not. In contrast, in the model aimed at discriminating between individuals who needed maximal or moderate assistance from those who were independent or in need of minimal assistance (Model 2), the perceived Ability to use ET had a significant effect on the outcome, but the Amount of relevant ETs did not. See table 5 for details of the two logistic regression models.

**Table 5.** Outcomes of the logistic regression analyses aimed at predicting overall functional level among older adults with mild stage AD or MCI

Variables	<b>Model 1</b> <i>Outcome variable: Independent (1) vs. in need of minimal, moderate or maximal assistance (0).</i>			<b>Model 2</b> <i>Outcome variable: In need of moderate to maximal assistance (1) vs. independent or in need of minimal assistance (0).</i>		
	P	OR	95% CI	P	OR	95 % CI
Amount of relevant ETs*	0.005	1.39	1.11-1.75	0.13	0.79	0.58-1.08
Perceived ability to use ET*	0.176	1.12	0.95-1.31	0.007	1.82	1.76-2.82
Overall model evaluation	-2LL	x <sup>2</sup>	p	-2LL	x <sup>2</sup>	p
Likelihood ratio	37.84	15.03	0.001	27.14	13.26	0.001

Notes: Higher values indicate higher amount of relevant ETs and higher perceived ability to use ET; Nagelkerke R<sup>2</sup>: Model 1: 0.37; Model 2: 0.40.

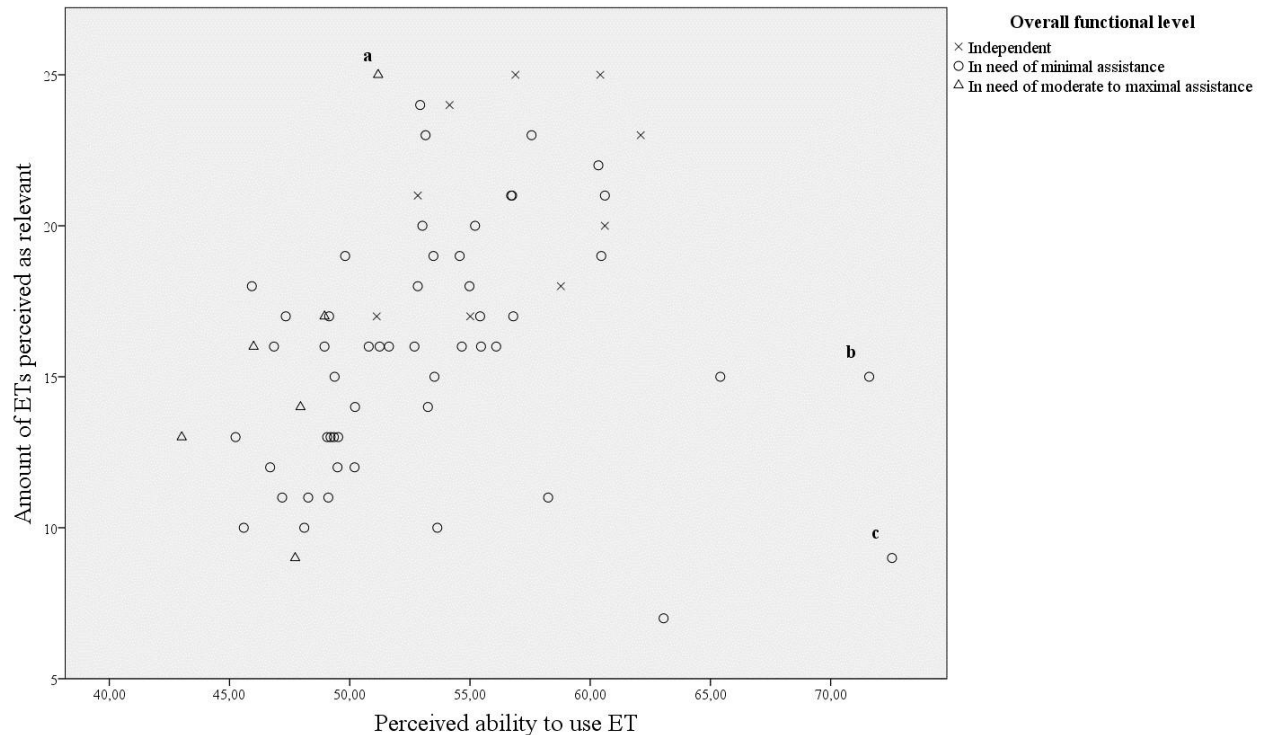
The distribution of how the participants' functional levels (need for assistance) were actually scored by the OTs and how it was predicted by the two logistic regression models is outlined in table 6.

**Table 6.** Classification of how the overall functional level was scored by the occupational therapists and how it was predicted by the logistic regression models

<b>Model 1</b>		
<b>Predicted need of assistance</b>		
	Independent	Minimal, moderate or maximal
<b>Scored need for assistance</b>		
Independent	3	6
Minimal, moderate or maximal	0	58
<b>Model 2</b>		
<b>Predicted need of assistance</b>		
	Moderate to maximal	Independent or minimal
<b>Scored need for assistance</b>		
Moderate to maximal	1	5
Independent or minimal	1	60

The logistic regression models indicated that the Ability to use ET and the Amount of relevant ETs were differently related to the outcome (overall functional level) depending on how the three-step scale of needed assistance was dichotomised. In order to obtain a more detailed view of these relationships, they were visually explored in a scatterplot (Fig. 1). In this plot, the participants are divided according to the original three levels of need for support. The plot reveals that there are some outliers (marked with b, c and d in Fig. 1) in the sample, who had an unexpectedly high perceived Ability to use ET in relation to the rest of the sample. The individual marked with an a had an unexpectedly high amount of relevant ETs compared to the others at the same functional level. The plot also reveals that individuals who were scored as independent and those who were scored as in need of moderate to maximal

assistance are clearly differentiated both regarding the Amount of relevant ETs and the perceived Ability to use ET, while the individuals in need of minimal assistance are more evenly distributed along the scales.



**Figure 1.** Scatterplot of how perceived Ability to use ET and Amount of relevant ETs were distributed among the three overall functional levels. Outliers are marked by letters. Notes: ET: Everyday Technology.

#### 4.2.2 Utilization of support in technology use

In study IV, three categories were identified as significant for if and how the participants utilized support from others, and the consequences this could have on their occupational performance and engagement.

***Having accessible and useful support within reach*** - Being a person utilizing support was often associated with contacts with various persons and having someone within reach that could provide support could be decisive for the choice of using ET. When others took the initiative in the use of a new ET, it could become a part of the participant's daily lives, but it could also result in the acquired technology not being used. When support was within reach, it could still be perceived as more or less accessible to the participants. The more accessible support a person could provide, the more likely it was that the participants used it. Knowing the person providing support privately and being geographically close to that person increased the participants perception of the support as accessible. For the support to be

perceived as accessible, it was also important that the person providing support did so in a way that was understandable and led to the participant learning how to use the ET.

The participants' own ambitions and perceived possibilities learning how to use ET could be decisive for whether they considered it useful for them to utilize support from others. If they did not consider it useful the consequence could be that others took over the ET use.

***Feeling secure when utilizing support*** - Utilizing or having support within reach was often necessary for the participants to feel secure when using ET and also often a prerequisite to use an ET at all. Feeling secure could be especially important in the initial use of ETs. Letting someone else take over the use of an ET could increase the participants feelings of security. Hence, feelings of security associated with utilizing support with ET could facilitate engagement in and performance of occupations, but it could also be related to a decreased performance of and engagement in occupations. Being a person utilizing support from others using ET could also generate feelings of vulnerability due to the dependence on other persons for performing daily occupations.

***Feeling embarrassed or guilty for utilizing support*** - To use ET independently was described as a confirmation of personal competence. To be a person utilizing support with ET was often associated with one's own shortcomings and with feelings of embarrassment. It could also lead to feelings of guilt towards the person giving support. How entitled the participants perceived themselves to be in having support from others could vary with the type of technology they needed support with, from whom the support was provided and to what extent the support was given. Utilizing support with ICTs seemed less likely to generate feelings of embarrassment than utilizing support with domestic ETs. Support provided by sellers or others within their profession was less likely to lead to feelings of guilt as compared to when a friend or family member provided support. Feelings of guilt towards friends or family that provided support could be eased by offering something in return, showing the importance of reciprocity in this context. Utilizing support occasionally was not associated with embarrassment or being a burden for others in the same extent as being someone with a continuous need of support. However, having continued support in the form of collaboration with a partner was not as associated with feelings of guilt even if it was utilized continuously. This suggests again that reciprocity within the relationship between the participants and the person giving support can reduce feelings of guilt.

## 5 GENERAL DISCUSSION

The findings from the studies in this thesis contributes with knowledge regarding how ET use is related to daily life occupations and the need of support among older adults with and without cognitive impairments. The studies confirmed that ET use and ADL performance are associated among older adults with cognitive impairments, and they also provided new knowledge on how ETs are incorporated into the daily life occupations of older adults and how occupations can change as new ETs become available. The thesis also provided knowledge of the usefulness of an instrument measuring ET use so as to predict need of support in daily life among older adults with cognitive impairments. Also, knowledge of how support in using ET was utilized, and the consequences different ways of utilizing support could have for occupational performance and engagement among older adults with or without cognitive impairments, was generated within this thesis.

The findings will be discussed in the following sections:

- Amount of relevant ETs and its significance for daily life occupations, and need of support among older adults with and without cognitive impairments.
- Occupational identity and competence in relation to ET use among older adults with and without cognitive impairments.
- Occupational change and adaptation in relation to ET use: An individual or societal challenge?
- Identifying older adults with functional limitations due to challenges using ET.

### 5.1 AMOUNT OF RELEVANT ETs AND ITS SIGNIFICANCE FOR DAILY LIFE OCCUPATIONS, AND NEED OF SUPPORT AMONG OLDER ADULTS WITH AND WITHOUT COGNITIVE IMPAIRMENTS

One of the concepts related to ET use investigated within this thesis was Amount of relevant ETs. The Amount of relevant ETs, measured by the full version of ETUQ comprising about 90 ETs, has in another study been found to discriminate between groups of older adults with no known cognitive impairment, with MCI and with mild stage AD (10). Within study I the group consisting of persons with MCI had a significantly higher Amount of relevant ETs than the group diagnosed with mild AD. This further supports that the Amount of relevant ETs is a measure that can be viewed as being sensitive enough to separate these two groups' with probable subtle cognitive and functional impairments from each other. In study III, the findings indicated that both the Amount of relevant ETs and the Ability to use ET measured by the S-ETUQ were useful for predicting need of support in daily life among older adults with MCI and AD. Among people with cognitive impairment, you would expect that it is foremost the Ability to use ET that is related to need of support in daily life because performance abilities are known to be decreased among persons with cognitive impairments (13) and that decreasing ADL performance abilities, especially process ability, has been proven to be associated with decreasing functional level among persons with AD (72). Hence, the link between ADL performance and Ability to use ET is almost self-evident. The



Amount of relevant ETs was not expected to be as directly related to ADL performance because the link between having reduced cognitive functions and using fewer ETs is not as obvious as the link between decreased cognitive function and Ability to use ET. That these two measures of ET use turned out to be equally useful for making predictions of need of support among older adults with cognitive impairments is therefore somewhat surprising. Possible explanations for the usefulness of the Amount of relevant ETs for both differentiating groups that have relatively subtle cognitive impairments from each other and predicting need of support in those groups are reflected on below.

Potential answers to how Ability to use ET and Amount of relevant ET are related to need for support among older adults with cognitive impairments might be found in the qualitative studies in this thesis. How many ETs a person perceives as being relevant in their daily life is likely to be a direct consequence of to what extent they incorporate new ETs, i.e. a person that incorporates many ETs into daily life occupations is likely to have a higher amount of relevant ETs compared to someone who incorporates fewer ETs. In study II and IV incorporation of new ETs was dependent on the participant's perceptions of occupational purposes, needs to feel safe, what kind of ET user they wanted to be and possibilities to utilize support. The incorporation of ETs and hence also Amount of relevant ETs can therefore be seen as reflecting a variety of both person-specific and environmental components that constitutes the dynamic system of human occupation as described in the MoHO (1). The MoHO can also be used to scrutinize why the Amount of relevant ETs identified persons in need of support in a different way than Ability to use ET. Ability to use ET is likely to be a reflection of a person's performance abilities and Amount of relevant ETs is likely related to various aspects tied to both personal and environmental components. This difference of to what extent the measure of Ability to use ET and Amount of relevant ETs reflects personal and environmental components significant for occupational engagement and performance can be the reason that they had different effects in the statistical analyses of study II. The measure of Amount of relevant ETs discriminated between individuals who were independent and those in need of assistance in daily life (minimal, moderate or maximal), while the measure of Ability to use ET discriminated between individuals who needed moderate or maximal assistance in daily life and those who were independent or needed minimal support. Why the two measures of ET use identified persons in need of support at different levels is a phenomenon worth exploring further. However, in this thesis this will not be covered in-depth due to the methodological limitations of study III in terms of a limited sample size and the occurrence of outliers that potentially had a large impact on the outcomes of the statistical models. Rather, it is worth exploring further if these findings are consistent also within studies based on larger sample sizes.

What makes the findings of the Amount of relevant ETs useful for differentiating between groups of people with MCI and AD and for predicting the need for support in these groups that emerged in study I and III even more interesting is the fact that it was the short version of the ETUQ that was used. The S-ETUQ contains 33 ETs; hence it is likely that it only reflects a small proportion of the ETs that an older adult is likely to encounter in their daily lives. It

was, therefore not expected to be a very sensitive measure for differentiating between overall relatively high functioning groups, but still it turned out to be so. This finding of the Amount of relevant ETs as a useful and sensitive measure among older adults with subtle cognitive and functional impairments is further supported by a recently published study. Within that study the Amount of relevant ETs measured by the S-ETUQ discriminated between people with no known cognitive impairments, subjective cognitive impairment and MCI (9). Hence, the S-ETUQ shows convincing potential to be an instrument sensitive enough to discover functional impairments among older adults who have mild forms of cognitive impairments that has been requested within the literature (36). In addition the ETUQ is likely to be especially useful if both the measure of Ability to use ET and the Amount of relevant ETs are used, since it then reflects a person's performance ability as well as other personal and environmental components.

## **5.2 OCCUPATIONAL IDENTITY AND COMPETENCE IN RELATION TO ET USE AMONG OLDER ADULTS WITH AND WITHOUT COGNITIVE IMPAIRMENTS**

In study II, the participants described how ET use was important for their perception of themselves as competent at the same time as exaggerated use of ET was not in line with the kind of ET user they wanted to be, in other words not in line with their identity as technology users. In study IV, utilizing support with ET was often regarded by the participants as a consequence of their own shortcomings, and it could generate feelings of embarrassment and guilt. Hence, feeling embarrassed could be a consequence of not demonstrating competence in using ET. In study IV, the utilization of support with ET use was partly dependent on the participant's perception of their own ability to learn, i.e. their perception of their own competence. These findings confirm that in the western world having and using objects in daily occupations can be a way of creating a sense of self and expressing identity that has been suggested in an interpretive study (84). The findings are also in line with other studies focusing on ET use among older adults with cognitive impairments. In a study exploring learning of ET among older adults with AD, the participants perception of whether ET was something for them emerged as a main theme that was decisive for if and how they learned to use ET (61). In another study exploring readiness to use ET among people with AD from the perspective of significant others the images the significant others had of themselves, as well as their perception of the person with AD, could be decisive for their readiness to use ET. ETs perceived as stigmatizing could be rejected (60). According to the MoHO, occupational identity is a composite sense of who one is and wishes to become and has to do with the subjective meaning of occupations. Competence has to do with the actions that comply with the occupational identity (1). In addition, it has been suggested that having an acceptable identity contributes to meaning, coherence and well-being in life, and that being limited in the engagement in and performance of occupations, and hence present ourselves as competent, can threaten people's identity (85). The connection between engagement in occupations and identity have also been confirmed in empirical studies (86, 87). Drawing on the findings of study II and IV, identity and competence can, based on the MoHOs (1) definitions, and

Christiansen's ideas of competence and identity (85), be exemplified by how the participants strive towards being a certain kind of technology user was decisive for their use of ET within daily life occupations, how that striving was driven by achieving feelings of competence, and how feelings of embarrassment could be a consequence of not having the competence to independently use ET.

The findings of study II and IV, together with previous research identifying links between ET use and identity and competence as well as more general associations between occupation and identity and competence, builds quite a strong evidence base for claiming that an individual's occupational identity and need for feeling competent is an aspect that is decisive for ET use in daily life occupations among older adults with and without cognitive impairments.

With that in mind I will also reflect on the findings of study I and III in relation to the concepts of identity and competence. Study I showed that the group of people with AD in general had a lower Ability to use ET and ADL ability than those with MCI and study III found that lack of Ability to use ET or having a low Amount of relevant ETs was associated with a need of assistance in daily life. This indicates that cognitive decline is associated with limitations in both ET use and daily life occupations. Therefore, the risk of experiencing a disrupted identity and lack of feeling competent might be greater among those with more advanced cognitive impairments. Hence, the effects functional limitations caused by ET use might have on a person's perception of their own competence and identity should be given attention especially among those with more advanced cognitive decline.

It has also been suggested that a person's occupational identity shapes and is shaped by the social context and that occupations are the mean by which we communicate our identities as competent person towards others (85, 86). Hence other people's views and expectations of your occupational engagement and performance are likely to affect the occupational identity you strive towards as well as the way you want to communicate competence. In relation to ET, this can be exemplified by how use of a certain ET can communicate that a person has the resources and knowledge to use that ET. Old age is associated with stereotypes that attributes older adults with characteristics of incompetence (88) and as unwilling and unable to learn new technologies (89). These ageist stereotypes are not problematic merely due to the expectations and treatment of others. It is also problematic, since these negative stereotypes can be integrated by the older adults themselves and have a negative impact on technology use. This phenomenon has been suggested to contribute to the digital divide between age groups (90). In study IV, signs of such an incorporation of negative ageist stereotypes can be seen in the findings. The participants tended to see their own shortcomings as the reason they could not use ET independently, and said for example that they were too stupid or too old to be able to use an ET. Some participants also viewed their own ability to learn as limited. That older adults construct their own identities under the influence of these ageist stereotypes is likely to contradict technology use within occupations since it might increase their perceptions of themselves as incapable and unable to learn how to use ET. Such perceptions

might of course, sometimes be accurate but also contradicts research that has found that older adults with cognitive impairments do strive towards updating in relation to technology use (91) and can be capable of learning and using technology (60, 61). That older adults would be unwilling to use or uninterested in using technology is also contradictory to the findings in study II, which show how the participants strive towards being ET users, and of the findings in study IV that showed how the participants actively choose to utilize support to learn how to use new ETs. Hence, negative ageist stereotypes, whether they are incorporated by older adults themselves or adopted by others, can have unnecessary negative influences of older adults ET use and should be opposed.

### **5.3 OCCUPATIONAL CHANGE AND ADAPTATION IN RELATION TO ET USE: AN INDIVIDUAL OR SOCIETAL CHALLENGE?**

The MoHO suggests that occupational identity and competence are two closely related concepts that, together with the environment, lead to occupational adaptation. According to the MoHO, occupational adaptation results from a person's striving to achieve correspondence between a positive occupational identity and competence over time (1).

Study II revealed that if and how the participants incorporated new technologies into daily life occupations was partly dependent on their striving towards being a certain type of technology user. This can be seen as the participants' going through adaptations, hence a process aiming towards correspondence between their identities (as technology user) and their competence (to use technology) (1). In study II and IV it is illustrated how occupational adaptation can be the result of a disruption between identity and competence caused by the environment, i.e. the introduction of new ETs where their use (or non-use) can both affect a person's identity and perceived competence and cause a need to reconstruct a competent identity by adaptation. Within the MoHo (1) adaptation is first and foremost described as being related to life changes, as when an individual gets an illness or impairment, and hence the model does not offer a developed understanding of the concept of occupational adaptation when it is caused by environmental aspects.

Also, the concepts of occupational change and how occupations work as a dynamic system according to the MoHO can be scrutinized by using the findings of study II and IV.

According to the MoHO, a change in any aspect, personal or environmental, can create a new dynamic where new thoughts, emotions, and/or actions might emerge as a result (1). The findings of this study give some insight into the understanding of occupations and their dynamics, as it can be seen as an illustration of how a, sometimes quite small, change in the environment can have extensive effects on the dynamic of an occupation. Such effects are shown in study II and IV where, for example, use of ET was found to have consequences for the participants' sense of their own competence and the purposes they saw in performing an occupation. Hence, disruptions leading to occupational change and adaptation among older adults can be caused by changes in the environment, e.g. the implementation of or access to new technological objects. Also when it comes to occupational changes caused by environmental changes, as when new ET is incorporated into an occupation, the MoHO is

limited due to its focus on primarily how occupational change is triggered by change within a person.

The fact that occupational change and need for adaption can be caused by challenges in the environment, such as challenges caused by the technological development, highlights that change and adaptation can also be triggered by circumstances beyond the control of the individuals it affects. This implies that challenges with ET use among older adults are not an issue that only should be approached at an individual level, but is rather an issue that also should be addressed at a societal level, as it is a result of how different stakeholders develop and implement ETs.

Criticism has been levelled regarding considering of occupational challenges as individual problems rather than as collective or social problems within the field of occupational science (92-94). Such an individualistic view can prevent the understanding of, and actions targeted to issues among people who are experiencing systematic disadvantages affecting their possibilities of performing and engaging in occupations. For example, if functional limitations caused by challenges using ET are seen solely as an individual problem, this might prohibit interventions aiming to prevent these limitations on a societal level. The findings in this thesis together with previous research indicates that older adults as a group are experiencing systematic disadvantages (8, 11, 12) that affect their engagement in and performance of occupations due to technology use (48). To address the inequalities that might come out of these systematic disadvantages actions addressing ET use among older adults with and without cognitive impairments needs to be taken at a societal level. Such actions might, for example, be an increased awareness of and compliance to the aspects influencing ET use specifically among older adults with and without cognitive impairment, e.g. their need to feel safe and in control when using ET or their perceptions of how support can be utilized for them to be able to learn an ET, something that emerged in study II and IV.

The individualized view of occupations within the MoHO (1) has been problematized in relation to the findings in this thesis as well as in papers concerning the use of system theory for conceptualizing human occupations (92, 93, 95). The focus on individuals in the MoHO, in combination with its lack of providing a comprehensive theoretical framework for understanding how occupational change and adaptation can be triggered by the environment, highlights the need for additional theoretical frameworks to understand the relationships between individuals, occupations, and ET use. In future studies, choosing a theoretical framework that is more suitable for understanding relations between occupational change/adaptation and environment as well as choosing a less individualized framework would probably enhance the possibilities of understanding how ET use is related to daily life occupations and at what levels (societal or individual) the challenges of ET use can most effectively be addressed.

#### **5.4 IDENTIFYING OLDER ADULTS WITH FUNCTIONAL LIMITATIONS DUE TO CHALLENGES USING ET**

Another issue to be given attention, at a societal as well as an individual level, in order to prevent older adults' occupational performance and engagement being reduced due to limitations in ET use is the identification of those people in need of support or other kinds of interventions. Occupational limitations caused by challenges using ET among older adults with and without cognitive impairments should not only be treated as an individual issue, as stated above. However, there are still individuals within this group who are likely to be extra vulnerable to experiencing challenges using ET. Hence, these individuals should be identified and approached with adequate methods in order to offer support or other targeted interventions.

Previous studies confirm that older adults with cognitive impairments are likely to experience greater challenges in ET use than others within the same age group (9, 10). However, there is also evidence of older adults without cognitive impairments experiencing challenges in ET use (51, 52, 55). The results of study II and IV illustrates how some of the participants experienced challenges in relation to ET use, even though they did not have cognitive impairments. Hence, solely using diagnosis or level of cognitive impairment is not likely to be a very accurate way of identifying people with functional limitations caused by challenges in using ET. Such an approach might lead to a large proportion of those who experiences functional limitations related to ET use going unnoticed. This issue has been addressed in a debate paper written by myself and colleagues relating ET use to occupational injustices (48). In that paper, occupation-centred measures were suggested as a way of identifying those with a risk of being limited in their occupations due to technology use. The findings of study III indicate that the ETUQ might be such an instrument, but evidence of how ETUQ predicts function among older adults without cognitive impairments is lacking. The ETUQ has proven to be a valid and sensitive measure when used among older adults both with and without cognitive impairments (9, 10) as well as among younger persons with acquired brain injury or mental retardation (96, 97). The evidence base of ETUQ as a valid and sensitive measure in a variety of groups together with the findings of study III, which show the ETUQ's potential to identify need of support among older adults with MCI or mild stage AD, indicates that it could be an instrument with potential also to discover functional limitations among older adults regardless of their origin. For example, the functional limitations a person might have due to challenges using ET could be discovered by the ETUQ even if the challenges are caused by limited motor ability, lack of support, lack of control, or not identifying oneself as an ET user (thus, aspects that emerged as related to ET use in study I, II and IV). When aiming to identify functional limitations with the use of ETUQ, using both the measure of Ability to use ET and Amount of relevant ETs is probably useful in order to acquire a more comprehensive estimation of a person's ET use and potential functional limitations as they turned to capture need of support at different levels in study III. Including the measure of Amount of relevant ETs might be even more significant among older adults without cognitive impairments than among those with cognitive impairments due to its

potential to capture a larger variety of aspects potentially affecting ET use than the ability-measure (as argued for above).

## **5.5 METHODOLOGICAL CONSIDERATIONS**

In this thesis, different methodologies and approaches have been used to investigate and explore how ET use, daily life occupations, and need of support are related. Each study included in the thesis has its own methodological limitations and strengths and in the following sections the main methodological considerations will be highlighted and reflected on. Firstly, some more general reflections regarding the use of different concepts and methodologies within this thesis will be presented.

### **5.5.1 The use of different concepts and methodologies**

Triangulation within research can among other things be the combination of two or more data sources, methodologies, or theoretical perspectives in order to increase the understanding of a phenomena (98). Using different perspectives and methodologies to explore the same topic is also a way of strengthening the validity of research findings (99). Hence, the credibility of the general findings of the thesis is strengthened by the use of different concepts and methodologies.

Another consequence of using different concepts and methodologies to explore an issue is that it reveals complexities and details that might not be possible to reach an understanding of by the use of a single concepts and/or methodology. The findings of study I, that found that associations between ADL performance and Ability to use ET were stronger among those with MCI than those with AD and also that ADL motor abilities are related to ET use among older adults with cognitive impairments. Study II gave knowledge of how subjective perceptions of aspects such as occupational purposes and competence was decisive for ET use among older adults. The findings of study II can be seen as complementing the findings of statistical associations between performances components (ADL performance and Ability to use ET) found in study I and hence increasing the possibilities to understand and target challenges in ET use among older adults with, and without cognitive impairment. Also, the studies concerning support in relation to ET applied different conceptualisations and methodologies. In study III Amount of relevant ETs and Ability to use ET identified need of support at different levels. The complexities within those findings were not possible to fully understand within the scope of the study design and approach and the need for more explorative approaches was evident in order to understand the links between ET use and need of support. This was in a way conducted within study IV, where an explorative approach was used to explore older adult's utilisation of support from others with ET use and hence gave a more in-depth knowledge useful for understanding the role of support in relation to ET use. In conclusion, using different concepts and methodologies to explore relationships between ET use, daily life occupations, and need of support strengthens the credibility of the overall findings of the thesis. At the same time, it contributes new knowledge of the complexities in

those relationships useful for identifying and supporting older adults with functional limitations caused by challenges in ET use.

### **5.5.2 Sampling**

A main methodological limitation of this thesis is the sampling of participants. The participants within the studies were all recruited within a Swedish urban or sub-urban context. Information about the participant's socioeconomic status and ethnicity were not collected and hence we do not know how diverse the sample is regarding those aspects. As there are indications of both socioeconomic status and ethnicity being related to technology use among older adults (100, 101) the findings in the thesis needs to be interpreted with the lack of knowledge of how diverse the samples are regarding those aspects in mind. In addition, the perspective of people living in rural areas is not well represented within the findings. There are studies indicating that people living in rural areas are using less technology than those living in urban areas (100-102) hence also this lack of diversity needs to be considered when generalisability or transferability of the findings are estimated and discussed.

During the data collection and analyses of study IV it also seemed as though the majority of the participants had easy access to people supporting them with ET use. Even though I got the personal impression of the participants having easier access to support than most older adults, it was not possible to confirm this within the study. However, this impression might be due to people with larger social networks being recruited to this study to a larger extent than people with narrower social networks. Hence, also a potential lack of variation regarding the size of social networks in this sample should be considered when estimating the transferability of the findings in study IV. In order to increase generalisability and transferability of future studies concerning ET use, support, and daily life occupations among older adults with or without cognitive impairments participants, characteristics such as socioeconomic status, ethnicity, and the size of a person's social network and these characteristics potential effects on ET use needs to be considered.

The studies within this thesis use different approaches and perspectives to explore the main aim as described previously. This decision also led to a variety in characteristics of the participants included. Study I and III included participants with MCI and AD and study II and IV included both older adults with and without cognitive impairments. This was an appropriate choice due to the different characteristics of the separate studies, but might also bring some uncertainties regarding what target population this thesis as a whole has. Is the target group older adults in general or those with cognitive impairment due to AD or MCI? There is no simple answer to that question, rather it is a quite complex matter. Within study I and III the participants were all diagnosed with AD or MCI and hence these findings can be applied to that target group specifically but might also apply to other populations of older adults. In study II and IV the sample was a mix of people with and without cognitive impairments but the findings from these studies does not emphasize the role of having a cognitive impairment. Hence, it is likely that those findings can apply to both older adults



with and without cognitive impairment. To achieve a better understanding of how the findings of this thesis apply to different groups within the population of older adults, additional research should be conducted with an approach targeted towards making such distinctions. This could for example be achieved by investigating similar aims of the conducted quantitative studies (study I and III) in other groups within the population of older adults, e.g. older adults with cognitive impairments of other origins or older adults without cognitive impairments. The findings of the qualitative studies within this thesis (study II and IV) could also be explored further among older adults with and without cognitive impairment with a more distinct ambition to explore the role of cognition in relation to ET use and need of support.

The studies within this thesis included older adults and the inclusion criteria regarding age was being over 55 in study I and III and over 65 in study II and IV. There are indications of non- use of technology not having a linear but an exponential association with age among older adults over 70 (55). Hence it is likely that there are extensive differences in ET use within the group of older adults where the younger older adults might have a significantly higher degree of ET use. Hence, treating older adults as one age group, as done within this thesis, might lead to the challenge or needs that differ depending on age not being sufficiently explored. To explore ET use and need of support among older adults with respect to age in a more detailed way would probably increase the accuracy of the research findings and also the adequate provision of support and other interventions to relevant subgroups.

### **5.5.3 Data collection**

Within this thesis structured interviews and observations by the use of standardised questionnaires were applied (study I and III) as well as more unstructured explorative interviews (study II and IV) for collecting the data. Within all four studies the S-ETUQ was used to measure the participants' Ability to use ET by their own report. Overall, the participant seemed to be able to adequately do such estimations of their own abilities. However, there were also a few individuals among the older adults with cognitive impairments who estimated an unexpectedly high Ability to use ET in relation to their observed ADL performance in study I, indicating a discrepancy between observed and self-perceived ability. In addition, the somewhat stronger associations between observed ADL performance and self-perceived Ability to use ET within the MCI group compared to the AD groups in study I can be a consequence of larger discrepancies between observed and self-perceived ability among those with more advanced cognitive impairments (AD) than among those with less advanced cognitive impairments (MCI). Hence complementing the S-ETUQ with other more observation-based approaches to assess Ability to use ET for some individuals might be necessary to get a more comprehensive view of challenges using ET, especially among those with more advanced cognitive impairments. Such an approach can be offered by the assessment tool Management of Everyday Technology Assessment (META) (103, 104). The META is an observation based assessment of Ability to use ET that is validated for use among older adults both with and without cognitive impairments. Hence the

META could be a useful tool to use when self-reports are considered as being less reliable for estimating a person's Ability to use ET.

Within this thesis the S-ETUQ containing 33 technological objects was used to estimate the Amount of relevant ETs within a person's daily life. The original version of the ETUQ comprised 92 ETs (71) and hence is likely to provide a more comprehensive estimation of the Amount of ETs a person perceives as relevant in daily life. Still Amount of relevant ETs measured by S-ETUQ turned out to be a relatively sensitive measure in study I and III. However, it is probably not as useful when used to make predictions at an individual level due to the limited amount of ETs included. For example, when aiming to estimate an individual's Amount of relevant ET's within a clinical setting the 33 ETs in the S-ETUQ might not at all correspond with the ETs that specific client perceives as relevant in his or her daily life, given the large variation that can occur in individuals.

Within study II and IV interviews were used to explore ET use in relation to daily life occupations and need of support. Using observations within qualitative research can provide insights into social interactions, and can capture the influence of the physical and social environment and hence have potential to capture the setting in which people function in a more comprehensive way than interviews (105). Complementing qualitative interviews with observations can be especially valuable when aiming to explore the experiences of older adults who have cognitive impairments, who thus might have limited ability to recall and describe past events (106). Hence, observations of the participant's use of ET and utilisation of support could have enhanced the depth and richness of the data in study II and IV and in future studies with similar aims these need to be considered, especially when older adults with cognitive impairments are included. In addition, following older adults over time to explore incorporation of new ETs and how older adults relate to ongoing changes in technological development, as well as their utilisation of support in the implementation of new technology could enhance the understanding of the mechanisms behind, and consequences of, the technological development for this group.

Within the qualitative studies of this thesis (II and IV) a variety in cognitive function was sought among potential participants in the recruitment in order for the findings to reflect experiences of both people with and without cognitive impairment. Participants without cognitive impairments were initially included and interviewed before those with subjective cognitive impairment or dementia. This procedure made it possible to ask more specific questions and give concrete examples to trigger the older adults with cognitive impairments to tell about their experiences of ET use in daily life. However, this procedure also may have the disadvantage of having the participants without cognitive impairment functioning as "gatekeepers" in the theoretical sampling that was applied in study II. "Gatekeepers" refers to how the initial participants can set the direction for the coming data collection and analyses within a GT study (107). Within study II that can be interpreted as the perspectives of the participants without cognitive impairment might be reflected in the findings to a larger extent than the perspectives of the participants with subjective cognitive impairment or dementia.

The risk for having older adults without cognitive impairments being “gatekeepers” within a GT study could have been avoided if people with cognitive impairments were interviewed earlier on in the sampling. However, that procedure could lead to the drawback of not having concrete questions and examples to facilitate the interviews with the older adults with cognitive impairments.

#### **5.5.4 Data analyses**

Within study I and III the sample size was relatively small and may not be fully representative of the study population and hence the choice, and interpretation of statistical analyses needs to be given extra considerations. Non-parametric statistics were when variables did not demonstrate a normal distribution. Non-parametric statistics also have the advantage of being a more plausible choice than parametric methods in small sample sizes (108). Hence, the credibility of the findings in study I is strengthened by the choice of non-parametric statistics. In addition, the data was visually explored and presented in scatterplots and boxplots to investigate how the participants were distributed regarding ADL performance, functional level, Ability to use ET and Amount of relevant ETs (study I and III). This approach made it possible to also identify outliers that potentially could have a large impact on the findings as well as increasing the visibility for the readers to interpret and estimate the full results. Hence, despite a limited sample size in study I and III the findings in these studies can still be viewed as credible due to the visualization of the data and the use of non-parametric statistics.

The explorative qualitative studies (study II and IV) were conducted after the completion of study I and III. In the constructivist tradition of GT, which was applied in study II and IV, the researcher’s impact on the data is seen as unavoidable (68, 109). Conducting Study I and III before the explorative studies is according to this standpoint likely to have affected my preunderstanding of the topics in focus in these studies (II and IV). When collecting and analysing the data of study I and III I perceived the strong impression that ET use among the participants, beyond aspects of cognition, were strongly influenced by aspects such as personality, anxiety, and interest. This impression did contribute to the choice of including participants with varying cognitive levels in study II and IV but might also have affected the analysis and results of these studies in a less obvious way. This presupposition I carried of ET use being strongly influenced by aspects other than cognition might also very well have contributed to the significance of cognition not being sought and hence did not emerge as central within the findings of study II and IV. According to the constructivist standpoint, research reality arises within a specific situation that includes both what the participant and the researcher bring to it. Knowledge is seen as constructed rather than discovered implying that the researcher must be aware and reflexive of his or her own preconceptions and how these are related to actions and decision when conducting research (68). Hence, bringing my preconceptions to the explorative studies does not necessarily interfere with the credibility of the findings as long as I as a researcher stay aware and reflexive of those.

Within study II and IV Charmaz (68) guidelines for conducting GT were followed. However, when conducting study IV the data analyses took place after data collection ended and hence theoretical sampling, which is one of the foundations within GT (109), was not used in study IV. This procedure was chosen as the theoretical sampling of study II took place parallel to the data collection of study IV. Applying theoretical sampling in relation to two studies within the same data collection was estimated to be a too complicated task to achieve with preserved quality within the data collection and analyses. Hence, study IV is not referred to as a GT study rather as a constant comparative approach even though Charmaz (68) guidelines were strictly followed in other aspects. The consequences of not applying theoretical sampling in study IV was that the ideas and questions that occurred during data collection were not explored to the same extent as they would have been if theoretical sampling was applied. Hence, also the findings that emerged in this study did not become as rich and in-depth as the findings of study III.

Both explorative studies (study II and IV) within the thesis are limited in terms of what level of conceptualization and abstraction that is reached within the findings. What constitutes a theory differs depending on which GT approach is applied. According to Charmaz (68) the goal with conducting constructivist GT studies is to interpret how participants construct their realities in a world where multiple realities exists. This can be seen in contrast to the classical form of GT that aims to conceptualize underlying patterns within one reality (110). Hence, having the perspective of classical GT the findings of study II and IV would not be classified as a theory. Applying Charmaz approach when constructing theory implies aiming for “interpretations that goes beyond ordinary explanations and understanding and attend to some realities and not to others” (68). That view corresponds with the findings in study II and IV, even though higher levels of conceptualizations and abstractions could have been reached.



## 6 CONCLUSIONS AND IMPLICATIONS

The findings of this thesis provide insights and new knowledge regarding how ET use is related to daily life occupations and need of support among older adults with and without cognitive impairments. In study I, associations between ADL performance and Ability to use ET among older adults with MCI or AD were confirmed using statistical analyses. Within study II, the incorporation of ETs into daily life occupations and the effects this had on occupational engagement was further explored among older adults with and without cognitive impairments. Hence, previous more hypothesised relationships between ET use and daily life occupations were empirically confirmed. Hinders and driving forces for incorporation of new ETs as well as how changes related to ET use may impact daily life occupations and among older adults with and without cognitive impairments were identified. A good match between ET and: 1) occupational purposes, 2) a desired identity as ET user and 3) and needs for feeling safe and in control were found as driving forces for incorporating ET in to daily life occupations and for satisfaction when using ETs in this sample of older adults. Within study III, two measures of ET use; Ability to use ET and Amount of relevant ETs generated by a standardised instrument, the S-ETUQ, was found to have potential to identify need of support at different levels in daily life among older adults with MCI and AD. In study IV utilization of support from others in relation to ET use was explored more in-depth and was found to be of major importance for ET use among older adults' with and without cognitive impairments. Utilizing support from others was often crucial for new ETs to be initiated. In addition, utilizing support could be necessary to feel safe in ET use and was also found to exceed the actual use of ET as it was connected to meanings imbedded in social relationships.

Within the findings of this thesis aspects related to ET use among older adults with or without cognitive impairments emerged as important. Such aspects were:

- That ET use is indeed related to performance of and engagement in the daily life occupations of older adults with or without cognitive impairments.
- That also ADL motor abilities should be considered when estimating ability to use ET among older adults with cognitive impairments.
- That the amount of technological items and services older adult with cognitive impairment perceives as relevant in daily life might be related to how much support they need in daily life.
- That values and meanings related to social relationships are important for ET use and the utilization of support with ET among older adults with or without cognitive impairments.
- That the perception of identity and own competence of an older adult with or without cognitive impairment may be significant for his or her ET use.
- This thesis revealed that relationships between ET use and daily life occupations are multifaceted. It did that for example by confirming that observed ADL performance was related to Ability to use ET as well as it found relationships between ET use and

daily life occupations as related to a person's own perception of occupational purposes competence, and safety. Hence, the thesis highlights the need of having multi-faceted approaches when aiming to understand ET use and its relations to daily life occupations and need of support among older adults with and without cognitive impairments. Such diversity in approaches is called for both in research and in clinical practice.

To facilitate ET use and hence, also the engagement and performance of daily life occupations among older adults with and without cognitive impairments challenges with ET use can and should be identified and approached both at an individual and societal level. Based on the findings in this thesis the following aspects should be addressed:

- Ability to use ET is of significance for ADL performance among older adults with cognitive impairments and should be addressed when aiming to identify functional limitations in this group. This is of relevance both for identifying individuals in need of targeted interventions to stay engaged in for them needed and valued occupations, as well as for diagnosing cognitive impairments.
- Both Ability to use ET and the Amount of ETs perceived as relevant in daily life can be important aspects to consider in relation to how much support an older adult needs in order to manage their daily lives. Hence, when aiming to identify older adults with potential functional limitations due to challenges using ET not only the Ability to use ET should be considered but also the how many ETs a person perceives as relevant in his/her daily life.
- To facilitate use of ET in the daily life occupations of older adult's multiple aspects needs to be considered. For example, ability to use ET, feelings of security using ET, the need for a relevant purpose with the occupations in which the ET is aimed to be used, the identifications of one self as an ET user, and having a social network providing support with ET use are all aspects that emerged as related to ET use within this thesis.

Even if this thesis was not focused on developing interventions it still generated knowledge that is likely to be useful in interventions aiming to facilitate older adults ET use. Hence, also with regards to interventions some aspects that should be addressed based on the findings are suggested below:

- In order to decrease the risk of occupational purposes being lost with the implementation of new technology ET should be designed with respect to the specific occupations it is aimed to be used in.
- Technology should be designed in a way that facilitates feelings of safety and control.

- In order to facilitate ET use among older adults support from other persons that can provide a safe environment trying and learning ETs should be offered. Such interventions should also offer support by teaching how to learn ETs in a way that is understandable and leads to learning for the older adults. Interventions offering such support is likely to be especially important to those who have a limited access to support within their own social network.

## 6.1 FUTURE STUDIES

Within this thesis the Amount of relevant ETs was found to have an effects on need of support in daily life among older adults with MCI and AD. However, it is not known how use of specific ETs can be more or less significant for their daily lives. Studies exploring how challenges with specific ETs are related to functional limitations among older adults would increase the understanding of the relationship between ET use and need of support and potentially facilitate accuracy of targeted interventions.

Further studies are also needed to confirm the potential usefulness of ETUQ for predicting need of support in daily life. Larger sample sizes and greater variations in overall functional level (level of needed assistance) among participants are here needed to confirm the findings within this thesis and to develop cut-off criteria in relation to the ETUQ that could predict functional limitations.

How the relationships found between ET use, ADL performance and need of support in older adults with MCI and AD apply to older adults without cognitive impairments and to groups with cognitive impairments of other origins is not known. However, studies in other populations could give knowledge of whether these relationships are bound to certain diagnosis or more general.

To further explore concepts such as identity, competence, adaptation, and occupational purposes in theory generating studies in relations to ET use would deepen the understanding of ET use in the daily life occupations of older adults.





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