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WETAKECARE

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Report on needs and requirements

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Full Project Title:	WETAKECARE – Collaborative interaction in caring & training to improve the autonomy in Activities of Daily Living
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Executive Summary

Background: Societies in Europe are ageing. As people become older, the biological process of ageing leads to a decline in functional capabilities, being its level and impact highly dependent on each individual. This decline, such as reduction of movement ranges, muscular strength or sensorial capabilities, entails difficulties in the performance of Activities of the Daily Living (ADL) and results in need of care in daily life.

Goal of the Project: The WeTakeCare project aims to empower the collaborative caring and training between older persons and non-professional carers in order to promote the independent living of elderly people.

Goal of Work package 1: The project is subdivided into six work packages. Work Package 1 (M1-M12) has the objective to identify through a holistic user-centred approach, the needs and difficulties of older people as well as of their non-professional care givers in the performance of ADL and to define the best strategies to support them with the WeTakeCare system.

Methods: A literature review in databases, re-analyses of four data sets and focus-groups with elderly, caregivers and professionals have been conducted. The used data sets were: German Ageing Survey (DEAS), Austrian Health Survey 2007, SHARE - Survey of Health, Ageing and Retirement in Europe, Swiss Household Panel (SHP) and Assessment of Motor and Process Skills (AMPS) database. Three focus groups with elderly have been carried out, two in Switzerland, one in Spain. Two focus group included relatives and other non-professional caregiver (one in Switzerland, one in Spain) and health professional were interviewed in one focus group in Switzerland.

Results: The literature did not provide enough information to develop the WeTakeCare program. Therefore an unplanned re-analysis of four data sets from surveys carried out in European population 50 years and older has been conducted. Most problems reported were doing strenuous motor tasks such as climbing stairs, lifting, carrying or moving heavy objects etc. Cultural and gender differences can be observed: a higher percentage of Spanish speaking respondents indicate having difficulties compared to German speaking respondents and a higher percentage of women indicate having difficulties performing an ADL or motor task than men do, with exceptions only in typical household chores such as cooking or doing laundry. Focus group interviews confirmed the information from data: Basic ADLs like eating, drinking, bathing and toileting were reported as difficult in Spain. Limitations in Swiss population were moderate and often related to mobility, dressing, cleaning and preparing food. Participants liked the idea to practice with partner or in a group. Caregivers wanted support in caring through information, communication and contact to others. They need release from the daily burden through relaxing activities and training for their own health conditions.

Conclusion: Important activities to train with the WeTakeCare programme are tasks like bending, kneeling down or tasks that need balance and coordination e.g. getting dressed, putting on socks. It would be advisable to train also general fitness and improve strength. Lifting and carrying heavy things, shopping, walking 500 meters without aid, walking stairs up and down seem to be tasks worth training already in early ages, as limitations start early and are in higher ages very common. Different functions and technical requirements of the program could be detected and described. A lot of information has been gathered and serves for the next steps of program development.

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Abbreviations

ADL	Activities of daily living
BADL	Basic activities of daily living
IADL	Instrumental activities of daily living
IBV	Instituto de Biomecánica de Valencia
KP	Knowledge of performance
KR	Result of the performance
MMF	Mild to moderate frailty
MSF	Moderate to severe frailty
OT	Occupational Therapist
TS	Technological Specialist
WP	Workpackage
ZHAW	Zurich University of Applied Sciences

1 Introduction to the WeTakeCare Project

This chapter introduces the WeTakeCare project, defines the goals of the project and describes the overall approach. This is made from the point of view of WP1 *From needs to concepts and contents.* The second part of this chapter introduces this report resulting from the development of T1.1. *Identification of needs and requirements*.

1.1 Introduction to the WeTakeCare and WP1 From needs to concepts and contents

The WeTakeCare project aims to empower the collaborative caring and training between older persons and non-professional carers in order to promote the independent living of elderly people. The kick of meeting of the WeTakeCare Project took place in June 2013. Therefore, now we are on month 8th. During this time, the efforts of the consortium have been mainly focused on WP1 (M1-M12). The objective of this first WP is to identify, through a holistic user-centred approach, the needs and difficulties of older persons, as well as of their non-professional care givers, in the performance of ADL and to define the best strategies to support them with the WeTakeCare system.

WP1 *From needs to concepts and contents* has to establish the base for the future development of the system fixing their activities and functionalities to be implemented as well as the materials of support that have to be developed for the users and caregivers. This development will be based on: (i) gestural controlled ADL exercises with Kinect, (ii) a web platform with courses, workshops and links to main care-giving blogs, forums and social networks and (iii) other general functionalities such as agenda & reminders, communication or TV control.

WP1 is the first of the six WP in which the WeTakeCare project is subdivided:

- WP1. From needs to Concepts and Contents (ZHAW)
- WP2. Product system definition and development (KAASA)
- WP3. Product system integration (CPMTI)
- WP4. Validation and Evaluation (IBV)
- WP5. Dissemination and exploitation (IBV).
- WP6. Project Management (IBV)

At this moment, we are having an intensive work in WP1. We have obtained the first important results in relation to the definitions of user and caregivers needs, and to the activities and functionalities that have to be implemented in the systems during the development work packages (WP2 and WP3).

WP1 is one of the WP with more intensive participation of the users, persons, aged 50+, presenting an initial lost of capabilities and/or having a light to moderate physical disability. This lost of capabilities increases the difficulty to perform ADL, leading frequently to its poor execution and therefore finally taken up by carer. This uptake of ADL leads to an over-care situation, which can ultimately diminish autonomy of the older person.

The integration of the end-users in the WeTakeCare project is being very active. They have been involved in the different methodologies to obtain information about needs and requirements of

the users (focus groups or personal interviews, meeting with advisory group in Switzerland on 2013.09.26). A representative of VASOS took a very active role during the meeting of the Consortium in Cordoba with the objective, among others, to fix the target group and to define the main aspects of the application. Next key point will be the validation of the initial proposal for the activities and functionalities to be implemented with the advisory group that have been supervising all the work. The meeting will be at the end of February.

All the public information of the WeTakeCare project is uploaded in the following website: http://wetakecare.ibv.org/

1.2 Introduction to this Report

This report shows the proceedings and results of T1.1 *Identification of needs and requirements* of WP1 of the WeTakeCare project. We have structured the report in 6 chapters, including this one. In Chapter 2 the background upon which this project is arranged is described and the theoretical background of skill acquisition and motor learning as well as information about the creation of virtual environments is given. Chapter 3 contains the literature review, which was undertaken to find relevant ADL that will be addressed by the planned program. As the literature review was not very fruitful, a data analysis was conducted. Chapter 4 describes the method of data analysis and presents the results of ADL performance amongst people 50 years or older in Europe. Chapter 5 describes the procedure of focus group interviews and presents the result of the 6 conducted interviews in Spain and Switzerland. Chapter 6 is a summary of the findings and conclusions of needs and requirements. The literature is listed in Chapter 7 followed by the Appendix.

2 Background

2.1 Ageing in Europe and Need for Training of Activities of Daily Living

Societies in Europe, as well as in other OECD countries, are ageing. The proportion of elderly people between 65 and 79 in the European society (EU 27) is expected to increase from just above 15% in 2010 to almost 25% in 2035 (Colombo et al., 2011). For the population above the age of 80 the OECD (Colombo et al., 2011) expects that over the next decades, OECD countries will continue to age, leading to around 4% of aged 80 years and older in 2010 and by the year 2050 an expected 9.4% of population. As for some European countries the increase is more gradual and reach relatively lower levels of about 9% (e.g. Norway, Sweden, Luxembourg, and Ireland), for Germany and Italy the projection of the OECD report goes even up to 15% of the population. As a result the share of people over 80 years in the OECD countries will triple.

As people become older, the biological process of ageing leads to a decline in functional capabilities, being its level and impact highly dependent on each individual (Poveda & Barbera, 2009). This decline, such as reduction of movement ranges, muscular strength or sensorial capabilities, entails difficulties in the performance of Activities of the Daily Living (ADL) (Hwang et al., 2006). “Activities of daily living (ADLs) are basic self-care tasks, akin to the kinds of skills that people usually learn in early childhood. They include the following: feeding, toileting, selecting proper attire, grooming, maintaining continence, putting on clothes, bathing, walking and transferring (such as moving from bed to wheelchair). ADLs are occasionally referred to as basic activities of daily living (BADLs). … Instrumental activities of daily living (IADLs) are the complex skills needed to successfully live independently. These skills are usually learned during the teenage years and include the following: managing finances, handling transportation (driving or navigating public transit), shopping, preparing meals, using the telephone and other communication devices, managing medications, housework and basic home maintenance. Together, ADLs and IADLs represent the skills that people usually need to be able to manage in order to live as independent adults”2.

In fact, according to several studies (Population Reference Bureau, 2007; European Commission, 2005 and 2003) between 6.8 – 14.1% of the senior population (10.2 – 21.2 Million people) have a light to moderate physical limitation hampering the autonomous performance of ADL. This situation is aggravated by the occurrence of disabilities resulting from falls, strokes, diseases, etc. The increase in difficulty to perform ADL by elderly people leads frequently to poor execution. This may lead to evasiveness in the execution of the ADL, the uptake by a non-professional or family carer or if several ADL are concerned to the need for professional care.

Therefore the number of people dependent on care and assistance is rising in Western countries (Colombo et al., 2011). Much of the tasks related to caring are taken up by relatives. In the OECD one in then adults is involved in informal care giving that is defined as providing help with personal care or basic Activities of Daily Living to people with limitations. While the percentage of people giving informal care is at around 10 to 11% for Switzerland, Germany and Austria, informal care giving is much more common in Spain and Italy with 15 to 16% of population reporting being involved in informal care giving (Colombo et al, 2011). Even a larger part of population is involved in instrumental activities of daily living, which are defines as functions which are concerned with a

[2] http://www.caring.com/articles/activities-of-daily-living-what-are-adls-and-iadls

person's ability to cope with her/his environment in terms of such adaptive tasks as shopping, cooking, housekeeping, laundry, use of transportation etc. Colombo et al (2011) estimate that one in three adults over the age of 50 is providing informal care.

As the demand of care is increasing on one hand, informal caregivers are not likely to step in as family structure and employment rates of women are changing. Therefore the demand for long-term care workers is expected to double by 2050 (OECD, 2011). At the same time many European countries are dealing with a shortage of trained healthcare professionals (e.g. Jaccard Ruedin & Waver, 2009; Simoens et al., 2005).

Solutions for these challenges in health care provisions need to be tackled soon. The rapid progress in communication technologies and digital electronics may provide solutions in health maintenance and care provision (McLean et al., 2011). The range of technologies serving patients to monitor and manage their disease but also to prevent diseases is increasing significantly as their market potential has been recognized. The new technologies to support care and security are increasingly applied in the assistance of elderly people and people with chronic diseases. The technologies enable patients to maintain their autonomy and allow them to live independently for a longer period of time. Technological solution may therefore serve the patient's interest in living for a longer period of time independently but also unburden the health care system. Living at home is moreover often mentioned to provide higher quality of live.

Devices for health monitoring, support and security therefore are expected to become increasingly popular (Meidert & Becker, 2013). Devices will be used for prediction and prevention. Instead of treating already existing conditions, the goal is to be able to prevent diseases altogether or manage them in an early state to prevent aggravation (Sadler, 2008).

With the Ambient Assisted Living Joint Program aims the European Union to „create better condition of life for the older adults and to strengthen the industrial opportunities in Europe through the use of information and communication technology (ICT). It carries out its mandate through the funding of across-national projects (at least three countries involved) that involves small and medium enterprises (SME), research bodies and user's organizations (representing the older adults)" (http://www.aal-europe.eu/about/ objectives).

WeTakeCare Project is a part of Call 5: „ICT-based Solutions for (Self-) Management of Daily Life Activities of Older Adults at Home". The program aims to enable and sustain older adults to continue managing their daily activities in their home by training ADLs and supporting their caregivers. To fulfill the objective a complex theoretical background has to be considered. The basic information is presented in the following chapter.

2.2 Skill Acquisition, Motor learning, Virtual Training

2.2.1 Performance of ADL

Performance is defined as „the action or process of performing a task or function" (Oxford Dictionary online: http://www.oxforddictionaries.com, download 2014-01-02). In Occupational Therapy performance is seen as the result of "a dynamic interdependence between person, the environment and the occupation" (CAOT 1997, p.32). According to the Canadian Occupational Performance Model (COPM, CAOT 1997, and Townsend, Polatajko 2007) performance is influenced by the following components:

- affective, cognitive and physical components of the person
- physical, social and institutional components of the environment and
- complexity and demands of the occupation or activity.

Therefore the WeTakeCare program can foster the performance of ADLs by affecting these different components:

1. physical, cognitive and affective state of the person by training and motivation
2. physical environment by adaptation and assistive devices and the social environment by supporting the care person
3. demands of the activity by suggesting new strategies for the performance.

Elderly need not only to train already mastered skills and habits, but to learn new skills, strategies and habits to compensate loss of functions (like vision, hearing, mobility and strength) or mild disabilities based on diseases (like rheumatism, arthritis etc.). Therefore they have to learn completely new ways of performance but also to „unlearn" automated movements.

2.2.2 Body-related learning and behaviour change

Because the ADLs are mainly physically performed activities, the learning, re-learning or unlearning is body-related learning. Body-related learning can be realized with different levels of reflection of the learner (Becker 2010). Daily routines evolve often without reflection and are more based on habituation and habitus (Bourdieu 1987) as on conscious decisions. They are like imprinted into the body and difficult to change. Therefore a first important step into the process of re-adaption in daily life is the recognition of the need to learn and change (Schäffter 1997). In adults different reactions to the irritation that daily routines don't work anymore are possible (Schäffter 1997). Learning is only one. Denying, avoiding and compensation without awareness can be observed very often. These reactions are well known as hindrances in prevention and health promotion (e.g. O'Brien Cousins 2003).

O'Brien Cousins (2003) asked people aged 55 to 92 years in 41 interviews about their thoughts on physical activities in their daily live. Her goal was to find out what brings or hinders people to life a physically active life. She integrated accepted models of behaviour change (Bandura 1997, Weinstein 1988, Prochaska and DiClemente 1983) and coded the interview data along to this model. Her main findings were:

- The main elements of current theory do seem to capture how elderly people think about their physical activities.
- Physically active people did not necessary express fewer barriers than inactive people, but they experienced more confidence in overcoming obstacles. They had clear triggers, goals, they reported to have social support and enjoy the activities they were doing regularly.
- Negative experiences in the past, like not being successful in sport, finding it to boring, to expensive, causing pain (e.g. knees), lack of peers to share the action with or not having the possibility to drive to the gym, pool or golf course are the main obstacles reported.

Triggering motivation comes often from self-perceived health threats or social prompts through doctors or peers. Clear goals like control of weight and mobility are important to perform the activities regularly. But the same health state can lead to opposite behaviour, e.g. after a cardiac arrest some people are totally afraid of physical activity whereas others start intensive exercising because they are frightened of further heart attacks. Little is known about the process that leads to one reaction or the other (O'Brien Cousins 2003). Even if people believe in the benefit and importance of physical activities they do not always come to realize their intentions. They got distracted with competitive life priorities and drift into inactivity. Active people in the opposite

overcome barriers by gave the activity the priority in their daily and weekly planning. Social encouragement from family, friends and health professionals seem to be crucial to maintain the active life. Active people are "highly efficacious for the activity they were in, and thus enjoyed participating" (O'Brien Cousins 2003, p. 447). The experience success and joy while performing and keep going because of the constant positive experience. There is still research needing to determine how some people develop strong commitments whereas others don't. Emotional and body-related experiences might be neglected in former and current research. The process of decision-making and behaviour change is mainly seen as a cognitive and reflected process in the human being. But theories from anthropology (e.g. Plessner 1928/1975), philosophy (Merleau-Ponty 1965, Waldenfels 1994), sociology (Butler 1993, Jäger 2004, Foucault 1977, Bourdieau 1987) as well as cognitive theory (Varela, Thompson 1992) lead to the equal importance of sensing, feeling and perceiving the body (Becker 2010). Cognitive structures evolve in action of the body within the environment. They form the habits, body image and result in intentions for further actions. Positive feelings and body experience must be created in exercises to result in the will and inner need for more of these positive experiences. Than the body itself guides the person to the commitment of performing a certain action. Clear goals, positive experience with the body and sharing with peers on a regularly basis are the key elements to in WeTakeCare because of this mechanisms.

To create positive experiences and the feeling of success and joy, it is important to build WeTakeCare on theories of motor learning and performance.

2.2.3 Motor learning and performance

Motor learning theories result from psychological research and provide knowledge about the processes of learning motor behaviour. Models like Fitts and Posner's (1967) discriminate the process in stages. The authors describe the following stages (subsumption from Polatajko, Mandich 2004, p. 37):

- **cognitive stage**: cognition guides the movements, high error rate, movements are inaccurate, inconsistent, slow and rigid. The learner is trying to understand the nature and requirements of the task.
- **associative stage**: performance is more successful, with higher speed and precision, movements are more relaxed and accurate, repetition is central in this stage.
- **autonomous stage**: movement is automatic, constant and coordinated, focus of attention on other skills or the environment is possible (dual task activities).

Central elements of the motor learning are feedback and practice.

2.2.3.1 Feedback

Feedback can be intrinsic or extrinsic. "Intrinsic refers to sensory-perceptual information received by the individual, such as visual, auditory, proprioceptive and tactile information, whereas extrinsic refers to feedback from an external source such as verbal instruction from a therapist" (Parker, Mountain, Hammerton 2011, p. 466). Extrinsic feedback can describe the characteristics of the movement as **knowledge of performance (KP) or can it can describe the results of the performance (KR**). It can either be delivered currently while the performance is going on or it can be given terminally after the performance has ended. The feedback can describe the errors made during the performance or it can also prescribe information how to correct the errors in future performance.

Feedback leads the individual's focus of attention during the learning process. The focus can be either on the effect of the movement (external focus, e.g. on the goal that should be reached) or on the movements and body parts (internal focus, e.g. on the arm that throws a ball) (Wulf & Prinz 2001). Experiments consistently demonstrated that participants using an external focus showed more effective performance and learning than participants who focused internally (e.g., Landers, Wulf, Wallmann, & Guadagnoli, 2005; McNevin & Wulf, 2002). Wulf, Töllner and Shea (2007) demonstrated that an external focus is especially important in difficult tasks. Weir, McNevin, Quinn and Wulf (2005) confirmed this result in participants aged 70 years and more. The older individuals benefit from the external focus, especially in performing difficult tasks.

If feedback is given by a technical system like in WeTakeCare by the Microsoft XBox, it has to be clear what kind of feedback has to be given in what kind of situation and learning state.
Parker, Mountain and Hammerton (2011) reviewed studies about **visual and auditory** feedback of computer technology in stroke rehabilitation. They found potential for functional improvement through the application of concurrent, visual Knowledge of Performance and subsequent Knowledge of results in patients with stroke. Only terminally visual feedback did not improve the performance of stroke patients who watched videotapes of themselves donning socks and shoes. But these patients rated a higher satisfaction with their performance than the control group without videotapes.
Concurrent and prescriptive KP can rapidly improve the performance but it also keeps the learner dependent on feedback and unable to self-correction. Therefore it is important to decide in constructing WeTakeCare how and when the feedback should be provided for elderly people.

2.2.3.2 Practice

Practice can be **massed** with the greatest amount of time used for exercising or **distributed** with rest between trails exceeded or equal to time amount of exercises. Distributed practice is more effective when the physical demands are high, the skill is complex or the motivation of the learner is low (Magill 1998, cited in Polatajko, Mandich 2004, p. 44).
Practice can be **blocked** in a fixed period of time or **random**ly spaced apart in time. Blocked practice seems to be more effective in the first stage of motor learning whereas randomized and more variable practice should be preferred if the learner is able to perform the task.
An activity can be practiced as a **whole** or broken down in **parts** that are first practiced separately. Complex and difficult task should be practiced in parts and then integrated in a whole.

The following Table 1 shows the recommended kind of feedback and exercise related to the stage of motor learning the learner is in.

Table 1 is a subsumption of information given in the book from Polatajko and Mandich (2004, p. 34-44).

Table 1: Feedback and practice in different stages of motor learning

Element	Cognitive Stage	Associative Stage	Autonomous stage
Extrinsic Feedback (information about the movement)	verbal feedback necessary		
Knowledge of result	detailed decelerated only if performance is especially well or wrong	Less detailed decelerated only if performance is especially well or wrong	Less feedback Less detailed decelerated only if performance is especially well or wrong
Knowledge of performance	Prescriptive (mention error and correction)	descriptive (error)	descriptive (error)
Intrinsic Feedback (sensory-perceptive)		auditory, visual, tactile, proprioceptive	auditory, visual, tactile, proprioceptive
Practice	blocked	randomized	randomized
	small blocks of different exercises	two or more movements with variations	two or more movements with variations

The relationship between complexity of task and practice is shown in the Table 2.

Table 2: Practice and complexity of task (subsumed from Polatajko, Mandich 2004, p. 36-44)

Simple, single task	Complex task
massed practice	Distributed practice also in physical demanding tasks and person with low motivation
Whole task training, important for transfer	Parted practice

2.2.3.3 Action observing and motor imagery

Other aspects in motor learning are the use of modelling an activity or movement and enhancing the motor imagery of the user.
Research from motor learning theory as well as from neuro-scientific and behavioural science suggests that observing the performance of an action improves the learning and performance of this task (e.g. Ertelt, Small, Solodkin, Dettmers, McNamara, Binkofski, Buccino, 2007, Mulder, 2007). Observation is for example successfully used in video therapy with stroke patients (Ertelt, Buccino, Dettmers, Binkofski 2007). Motor imagery provides additional benefits to conventional training (Zimmermann-Schlatter, Schuster, Puhan, Siekierka & Steurer, 2008).

The Microsoft Xbox Kinect has a special potential to provide a model in action performance and help the user to imagine himself in performing.

2.2.3.4 Generalisation and transfer

“Generalisation of learning refers to the degree that a specific skill, learned in a specific context, can be performed in another context” (Polatajko, Mandich 2004, p. 32). Generalisation is important to transfer the trained skills from the WeTakeCare program in the daily life of the users. Generalisation is influenced by:

- the way of learning,
- the degree of learning,
- similarity between the contexts and
- motivation.

Generalisation can be promoted by:

- providing direct feedback and reinforcement
- varying the practice
- practice in different contexts and making situations more difficult
- providing information about the usefulness of the skill in daily life
- involving relatives

(Polatajko, Mandich 2004, S. 32).
Generalisation can be supported by using virtual reality and the combination of real objects and support by the WeTakeCare system.

2.2.3.5 Virtual reality and training

“Virtual reality is defined as a computerized simulation in two or three dimensions that is in real time and interactive” (McComas & Sveistrup 2002; cited in Bisson et al., 2007, p. 17). The use of virtual reality for virtual augmented training has the potential to increase exercise behaviour in older adults (Van Schaik, Blake, Pernet et al. 2008) and to improve functional abilities and reaction times (Bisson et al., 2007). The advantages are mainly researched in neuro-rehabilitation e.g. post stroke (Laver, George, Thomas, Deutsch, Crotty 2011). De Bruin, Schoene, Pichierri and Smith (2010) stated that video gaming exercises could initiate a shift from negative to positive thoughts about exercises, an important aspect to gain the commitment from users for a long-term use of the WeTakeCare program, as already mentioned above. Older individuals benefit from visual and proprioceptive information during training and from the adaptation of the training environment according to their abilities (Bisson et al., 2007; deBruin et al., 2010). Merians, Poizner, Boian et al. (2006) demonstrated that improvement of hand movements after stroke was later transferred to the real world. A Cochrane review on virtual reality for stroke rehabilitation (Laver, George, Thomas, Deutsch & Crotty, 2011) showed a large significant effect from virtual reality training on ADL performance.

2.3 The creation of simulation environments

The term "simulator" encompasses a broad set of applications that are characterized by varying degrees that represent the nature and operation of systems, processes and procedures. In general terms, the simulators can be classified into three groups: for research, for entertainment and learning.

The simulators for research usually consist in models of a system, process or procedure with which the user can interact with to determine the behaviour of the object of representation in certain conditions. In this type of simulator is implemented an operating model, from which the user can manipulate variables and examine their implications.

The training of certain skills already learned, such as flying or driving, is not without risk. The training simulators consist of working models of vehicles, machines or protocols, sometimes supplemented with peripheral devices. The simulators aim to accumulate hours of experience to professionals, are facing critical situations and learn to successfully resolve all without experiencing real risk.

The simulators for learning, also called educational or didactic, are oriented applications to users, based on prior knowledge, develop skills that are part of their education or training program. Unlike the two aforementioned types, situations arise in which the student must solve cases, tasks or problems. Also, its didactic nature makes it particularly relevant to include an evaluation system that gives users clues about how continuing navigation and feedback on decisions and similar scoring system to quantify the user experience.

Training simulators in this proposal are a subset of the simulators for learning. The multimedia teaching resources including virtual scenarios highly faithful to reality. The user, faced with certain problems, cases or tasks, must make use of the skills required in their training. In these simulation environments, the user makes decisions and evaluates its consequences.

Like any project, the development of simulators is bounded. The requirements that limit development are various types: marked by the amount of content required for the formation, conditioned by the management of the project and determined by the licenses and intellectual property rights.

The simulators are defined as Digital Educational Objects (DEO) displaying virtual scenarios in which learning takes place through interaction with the elements likely situation. Faced with this situation, the student must take decisions and experience and analyse the consequences.

2.3.1 Educational requirements

2.3.1.1 Learning models

In simulation environments, the student must take an active role against learning situations. In this learning must underlie the models and following learning principles: learning by simulated action set and case-based learning. The learner has to set goals according to his problems in daily life, he or she needs to control his success and share practice with others in a playful way. Generalization and transfer in daily routines need to be supported by the system. Fun and positive body experience are crucial to support commitment of the user to the learning and ongoing training.

2.3.1.2 Instructional Design Sheets

The simulators must be made from Instructional Design Sheets (IDS) made by experts ZHAW, CUPS and IBV.
The IDS includes didactic information needed to develop a working definition of learning object minimum. These tabs include: prior knowledge that can be assumed by the student, objectives, content, methodological instructions, evaluation model, sequencing, timing, etc. From these records, we will outline the situations and cases to represent in the simulations.

2.3.2 Technical requirements

Simulators are the simplest and indivisible but explicit didactic function. In other words, the simulators will be developed from a complete instructional design (content, activities, evaluation, etc.). The general characteristics of these DEO shall be as follows:

- Compatibility: The simulators will be applications that can run with general purpose computers. Should be developed from technologies and formats compatible with most commonly used web browsers (Internet Explorer, Firefox, Opera and Safari).
- Physical and perceptual fidelity: It will include realistic representations of the environment to simulate how objects appear in various scenarios. The degree of accuracy of the proxy must be high and may receive the most important features of the simulated process.
- Accessibility: It will assess the incorporation of solutions that improve the care of special educational needs, as well as all the considerations that facilitate access to the contents. Should be taken into account considerations raised in the report "Guidelines for the design of educational environments accessible to visually impaired person" prepared by the ONCE (National Organization of the Blind of Spain).
- Usability: Simulators usability should be guided by the following considerations:
    - Structural homogeneity between the arrangements of the components of each screen.
    - Modern design, that offers clarity and comprehensiveness.
    - Appropriate writing and featured links.
    - Guided navigation before, during and after the interaction.
    - Specific feedback for each action taken.
    - Instructions and guidelines for user actions.
    - Error messages that allow decisions redirect.
    - Intuitiveness for easy navigation.
    - Optimized screen resolution at least 1024x768.
    - Pre-set for printing text and images, where relevant, in A4 format.
    - Identification Signs for all screens.
    - Text boxes that support varying sizes to accommodate translations, without inscription in the media.
- Architecture: Simulators must be disagreeable in the sense that its components must be located in directories that facilitate removal and independence. With the aim to facilitate translations, the architecture must guarantee the independence of the content, so that all this dependent elements (text, icons, etc.) are clearly located within the structure, and therefore are easily editable.

2.3.2.1 Educational Features

One of the elements that distinguish the other simulators to teaching simulator is the presence of an evaluation system.

For the purposes of this project are considered as components of the evaluation system the following:

- Instructional messages that facilitate user navigation and assisting him in some form of use of the simulator, the resolution of the case, problem or task. These messages can be of two types: the so-called "clues" or "hints" that can be received before deciding on the choice of action,

and the "feedback" that is received as information about adaptation of the action performed. In these simulations, the feedback messages have to realize the feedback requirements according to the motor learning theories presented in 2.2 (see above). Instructions should include a model that allows action observing and comparing the user's avatar behaviour to the model's behaviour.

- A classification of errors according to various educational criteria: mild, medium and severe, with impact on the human relationship in the operation of the machines, in the health of people, etc.
- A set of weighted indicators always visible, make the user to know the impact of every action taken with respect to the specific stage and for the entire case, task or problem to be performed.
- Practice needs to be possible as massed or distributed, blocked or randomly, in parts of the task or as a whole depending on the learning stage (also according to theory in 2.2, see above).

These assessment systems to quantify not only use concepts and the application of procedures includes indicators of the suitability of the attitude.

In summary, this evaluation allows to show the impact on learning of each of the contents. Therefore an assessment area will allow the user to assess and reassess his performance but also give report after practice of certain exercises. The assessment is also important for security reasons: the system will exclude exercises that bear a risk for certain difficulties.

2.3.2.2 Use Common Structures: Interface

The simulators will share a common structure, which is generally the application interface, these elements are described below.

2.3.2.2.1 The cover

When running the simulator accesses the cover, which includes the following elements: title, a brief description of the simulator, one DEMO and logging functions and access to the simulator.

The DEMO is a short film that will show the simulator, how it works and what general characteristics has. This is a "trailer" that, like a movie, provides a quick overview of the features of the simulator.

2.3.2.2.2 Register and login

Registration allows the students to create a user profile, which is identified by a username and password. In this profile, the user can save and retrieve their work sessions. Traces of a specific session will be kept to resume the session at a later time.

2.3.2.2.3 Status and Tracking

The user profile containing all information on their performance, which enables show reports results that traces the user.

The record also will collect all actions performed by the user in all recorded sessions and in each case made.

Performance reports errors differ depending on its severity and quantify the impact on the score.

2.3.2.2.4 Simulation modes

Simulation environments include the possibility to choose among several ways to provide a range simulation between guided simulation modes or fully off.

In the first case, the simulation is not very interactive; the user simply moves sequentially through the event, task or problem to be solved and observes its solution by a guide that explains each step.

At the other end, interactivity is full and the user must take all necessary decisions to continue with the simulation. Thus, in addition to not having any guide, the impact of their decisions affects their progress.

2.3.2.2.5 Theoretical concepts

Simulation environments are learning resources that require prior knowledge. So should that includes theoretical concepts that activate the necessary theoretical knowledge for use and prepare for further training.

The simulators include:

- General content, instantiations, organized by topics, with media treatment, primarily through illustrations, animations and video clips which place the activity simulated in a real plane.
- References to the main information sources and documentation.
- Interactive concept maps to facilitate understanding of processes.

2.3.2.2.6 Help

Help is oriented functionality to allow the user to use the application. For this reason, the simulator must include the following features:

- Search terms returned illustrated explanations on how to use the simulator.
- A teaching guide that includes a summary of the IDS, as well as other information relevant to the use of the resource. In particular, it includes: objectives, content, timing, methodological approach, holding didactic suggestions.
- A DEMO access.
- A tutorial, which is an interactive application that sequentially, explains in detail how to use the simulator. It is intended for all users, teachers and students.
- The Accessibility statement that details how to use the application if the user specifically requested to address any difficulties: reduced visibility reduced hearing, etc. Although the simulators attempt.

2.4 Conclusions

2.4.1 Summary of findings

Different theoretical backgrounds provide knowledge about performance of ADLs in elderly.

- Performing ADLs independently or with little help is important for an ageing generation in Europe. To remain capable in performance people need to stay active and adaptable to changes in their health conditions.
- Activities and body functions need to be trained but also new ways of performing routines have to be learned. That includes often the use of assisted devices.
- Theories of change management support the relationship between cognitive believes and commitment to training. Learning theories show that fun, feeling of success and positive body experience foster the dedication to training and learning.

- Theories of motor learning provide the knowledge for creating effective training exercises.
- Virtual training in a simulation environment has positive effect on performance.
- Educational and technical aspects have to be considered for creating the simulation environment.

3 Literature review

Throughout this section, the method, results and conclusion of the literature review about ADL is described.

3.1 Method

A literature review was carried out to retrieve available literature that examines what kind of restrictions elderly people (50+) report in their everyday life.

The literature review was carried out in four databases: PubMed, Cinahl, OTseeker and Ovid SP Wolters Kluwer. The following search terms were used: “activities of daily living”, “independent living”, “elderly living”, “elderly”, “aged”, “older adults”, “senior”, “occupational performance”, “functional limitations”, “mobility limitations”, “functional impaired elderly” and “participation”.

These queries resulted in more than 1000 articles. A high amount of these investigated limitations of a specific patient population like stroke patients or patients with mental diseases etc.

Due to the fact that only healthy elderly persons (with only light to moderate physical restraints) were included in our project, the following terms were excluded from our search: “Parkinson’s disease”, “stroke”, “dementia”, “cancer”, “arthritis”, “mental disease”, “fracture”, “frailty”, “psychological disorder/ psychiatrics” and “patients”.

In order to get precise evidence about the most frequent confinements of elderly people, we only chose studies, which address restrictions in detailed Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL). If only broadly used terms like “problems in ADL”, “problems in IADL” were listed in the articles without naming the concrete activities; the articles were excluded from the review (e.g. Béland & Zunzunegui, 1999).

Studies written before 1990 as like as studies that are based on data sets that we also analysed in our data re-analyses were excluded from our literature review (e.g. Seidel et al., 2011). Surveys that are based on the question of what constraints people in old people’s homes are suffering from were also excluded from the literature review. Furthermore studies that give priority to physical parameters like grip strength, walking speed and other mobile abilities were also not included in our review (e.g. Garatachea et al., 2009).

A few studies investigated what kind of activities elderly people do in their everyday life and what kind of occupational engagements enhance their life satisfaction (Björklund & Henriksson., 2003). Due to the fact that in this kind of studies ADL and IADL performances had no significance, these studies were not included in our review.

Finally only eight studies from the literature review remained and were considered relevant to this project and therefore taken into account. The list of articles can be found in appendix A1. The following tables 3 -6 show the search strategy and the number of found articles in the databases.

Table 3: Research strategy for literature review (Pubmed)

Including criteria		Excluding criteria													
PubMed	search result	NOT children	NOT Parkinson' disease	NOT stroke	NOT dementia	NOT cancer	NOT arthritis	NOT mental disease	NOT fractures	NOT nursery homes/dwelling homes	NOT frailty	NOT psychological disorder/ psychiatric	NOT care	NOT patients	include in analyses
Elderly AND Activities of daily living AND Occupational performance	47	42	40	29	28	27	26	18	16						2
Aged AND Independent Living AND Functional limitation	160	154	154	143	137	128	119	104	99	98	87	79	53		2
Elderly OR Senior AND Functional Limitation AND Functional impaired Elderly AND Activities of daily living	1850	1763	1580	1374	1286	1162								97	5
Elderly AND Participation AND Activities of daily living AND Functional limitations	41	37	35	29	27	24	20	20	18	18	18	18	10		2
ADL AND elderly AND participation AND mobility limitations	5														

Table 4: Research strategy for literature review (Cinahl)

Including criteria		Excluding criteria													
Cinahl	search result	NOT children	NOT Parkinson' disease	NOT stroke	NOT dementia	NOT cancer	NOT arthritis	NOT mental disease	NOT fractures	NOT nursery homes/ dwelling homes	NOT frailty	NOT psychological disorder/ psychiatric	NOT care	NOT patients	include in analyses
Elderly AND Activities of daily living AND Occupational performance	16														2
Aged AND Independent Living AND Functional limitation	1														0
Elderly AND Participation AND Activities of daily living AND Functional limitations	106	106	106	101	93	91	91	91	91	91	89	89	56	48	2
ADL AND elderly AND participation AND mobility limitations	106	104	104	99	89	89	89	89	89	**89**	89	54	54	48	2

Table 5: Research strategy for literature review (OT seeker)

including criteria		**excluding criteria**														
OT seeker	search result	NOT children	NOT Parkinson' disease	NOT stroke	NOT dementia	NOT cancer	NOT arthritis	NOT mental disease	NOT fractures	NOT nursery homes/dwelling homes	NOT frailty	NOT psychological disorder/ psychiatric	NOT care	NOT patients	NOT heart diseases	include in analyses
Elderly AND Activities of daily living AND Occupational performance	0															
Aged AND Independent Living AND Functional limitation	18	18	18	15	13	13	13	13	13	13	13	13		8		1
Elderly OR Senior AND Functional Limitation AND Functional impaired Elderly AND Activities of daily living	0															
Elderly AND Participation AND Activities of daily living ADL	0															
Elderly AND Participation	21	21	7	6	6	5	5	5	5	5	5	5	5	1		2
ADL AND elderly AND participation AND mobility limitations	0															

Table 6: Research strategy for literature review (Ovid SP Wolters Kluwe)

Including criteria		Excluding criteria														
Ovid SP Wolters Kluwer	Search result	NOT children	NOT parkinson` disease	NOT stroke	NOT dementia	NOT cancer	NOT arthritis	NOT mental disease	NOT fractures	NOT nursery homes/ dwelling homes	NOT frailty	NOT psychological disorder/ psychiatric	NOT care	NOT patients	NOT heart diseases	including analyzes
Elderly AND Activities of daily living AND Occupational performance	88	59	53	23	15	12	9									0
Aged AND Independent Living AND Functional limitation	12															0
Elderly OR Senior AND Functional Limitation AND Functional impaired Elderly AND Activities of daily living	0															2
Elderly AND Participation AND Activities of daily living ADL	242	154	141	70	43		27	27	25							0
Elderly AND Participation	5417	335	2491	dito	dito	1505	1439	1430						304	49	2

ADL AND elderly AND participation AND mobility limitations	0															0

wetakecare
Ambient Assisted Living
(AAL Joint programme)
Project number:
AL-2012-5-036 Call 5
AAL-010000-2013-15
www.wetakecare.ibv.org

3.2 Results

The eight remaining studies are all chosen because they give a detailed overview of the most frequently constrained abilities that older people have in their everyday life. However, it has to be mentioned that every included study on its own does not make a representative statement of the restrictions of a whole generation.

3.2.1 ADLs often mentioned

Two studies took place with a very small amount of participants and only refer to a defined area or municipality.

Lindenberger et al. (2010) investigated the needs of older people (70–103 years old) living in the Western part of Berlin. Beyond the question of activities in the leisure time and outdoor activities, the study shows in which ADLs older people have problems. The data was collected by using the Barthel Index (an ordinal scale used to measure performance in ADLs) and a specified questionnaire. The results show that 32% of the participants (n=516) do not need any help in performing the ADLs or IADLs, whereas 50% of the older people are dependent of help in doing the groceries or using the bus, train or car. Furthermore, 21% of the participants who still live in their own flats or houses need help with “bathing and showering” as well as with “walking stairways” and “taking a walk”.

More specific framework conditions are shown in the study of Drooglever et al. (1999). The authors studied the daily life of elderly women (n=506) in a rural area in the Eastern part of the Netherlands. They report that most of the elderly women are free from constraints in their ADLs. Due to the fact that only 50% of the participants had a driving licence, the most frequently required help was the transport to do the groceries and other outdoor activities. Furthermore, help in activities like “cleaning”, “preparing meals”, “making a bed” and “repairing” are often mentioned by the elderly women.

Very similar spatial framework conditions like in the previous study are defined in the study of Johansson et al. (2006). Data were collected through interviews at participants’ homes in one urban municipality in Sweden (n=102). Data on demographics, housing, earlier modifications, time in the current housing and formal support were collected using a structured questionnaire. The Functional Independence Measure (FIM; assesses physical and cognitive disability) was used to collect data on the level of functional independence in ADLs. Part I of the Client Clinician Assessment Protocol was used to collect data concerning the perceived level of difficulty in ADLs. The aim of the study by Johansson et al. (2006) is to examine the relationship between the performance of ADLs, the housing and living situation and the home modification that has been applied for in a sample of home modification applicants. Furthermore, the aim was to examine differences in the performance of ADLs between subgroups with different social support. According to the FIM outcomes, the participants in all ADLs reported high levels of independence. Total dependence (Md=7) was only found in activities related to bath/shower, transfer to toilet, walking/wheelchair and stairs. The activities reported as most difficult (Md=3) were managing stairs and getting in and out of the house. High levels of difficulties (Md=4) were also reported in the activities “dressing lower body”, “bath/showering”, “walking a block”, “getting in and out of bed”, “getting in and out of car”, “doing grocery shopping” and “light housework”.

Beyond the studies that focus residents within a defined area or municipality, other authors chose a target group on the basis of a specific age. In their article, Kalldalen et al. (2012) show the requirements of 85-year-old women and men related to their daily life. The study focused on

physical, cognitive and environmental factors in 85-year-old individuals and their abilities to perform meaningful activities. It is part of the “Swedish population study” (ELSA 85), which comprised all people born in 1922 and living in the municipality of Linköping (n=650 at baseline).

Zingmark & Bernspang (2011) considered only one task of everyday life activities. The purpose of their study was to compare two groups that were provided with home health care by their municipality to help them with bathing. Clients in the intervention group received occupational therapy interventions, whereas clients in the control group received ordinary home help services provided by the local municipality. A quasi-experimental non-equivalent control group design was used in which participants with reported difficulties in bathing were consecutively recruited from two municipalities. ADLs, the quality of life and home-help allocation were assessed at the baseline and after 15 weeks. In the study of Zingmark & Bernspang (2011), the clients were asked to describe their ability to perform each action using a four-point scale. Each activity consisted of several hierarchically ordered actions. Most participants (intervention and control group) pointed out difficulties in "pedicure", "washing body", "washing hair", "putting on socks and shoes", and “walking from one floor to another". Severe problems were reported in "walking in and out of house; walking in neighbourhood", "manicuring“, and “dressing lower trunk" and "dressing upper trunk". Interesting for our project is not the difference between the two groups but the data collected at the baseline.

3.2.2 Gender-specific difficulties in ADL performances

The study by Zingmark & Bernspang (2011) shows that, compared to men, a larger proportion of women was living alone and using the transportation service, personal alarms and mobility assistive technology more often. Men drove a car to a greater extent than women (64% vs. 9%). According to the assessment IAM (Instrumental Activity Measure), “cleaning” was the most frequently reported occupational performance problem for women, and “travelling” for men. The second most frequently reported problem was “walking outdoors” for women (especially “problems with large-scale shopping”) and “cleaning” for men. In the third place, women reported “travelling” and men “walking outdoors”, which refers to “walking long distances”, “walking fast”, “walking uphill” and “walking in the dark”. In terms of self-care, women have more difficulties in “showering and bathing”, while men emphasize more problems in “dressing/undressing”.

The main findings are that women experienced poorer health and more occupational performance problems compared to men. Mobility-related problems seem to be gender-specific; “transportation”, “shopping” and “cleaning” difficulties were more common among women, while men identified more outdoor life activities as problematic. Shopping problems can be related to transportation problems, both of which were more common among women than among men, who were still driving a car to a greater extent than women (Kalldalen et al., 2012).

The next article included in our review is very similar to the previous one. The “Danish 1905 Cohort Survey” (Nybo et al., 2001) focused on the functional status and self-rated health in 2262 nonagenarians. The objective of this paper was to describe the functional capabilities and health of nonagenarians by using three different sets of measurements: self-reported measures of ADL, objective tests of physical performance and self-rated health. In this study, five items covering Katz’s ADL index – “bathing”, “dressing”, “toileting”, “transfer”, and “feeding” – were used to construct a three-level five-item ADL scale. "Not disabled" was defined as independent in all items, "moderately disabled" was defined as independent in one or two items and "severely disabled"

was defined as dependent in three or more items. The authors pointed out that the participating men managed all ADL activities better than women and that they are scored higher than women on the functional ability scales. According to the five-item ADL scale, 50.1% of the men and 40.7% of the women were classified as not disabled. The following ADLs were reported as the most strenuous activities for men as well as for women: “run 100 meters", "walk in bad weather/good weather" and "do hard exercises". Within the agility scale, the most straining activities were: „cut toenails" and "take a bath" before "cut fingernails" and "wash hair" as well as "take socks and shoes on and off". The authors concluded that women, despite their lower mortality, were more disabled than men and did not perform as well as men in the physical performance tests. Finally, nonagenarian men tend to be still living in the social context that characterized most of their adult lives, because a larger proportion of the men lived independently of help and was still married and thus had the responsibility for doing some of the more demanding tasks in the household (e.g. cutting the grass). Even if these tasks are fairly easy in absolute terms, they may have a training effect, thus maintain strength at a higher level.

3.2.3 Functional deteriorations in ADLs over time

Two longitudinal observation studies were found and included in the literature review.

Holstein et al. (2007) observed an eight-year-change in the functional ability among 70–95-year-old non-institutionalized persons. The study describes the stability and change in the functional ability among non-institutionalized old people in relation to sex, age and household composition during two subsequent four-year observation periods: Baseline 1986: n= 1231; 1990: n= 911; 1995: n=542. Functional ability was measured identically in the surveys by using a modified version of the WHO Functional Ability Questionnaire. At the baseline (1986), 1231 persons were invited to participate in a questionnaire-based prospective study of health and living conditions. The authors emphasize that more women than men live alone and that this population increases with age. The persons who were independent of help amount to 61% in survey I, 52% in survey II, 44% in survey III. The following difficulties in everyday activities were reported: “heavy housework”, “shopping”, “travelling by bus/train”, and “walking for 15 minutes at a brisk pace”. It was also shown that older age is related to a deterioration in the functional ability from survey I to survey II. Apart from that, neither sex, household composition nor family status and social class were significantly associated with deterioration in the functional ability. The majority of participants were independent of help in the two first surveys. There was not a single activity in which the majority of the participants needed help, not even in the third survey in which the participants had reached a very advanced age. The study showed only minor sex differences. The results also demonstrated that deterioration in the old age first of all manifested itself in mobility and the more outgoing IADLs such as “walking”, “travelling by bus/train”, “shopping” and “doing heavy housework”. In contrast, the changes in Physical Activities of Daily Living (PADLs), e.g. “dressing/undressing”, “washing”, “bathing” and “getting to toilet”, were small. A notable minority of elderly persons showed improvements in their functional ability during both four-year observation periods and a large proportion had unchanged functional abilities over the two periods. This suggests a potential for further improvements during systematic training, rehabilitation and health promotion efforts among elderly persons.

The longitudinal observation study conducted by Sonn (1996) examined the relationship between the ability in ADLs, the use of assistive devices and the relation to functional limitations and impairments among persons between 70 and 76 years of age in Gothenburg, Sweden. Most participants (83%) were independent in all activities at age 70 (n=617). Among the survivors followed in the longitudinal study, the incidence of disability was 8% between the age of 70 and 73

and 26% between the age of 73 and 76 years. The most problems are reported in activities like: “cleaning”, “shopping”, “transportation”. Only one sex difference was found (problems with cooking: female 6.2% versus male: 30.6%). Assistance given by relatives dominated. One fifth of the participants at the age of 70 and almost half of the population at age 76 used assistive devices in daily life activities. Physical impairments and functional limitations had a considerable impact on the dependence in daily life activities, as persons dependent in ADLs had a lower maximal “walking speed”, “grip strength”, “knee extensor strength”, “stair-climbing capacity” and “forward reach” than those who were independent in ADLs. Walking speed in both women and men and sight impairment in men had the greatest influence on the dependence in ADLs.

3.3 Conclusions

3.3.1 Summary of findings

Basically, a small amount of studies that are relevant to this project was found in the literature research. A lot of studies which are concerned with the relevant question what kind of restrictions elderly people (50+) report in their everyday life rely on special population groups like “patients with neurological diseases”, “frail elderly” or “people in a dwelling house”. These studies were consequently excluded from our literature review.

In addition, it was not easy to get a significant conclusion of which concrete ADLs and IADL are the most restrictive ones within the examined population, because the authors of the studies used different measurements (e.g. FIM, Barthel, C-CAP) and defined some activities in different ways.

Nybo et al. (2001) divided the item “walking outdoors” in many more “sub-activities” than others and asked in a differentiated manner for restrictions in e.g. “walking around the house”, “able to get outdoors”, “able to walk 400 meters”, “walking in nice weather”.

Therefore, in our conclusion, the item “walking outdoors” is considered as one activity, without differentiating the parts of the item. Furthermore, the populations examined in the studies differ in sex, range of age and life circumstances. While some studies examined only elderly women, other analysed and compared constrains of both women and men in their everyday lives. Here the findings vary a lot. Kalldalen et al. (2012) found out that there are different restrictions and needs related to the participants’ sex. Other studies showed that the requirements of the participating men and women are very equal (Holstein et al., 2007; Nybo et al, 2001).

Due to the fact that not every activity was investigated in every study and that many tasks were defined in different ways, the evidence of the findings is low. The following activities in Table 7 were mentioned most often as posing restrictions.

Table 7: Activities most often mentioned as posing restrictions

	Lindenberger et al., 2010	Droogleever Fortuijn., 1999	Johansson et al., 2006	Kalldalen et al., 2012	Nybo et al., 2001	Holstein et al. 2007	Sonn 1996	Zingmark & Bernspang 2011
Pédicure					x			x
Cutting fingernails					x			x
Walking outdoors	x	x	x	x	x	X	x	x
Using bus/train	x					X		
Bathing / showering	x		x	x	x			x
Walking stairways	x							x
Cleaning		x		x			x	
Preparing meals		x					x	
Making a bed		x						
Repairing		x						
Dressing lower body / upper body			x	x		X		x
Getting out of bed			x					
Getting out/in car			x					
Travelling				x				
Washing hair					x	X		
Putting on shoes / socks					x			x
Heavy housework						X		

ADLs reported most often as problematic in the literature:

- All eight included studies reported “walking outdoor” (which includes activities such as “do grocery shopping”, “go for a walk”, “walk a block”) as the most often mentioned problematic task for older people.
- Constraints in the tasks “bathing/showering” were mentioned in five from eight studies.
- “Dressing upper/lower body” was also noticed as problematic by elderly in four different studies.

4 Data Re-Analysis

Due to the fact that objective 1, i.e. which ADL should be trained in WeTakeCare, could not be answered sufficiently by the literature review, alternative ways to tackle the information on what ADL should be addressed by the WeTakeCare programme were sought after. Various data sets were acquired and an extensive data re-analysis of several European datasets was conducted to gather information about ADL limitations in the European population.

4.1 Method

Throughout this section, the data sets and the method of data analysis are described.

4.1.1 Dataset acquisition

A freehand search was conducted for available data sets concerning health issues of elderly people and ADL. We found several comprehensive surveys with several ten thousand participants containing relevant information about health status, difficulties or limitations in ADL, living conditions etc. conducted in several European countries. These were:

- SHARE - Survey of Health, Ageing and Retirement in Europe.
- The German Centre of Gerontology: German Ageing Survey (DEAS).
- Statistics Austria: Austrian Health Survey 2007.
- Swiss Household Panel (SHP).
- Assessment of Motor and Process Skills (AMPS) database.

For the acquisition of the datasets the author of the AMPS, Claire Fisher, the Swiss Competence Center of Expertise in the Social Sciences (FORS), and project managers of the German Health Survey and SHARE were contacted and data sets was ordered, individual data-use contracts were signed. For the AMPS data the entire dataset could not be obtained but analyses were performed by the authors. For all other surveys we received the entire data sets.

4.1.2 Description of Data Sets

The data sets obtained are shortly described below.

SHARE Data

The Survey of Health, Ageing and Retirement in Europe (SHARE) is a multidisciplinary and cross-national panel data. It has more than 85,000 individuals participating (approximately 150,000 interviews) from 19 European countries (and Israel) aged 50 years or older. The dataset contains extensive data on physical and mental health, but also data on socio-economic status and social and family networks. (Source: http://www.share-project.org/home0.html)

German Ageing Survey

The German Ageing Survey (DEAS) is a nationwide representative cross-sectional and longitudinal survey of the German population aged over 40. The comprehensive examination of people in mid- and older adulthood provides micro data for use both in social and behavioural scientific research and in reporting on social developments. Particular issues addressed in the surveys included an

assessment of occupational status or living conditions after retirement, social participation and leisure activities, information on their economic and housing situation, family ties and other social contacts, as well as issues regarding health, well-being and life-goals. The data are from the public release of the German Ageing Survey, provided by the research data centre of the German Centre of Gerontology (DZA). (Source: http://www.dza.de/en/ research/deas.html)

Austrian Health Survey

The Austrian Health Survey was conducted in 2006/2007 and is representative for the Austrian population aged 15 and above. For the survey personal computer assisted face-to-face interviews were conducted with around 15'000 participants. The survey focused on health, health related behaviour, quality of life and other health related topics.

Swiss Household Panel (SHP)

The principal aim of the Swiss Household Panel (SHP) is to observe social change, in particular the dynamics of changing living conditions and representations in the population of Switzerland. The SHP is a yearly panel study following a random sample of households in Switzerland over time, interviewing all household members. Data collection started in 1999 with a sample of 5,074 households containing 12,931 household members. In 2004 a second sample of 2,538 households with a total of 6,569 household members was added. The SHP database currently holds information on the years 1999 to 2012. (Source: http://www.swisspanel.ch/spip.php?lang=en)

AMPS Data

We also received data from the Assessment of Motor and Process Skills (AMPS) database. The AMPS is an assessment used by occupational therapists to evaluate a person's quality of performance of activities of daily living. The database includes thousands of test results from people with and without limitations from all over the world. The activities are described very precisely e.g. "vacuuming with removing of furniture" and are therefore particularly helpful for designing the training units for WeTakeCare.

4.2 Analytic Strategy

The datasets were reviewed by a statistician who also was consulted for the analytic strategy. The original plan was to perform a meta-analysis of all or most data sets. Because of differences in the surveys items and answer categories it was decided to analyse each dataset separately.

The datasets were analysed related to the following variables:

- Age (50+)
- Sex
- Limitation or difficulty performing specific ADL
- General health condition and physical condition (participants with dementia excluded)
- Independent living (not living in nursing home etc.)

In a first step a close scan of the questionnaires was conducted to identify relevant variables in the respective data set. Data sets were then merged if data was delivered in several packages. We then conducted a first basic analysis of the ADL functionalities in the entire population of 50 years

of age or above for Europe, the German and Spanish speaking population of Europe, or the respective European country.

In a second step we reduced the data set to our target population. Therefore people younger than 50 years of age were excluded, as the target population of the WeTakeCare programme are elderly people. Excluded were also proxy interviews as those were only conducted if the target person was deceased or the state of health did not allow participation. It was therefore decided that people with very poor health are to be excluded, as they are not targeted by the programme. Furthermore excluded were people living in a nursing home or home for the elderly as such individuals would also have more advanced limitations and thus make it necessary to have professional support with ADL.

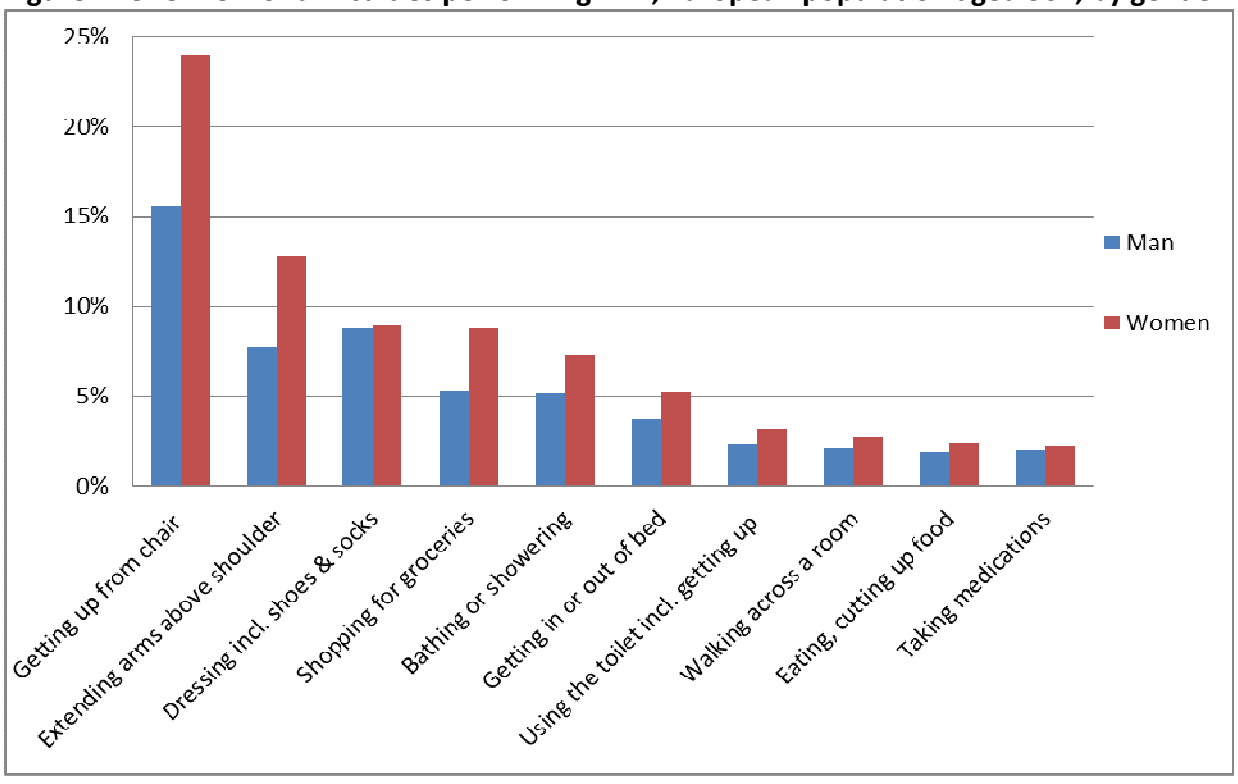
Once datasets were customized cross tables were calculated indicating the age category and ADL-task for each sex. Also health status, quality of life, household size, living circumstances and internet use were analysed if available in the respective data set. Some comparative analyses were also conducted to compare German speaking people to Spanish speaking people with the Share data.

4.3 Results

4.3.1 ADL in the general population in Europe, 50 years of age or older

Basic activities of daily living (BADL) in the general population 50 years of age or above in Europe (incl. Israel) can be found in the data of the Share survey. As shown below in **Figure 1** a very large part of the population over 50 is experiancing no difficulties performing basic ADL such as personal hygene, eating or going to the toilet. Most difficulties amongst basic ADL are reported in getting up from a chair with almost 20% of people over the age of 50 reporting having difficulties, followed by extending arms above shoulders.

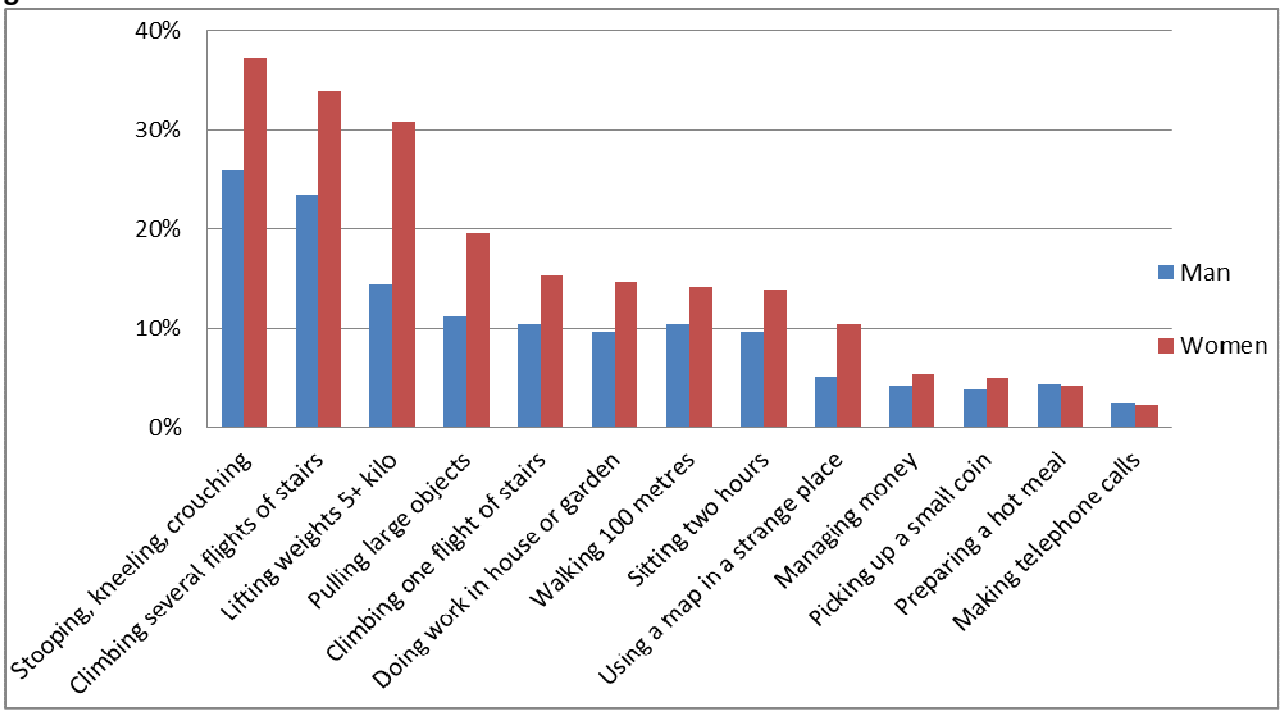
Figure 1: Overview of difficulties performing ADL, European population aged 50+, by gender



Source: SHARE (N men: 22’461 and 1'058'651, N women: 28’248)

A larger part of people above the age of 50 in Europe report having difficulties in performing ADL more strenouse in performance and concerning mobility. The task reported most often as being difficult to perform is stooping, kneeling or bending over followed by climbing several flights of stairs. Lifting weights over 5 kg or moving large objects also are for a considerable part of pople in the general population over 50 years of age in Europe difficult to perform (Figure 2: **Overview of difficulties performing ADL, European population 50 years or older, by gender**.

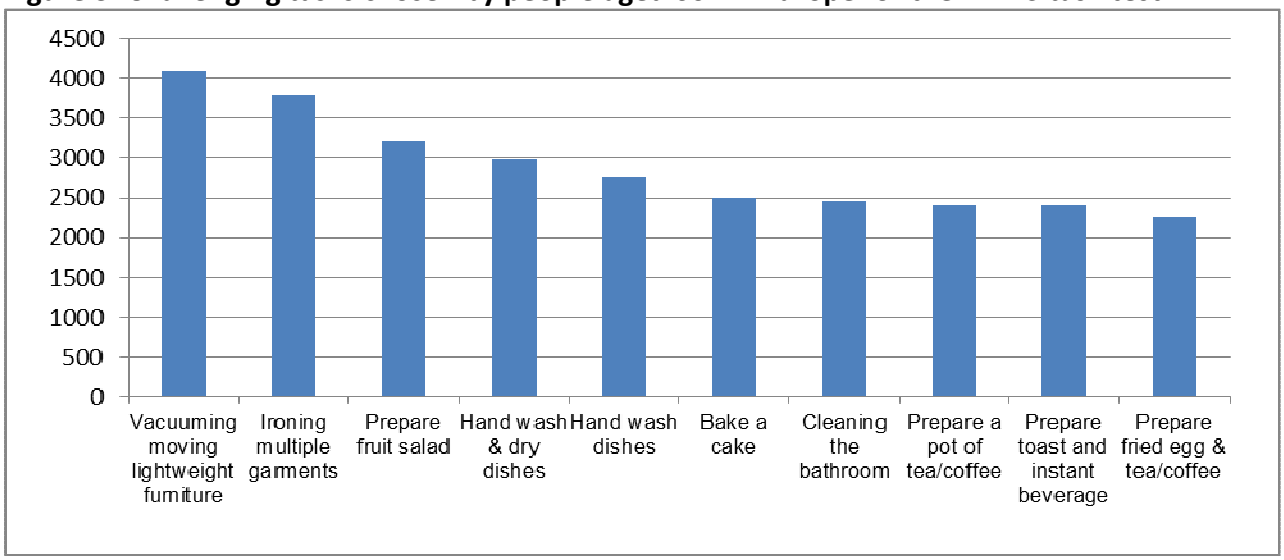
Figure 2: Overview of difficulties performing ADL, European population 50 years or older, by gender



Source: SHARE (N men: 22’461, N women: 28’248)

The AMPS data-set is no population survey; rather it contains data from healthy people, frail people and people with various musculoskeletal disorders in Europe. In the AMPS data-set ADL are recorded if the task is of personal relevance to a person and if the task is difficult or challenging to manage. Per person only one task is chosen. As shown in Figure 3, the tasks chosen most often were vacuuming and moving lightweight furniture, ironing multiple garments and prepare a fruit salad. Other tasks, including cooking or baking and doing dishes were also frequently chosen. Therefore preparing a meal and cleaning up after the meal are **of great relevance and are challenging for people 60 years of age or older** in Europe

Figure 3: Challenging tasks chosen by people aged 60+ in Europe for the AMPS task test

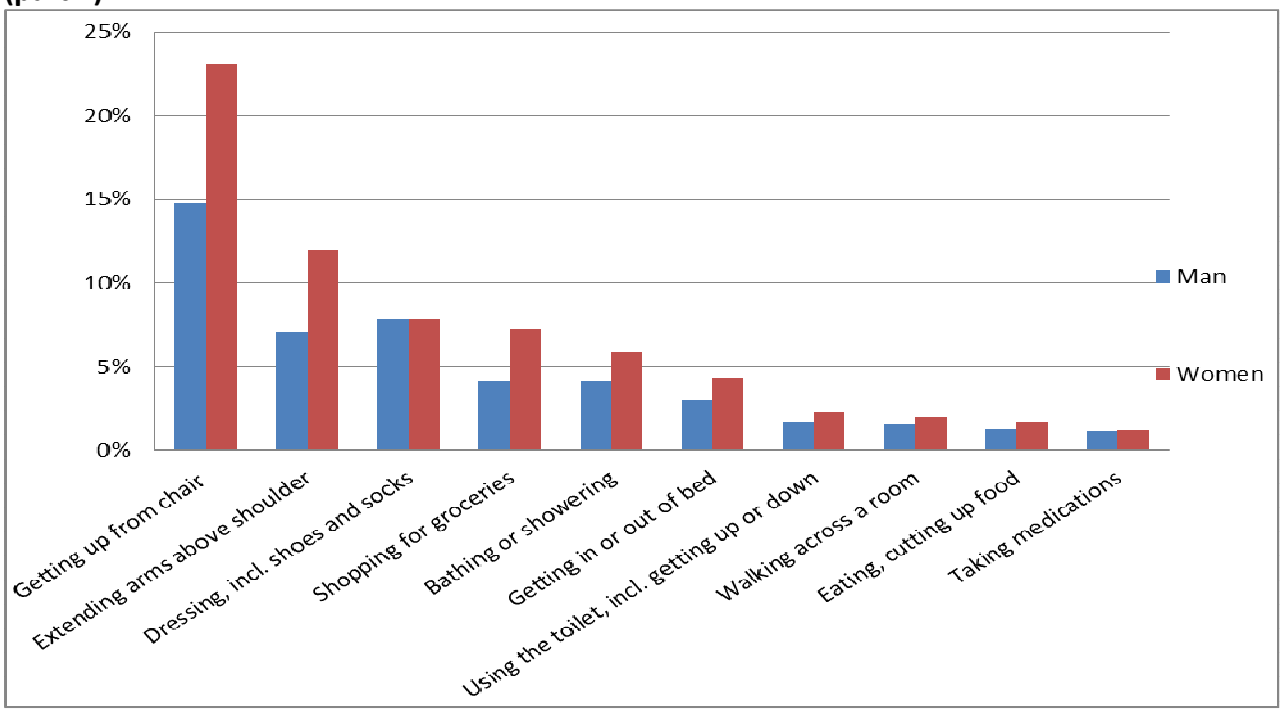


Source: AMPS (N: 100'123)

4.3.2 ADL in the WeTakeCare target population 50 years and older, living independently

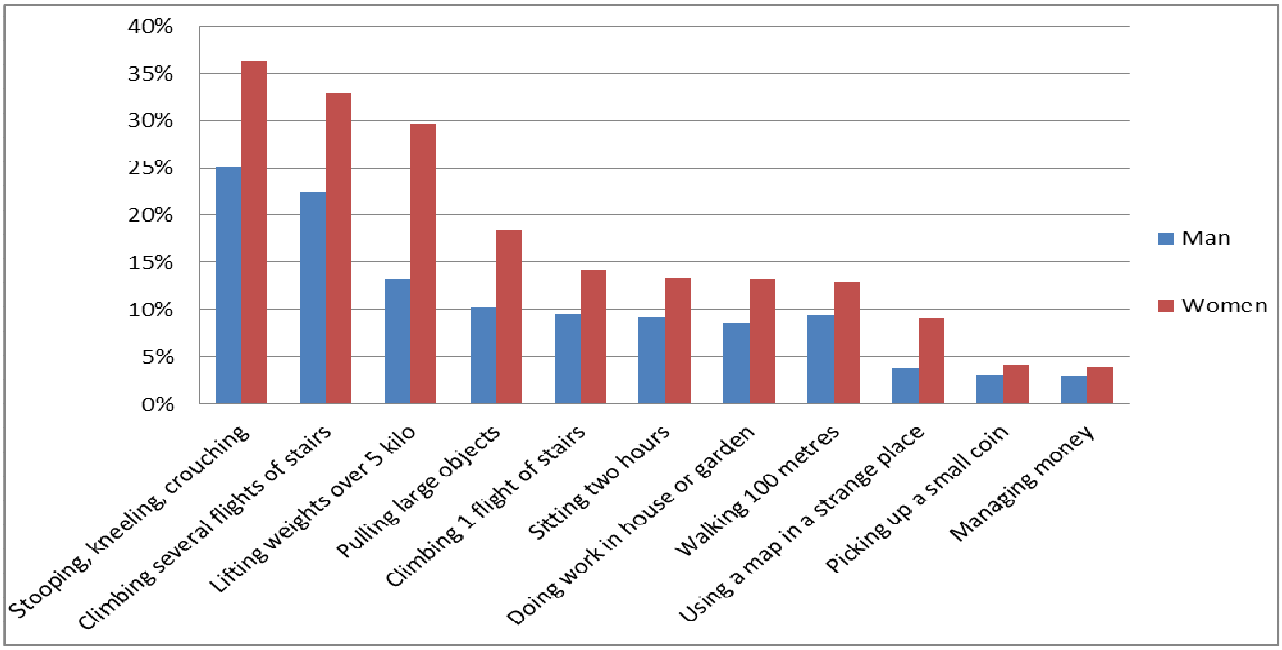
The target population for the WeTakeCare program is people over 50 years of age, still living independently and have no serious illness that would hinder the use of the program. The target population therefore varies from the general population in the point that people living in institutions (e.g. nursing home) and/or people with dementia and/or Parkinson' disease and/or who had a stroke were excluded from further analysis. The following analysis therefore focuses only on the target population of WeTakeCare. The difference between the general population (**Figure 1** and **Figure 2**) and the target population (**Figure 4** and **Figure 5**) is rather small.

Figure 4: Difficulties performing ADL, European target population 50 years and older, by gender (part 1)



Source: Share (N men: 21'633, N women: 27'297)

Figure 5: Difficulties performing ADL, European target population 50 years +, by gender (part 2)



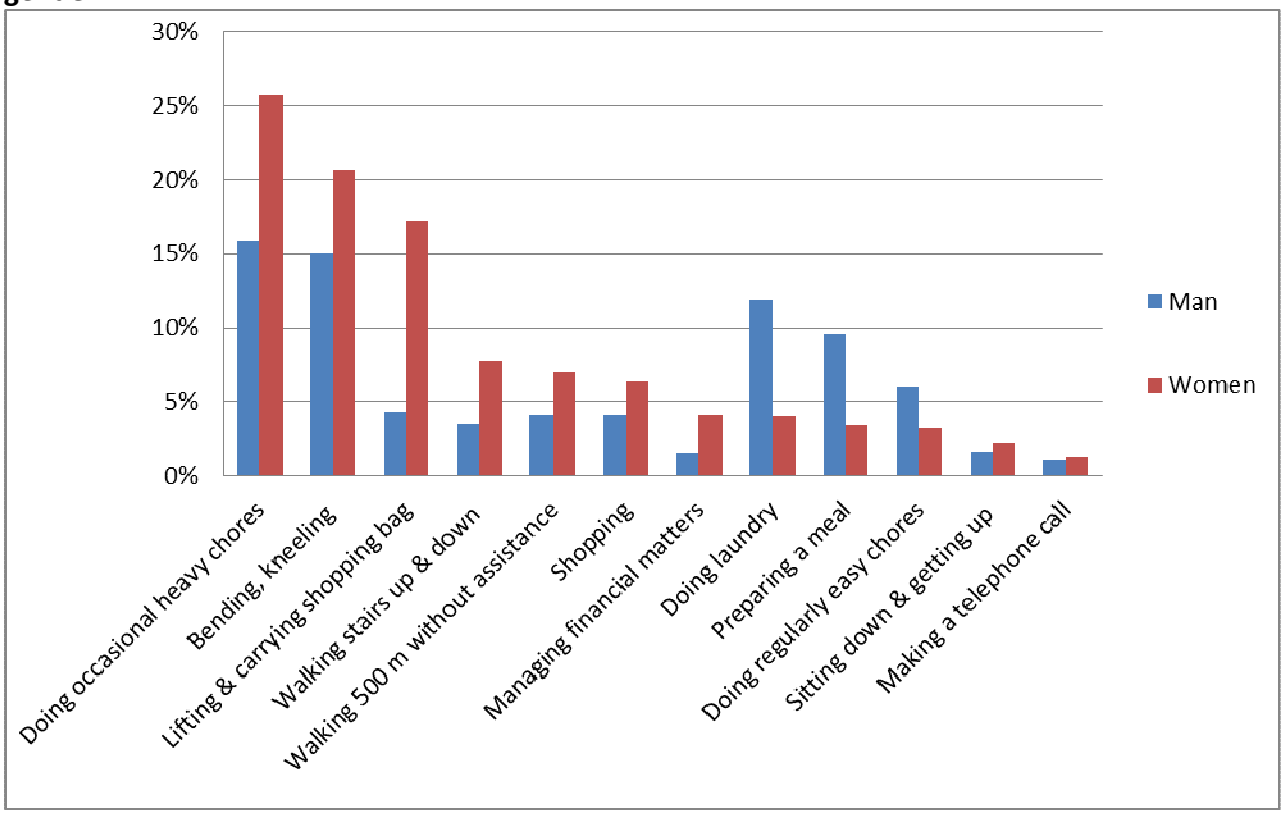
Source: Share (N men: 21'633, N women: 27'297)

The analysis of the Share survey shows, that generally a higher percentage of surveyed women report having difficulties compared to men. Also amongst more strenuous tasks a higher percentage of surveyed people report having difficulties than with less physical demanding tasks. Stooping, kneeling or crouching are amongst the tasks with that the highest percentage of surveyed people having difficulties with around 30% of people over the age of 50.

In the Austrian Health Survey similar ADL tasks were surveyed. An overview of various ADL amongst men and women over 50 years of age is shown Figure 6. The task with the highest percentage of respondents indication having difficulties or feeling insecure are heavy household chores (21%) and similar to the Share data, having difficulties bending or kneeling (18%). Easier and physically not so strenuous basic ADL such as "eating", "taking medication", "bathing or getting dressed" tend to cause less limitations according to the Share data, the German Ageing Survey and the Austrian Health Survey.

Some differences in percentage of people having difficulties are noticeable when the same items from the Austrian Health Survey and the Share Survey are compared. In the Austrian Health Survey a slightly lower percentage of people report having difficulties performing a specific ADL or physical task. Also in Austria men report having more difficulties doing typical house hold chores such as cooking or doing laundry.

Figure 6: Overview of difficulties performing ADL, Austrian target population aged 50+, by gender

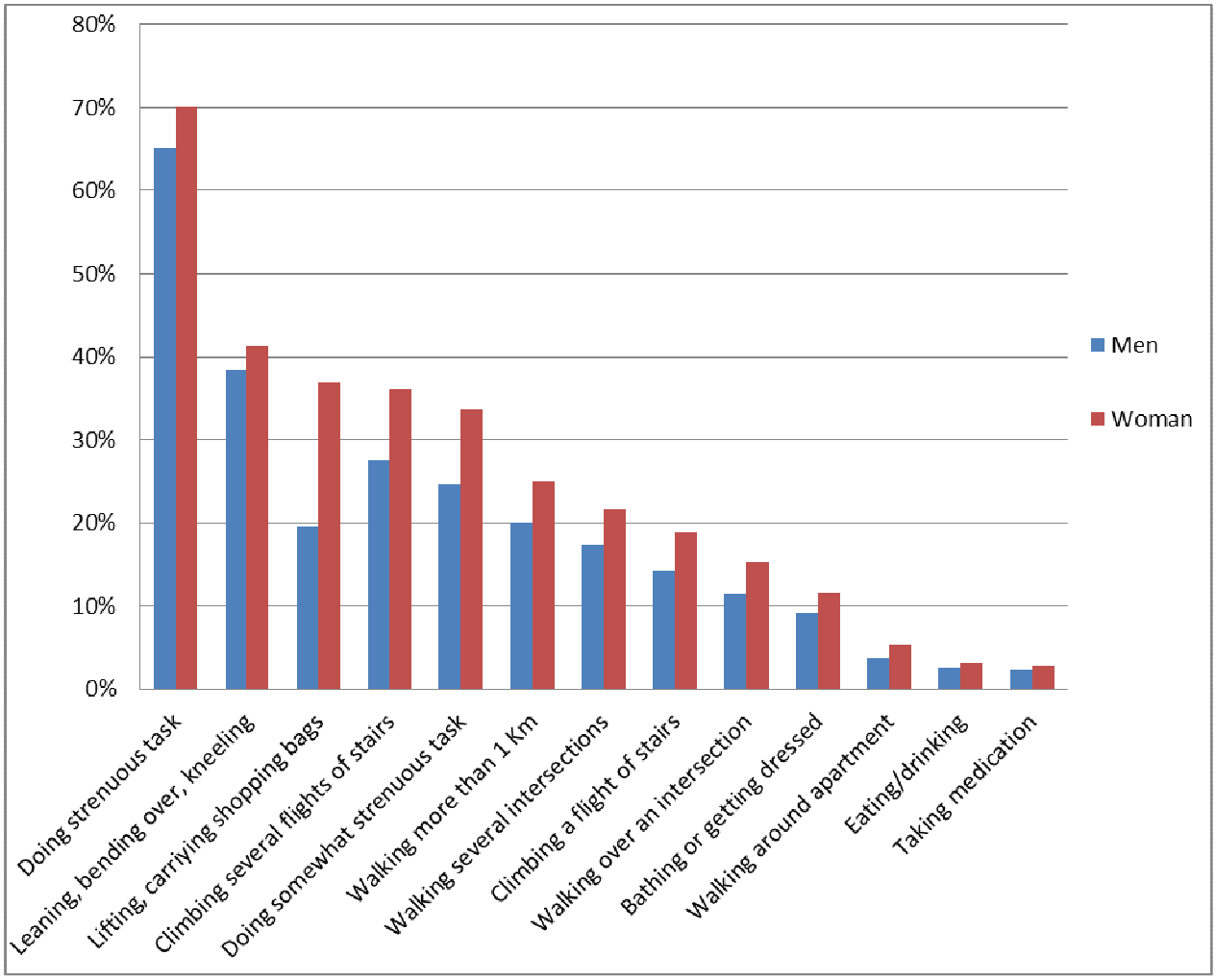


Source: Austrian Health Survey (N men: 1'058'648 and 1'058'651, N women: 1'268'341 and 1'268'344)

In the German Ageing Survey on the other hand, much more people report having difficulties with the same tasks as reported in the Austrian Health Survey and the Share data. E.g. the task "bending, leaning over or kneeling" 40% of respondents report having limitations in the German Health Survey compared to 31% respondents in the Share Survey and respectively 18% in the Austrian Health Survey. This is most likely the result of the answer categories in the German Health Survey as respondents could choose between "no limitation", "some limitation" or "strong limitations", therefore giving the respondents a category to report small limitations.

The pattern of reported limitations performing ADL however is the same as in the other data sets. Strenuous tasks, bending or kneeling, lifting shopping bags and walking stairs are amongst the task reported most often as being difficult to perform. Basic ADL such as bathing, eating or taking medications are amongst the task with which only a small percentage of surveyed people have difficulties to perform (**Figure 7: Difficulties performing ADL, German target population 50 years and older, by gender**).

Figure 7: Difficulties performing ADL, German target population 50 years and older, by gender



Source: German Ageing Survey (N men: 3503 and 3511, N women: between 3285 and 3288)

In the German Age Survey about 50% of surveyed people aged between 50 and 59 reported having difficulties "performing a strenuous task" (**Figure 16**). This percentage gradually increases to over 90% in people aged 80 years or older. The performance "doing a somewhat strenuous task" is in comparison much easier: about 15% of people aged 50 to 59 report being "strongly limited" or "somewhat limited". In the age group 80 years or older around 60% of woman and 55% of men are "somewhat limited" or "strongly limited".

4.3.3 ADL in detail in the WeTakeCare target population 50+ and living independently

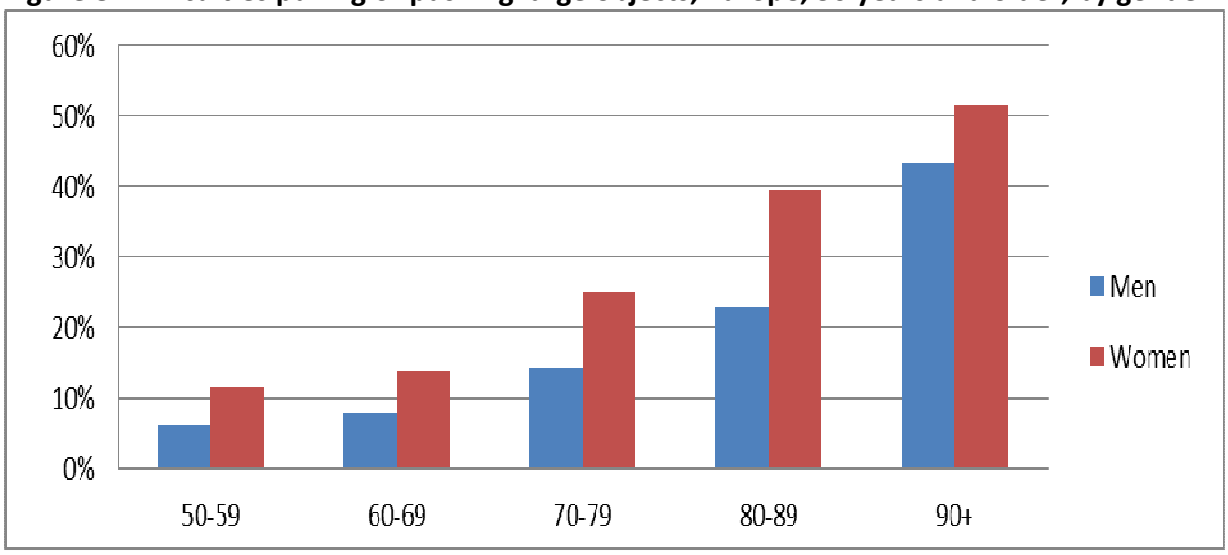
In the following sections ADL performance is discussed in more detail for each data set separately.

4.3.3.1 Reported difficulties in ADL performance in the Share Survey

In the Share survey an example for a strenuous task was "pulling or pushing large objects". While less than 10% of participants between 50 and 59 years of age reported having difficulties performing this task, about 30% of respondents between 80 and 89 years reported having

difficulties. And almost 50% of respondents over 90 years of age reported having difficulties pulling or pushing a large object (Figure 8).

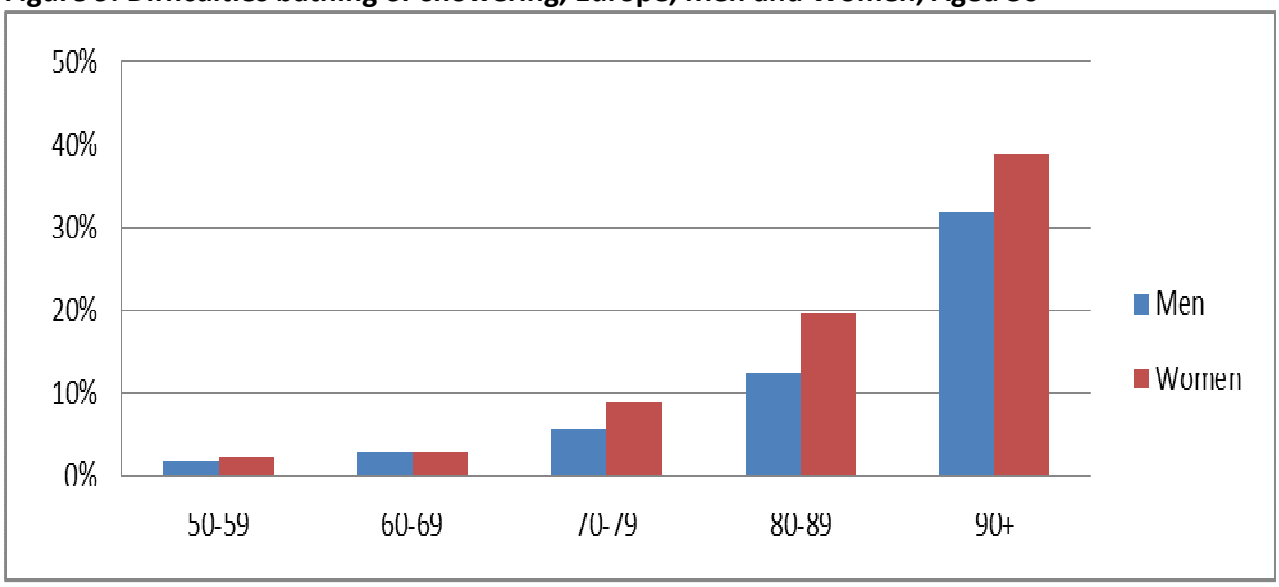
Figure 8: Difficulties pulling or pushing large objects, Europe, 50 years and older, by gender



Source: Share (N men: 21'633, N women: 27'297)

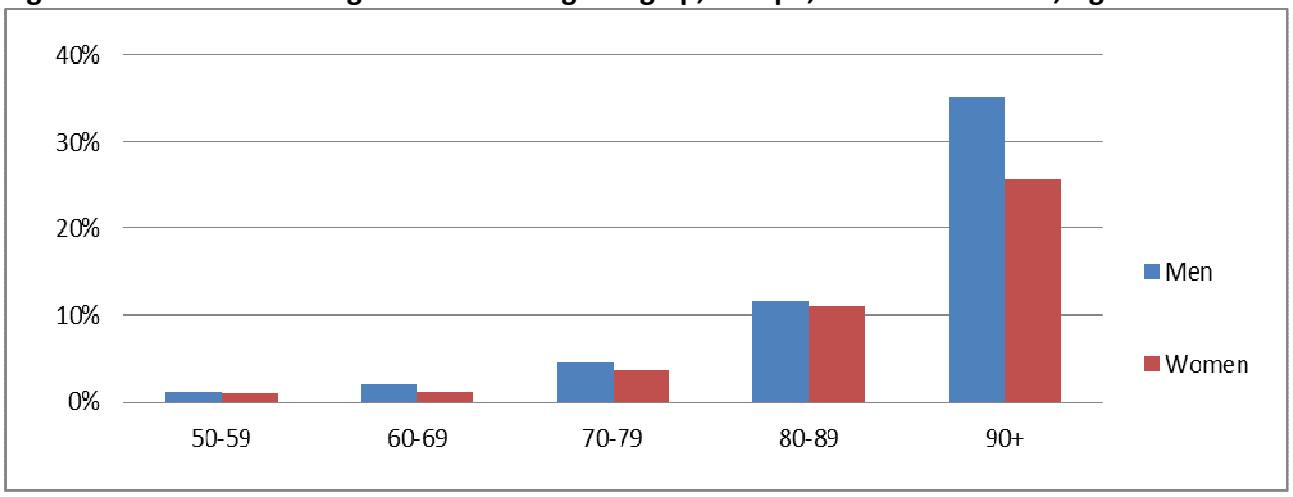
In the Share data no distinction was made between "somewhat limited" and "limited". This most likely resulted in even less people reporting difficulties performing ADL. Over 83% of men and 76% of women above age 50 years reported having no difficulties performing any from the following ADL: "dressing", "walking across a room", "bathing", "eating", "cutting up food", "getting in and out of bed", "using the toilet", "using a map in a strange place", "preparing a hot meal", "shopping for groceries", "making a telephone call", "taking medications", "doing work around the house or garden" and "managing money". Therefore it seems that almost all people still living individually between age 50 and 79 years of age manage their daily life well without much limitations (**Figure 8** through **Figure 11**). Only a share of less than 10% of people living independently reported having difficulties. A greater percentage of people aged 80 and above however experience some form of limitation especially while "shopping", "bathing" or "getting dressed" or "doing work around the house or garden" (**Figure 9**).

Figure 9: Difficulties bathing or showering, Europe, Men and Women, Aged 50+



Source: Share (N men: 21'633, N women: 27'297)

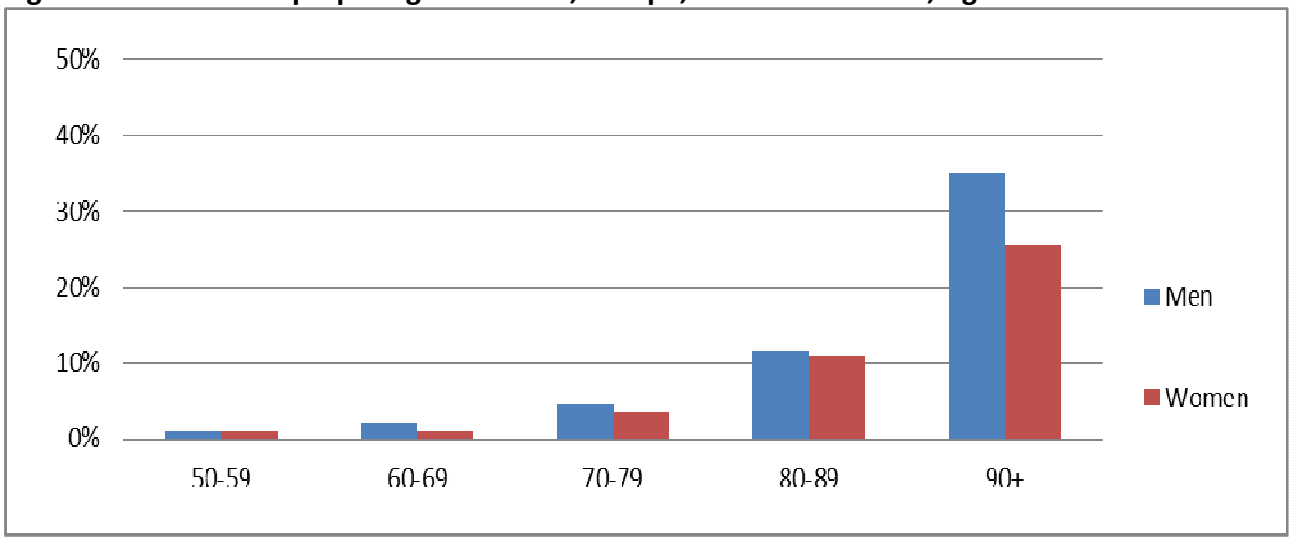
Figure 10: Difficulties using the toilet incl. getting up, Europe, Men and Women, Aged 50+



Source: Share (N men: 21'633, N women: 27'297)

Some difficulties cause the task "preparing a hot meal" (Figure 11). That is the only task a higher percentage of men report having difficulties than woman. This is most likely a result of the traditional role segregation, preparing meals typically being a task for homemakers (see also 4.3.7 Gender Differences performing ADL).

Figure 11: Difficulties preparing a hot meal, Europe, Men and Women, Aged 50+

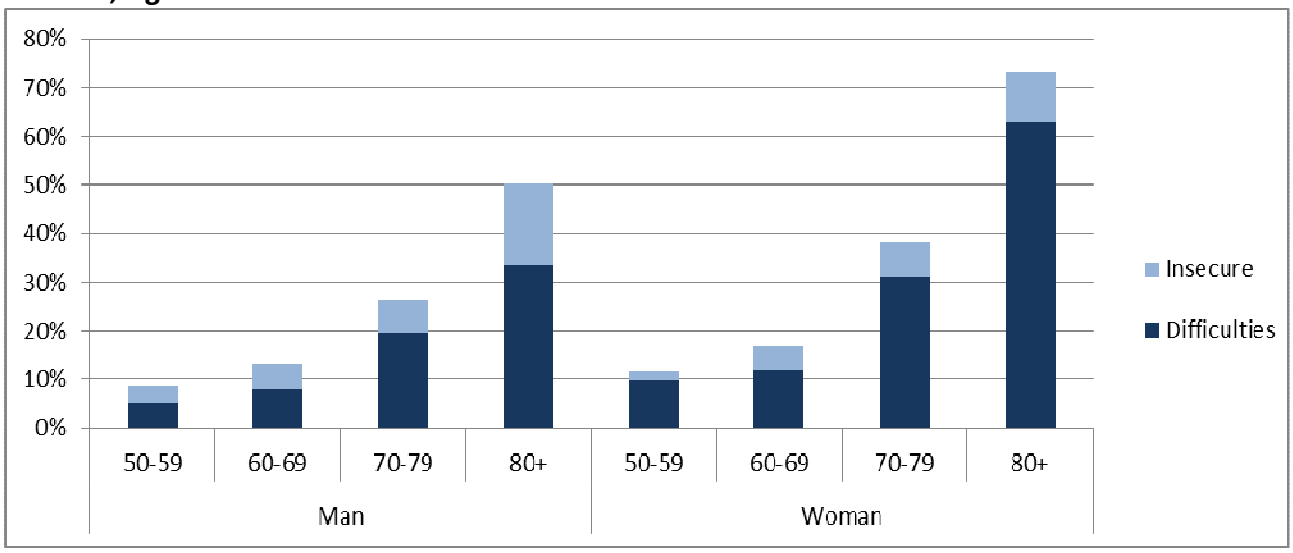


Source: Share (N men: 21'633, N women: 27'297)

4.3.3.2 Reported difficulties in ADL performance in the Austrian Health Survey

The highest percentage of reported difficulties in the Austrian Health Survey was the task "doing occasionally heavy house hold chores": 38% of women and 26% of men aged 70 to 79 years reported "having difficulties or feeling insecure" performing such a task. Over 70% of women aged 80 years or older reported "having difficulties or feeling insecure", while 50% did so as well (**Figure 12**).

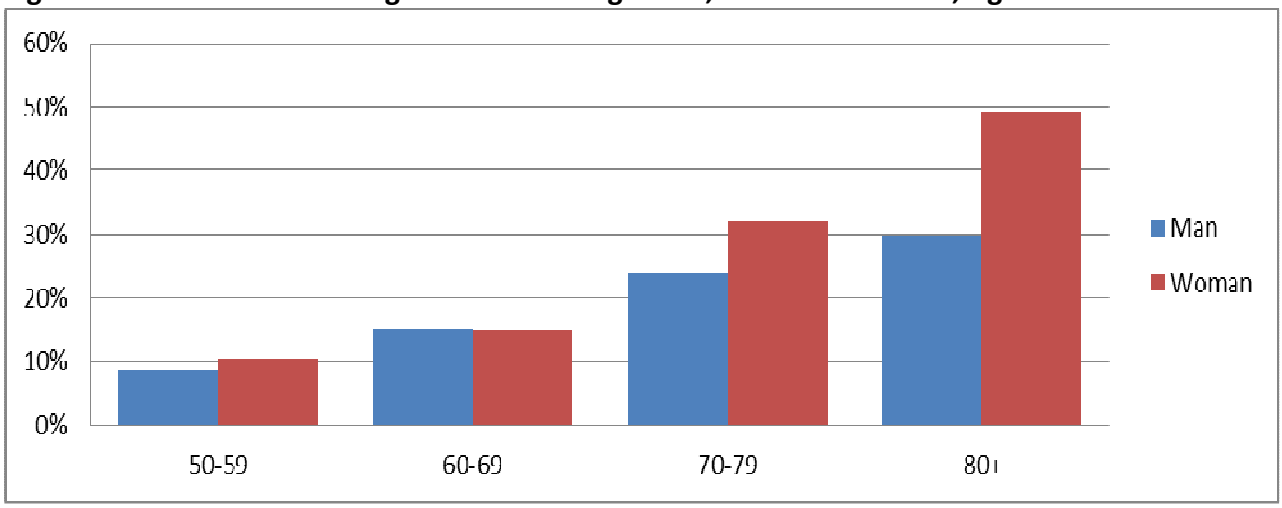
Figure 12: Difficulties or feeling insecure doing occasionally heavy house hold chores, Men and Women, Aged 50+



Source: Austrian Health Survey (N men: 1'058'648 , N women: 1'268'341)

Another item in the Austrian Health Survey in which high percentages of respondents reported having difficulties was "bending or kneeling down". Almost 30% of respondents in the age category 70 to 79 years and 40% in the age category 80 years or older reported having difficulties (Figure 13).

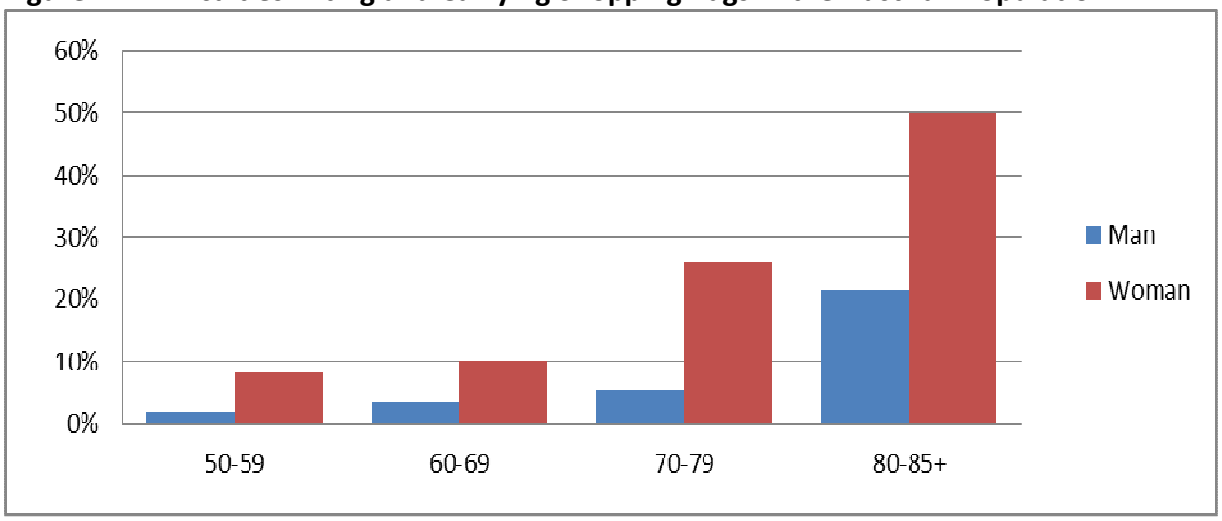
Figure 13: Difficulties bending over or kneeling down, Men and Women, Aged 50+



Source: Austrian Health Survey (N men: 1'058'648 , N women: 1'268'341)

Caring or lifting shopping bags is also a task that seems to cause difficulties to many elderly people. In the Austrian Health Survey the percentage of people reporting difficulties "lifting and carrying shopping bags" is in the age category of 50 to 59 years the percentage of people reporting difficulties was well below 10% and in the age category of 80 years or older 21% of men and 50% of woman reported having difficulties (**Figure 14**). This is in comparison with the German Ageing Survey (**Figure 17**) clearly lower, with less people reporting difficulties: This could be an effect of the answering categories or the setting in which the data has been gathered (see also 4.3.6.2 Cultural differences).

Figure 14: Difficulties Lifting and Carrying Shopping Bags in the Austrian Population

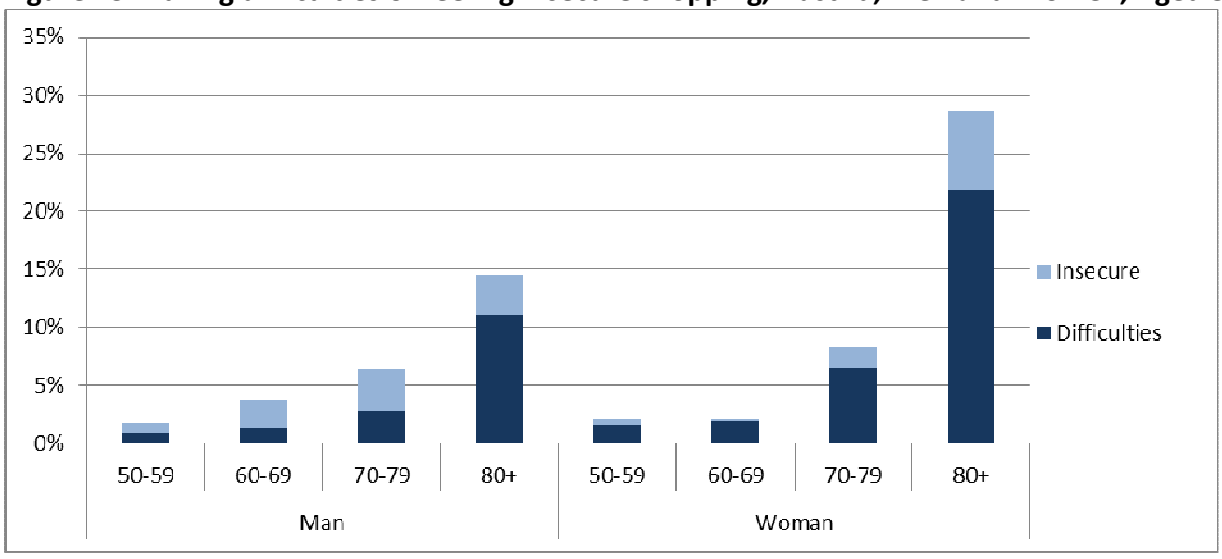


Source: Austrian Health Survey (N men: 1'058'648 and 1'058'651, N women: 1'268'341 and 1'268'344)

In the Austrian Health Survey ADL which caused for the bulk part of surveyed participants no difficulties were the basic ADL "sitting down or getting up" and "making a telephone call". Tasks with higher percentages of participants reporting difficulties or "feeling insecure" performing the ADL task were: "doing laundry", "shopping" and "preparing a meal" (**Figure 15**).

Furthermore several items showed a relative low overall percentage of people having difficulties but with high to very high percentages of people having difficulties for the age category **80 years and older**. Thus for a large part of surveyed people 80 years or younger the ADL inherits no difficulties while for people over the age of 80 the same task is difficult. Items with such a pattern were: "shopping", "walking 500 meters without aid", "walking stairs up and down" (**Figure 15**).

Figure 15: Having difficulties or feeling insecure shopping, Austria, Men and Women, Aged 50+



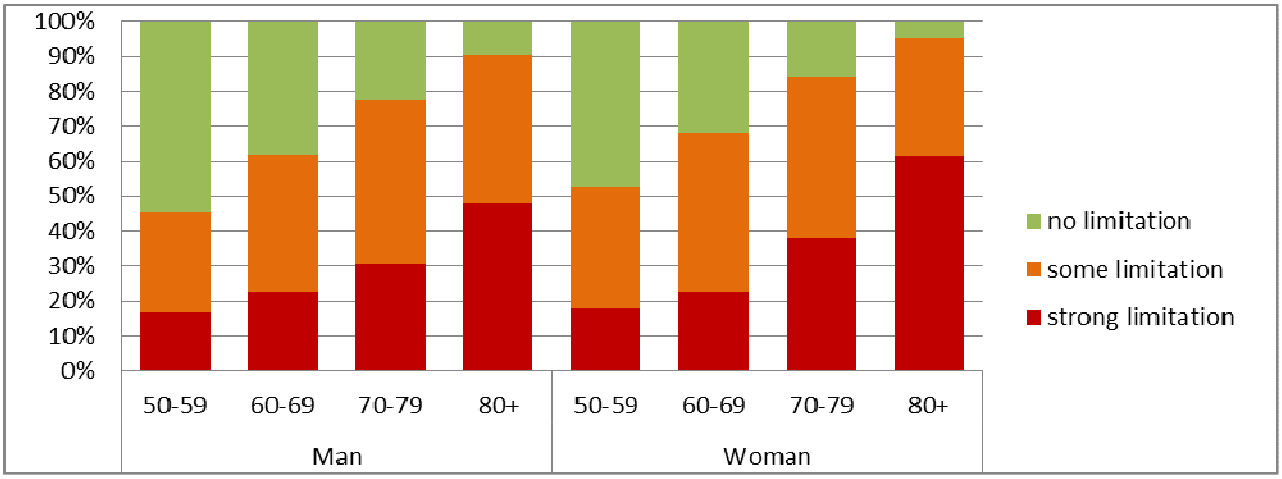
Source: Austrian Health Survey (N men: 1'058'648, N women: 1'268'341)

4.3.3.3 Reported difficulties in ADL performance in the Austrian Health Survey

Looking at individual ADL tasks in the Austrian Health Survey similar patterns of ADL performance can be observed. More respondents report having difficulties with strenuous tasks and mobility

than with lighter tasks or basic ADL. Most limitations were reported in performing a strenuous task.

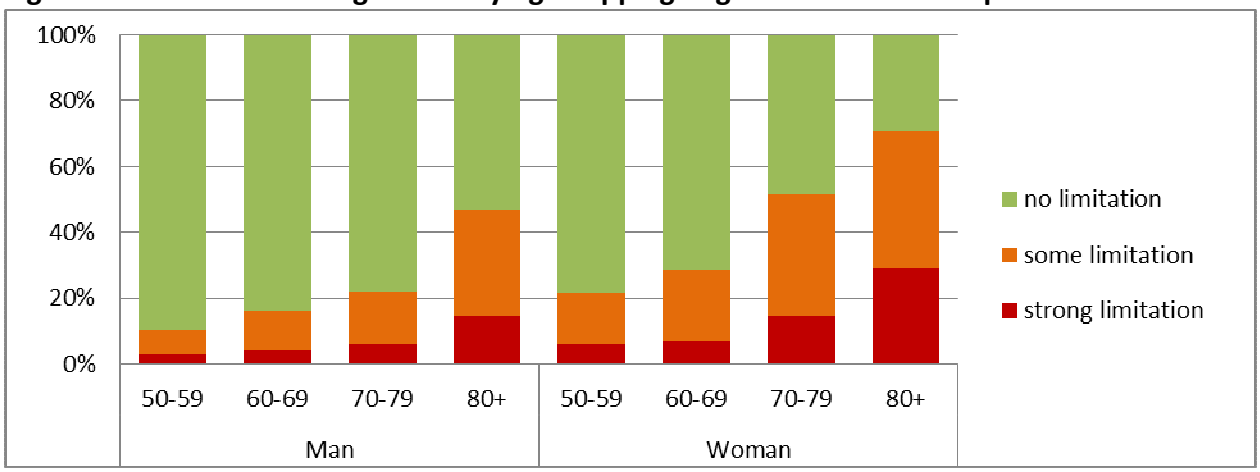
Figure 16: Limitation performing a strenuous task



Source: German Ageing Survey (N men: 3503, N women: 3287)

"Lifting or carrying shopping bags" is the task with the highest percentage of surveyed people indicating having at least "some limitations": 70% of women and 60% of men over 80 years of age reported having "some limitations" or "strong limitations" (**Figure 17**). At younger ages (50-59) more than 20% of women and 10% of men report "having limitations".

Figure 17: Limitation Lifting and Carrying Shopping Bags in the German Population



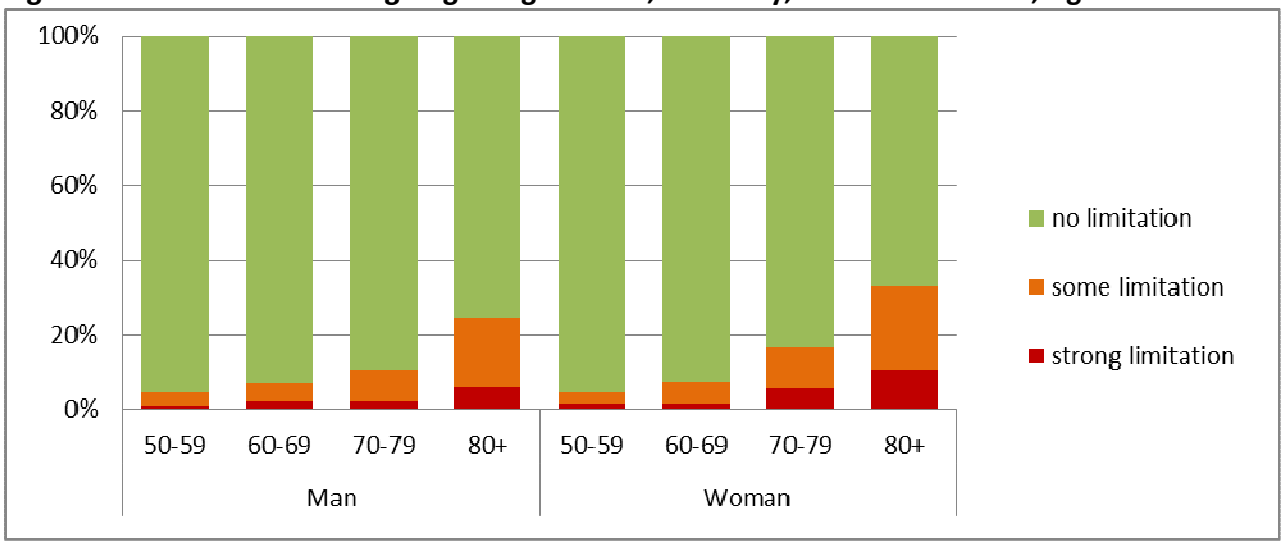
Source: German Ageing Survey (N men: 3509, N women: 3286)

Also more strenuous tasks such as "walking a distance of 1000 meters", "climbing stairs", "bending over or kneeling" bear for most people over 80 years of age "limitations" or "strong limitations". Especially "bending over or kneeling" is a difficult task: 20% of people aged between 50 and 59 reported in the German Age Survey limitations, and over 60% of people aged 80 years or older do so as well.

In basic ADL tasks smaller percentages of respondents reported having difficulties. Amongst those were: "walking around the apartment", "using the toilet", "taking medication", "making a telephone call", "cutting food or eating" (e.g. **Figure 19**). The percentage of people reporting difficulties with basic ADL might be caused throe the exclusion of respondents living in nursing homes. People in the German and also Swiss culture not able to perform basic ADL usually move to care facilities or nursing homes.

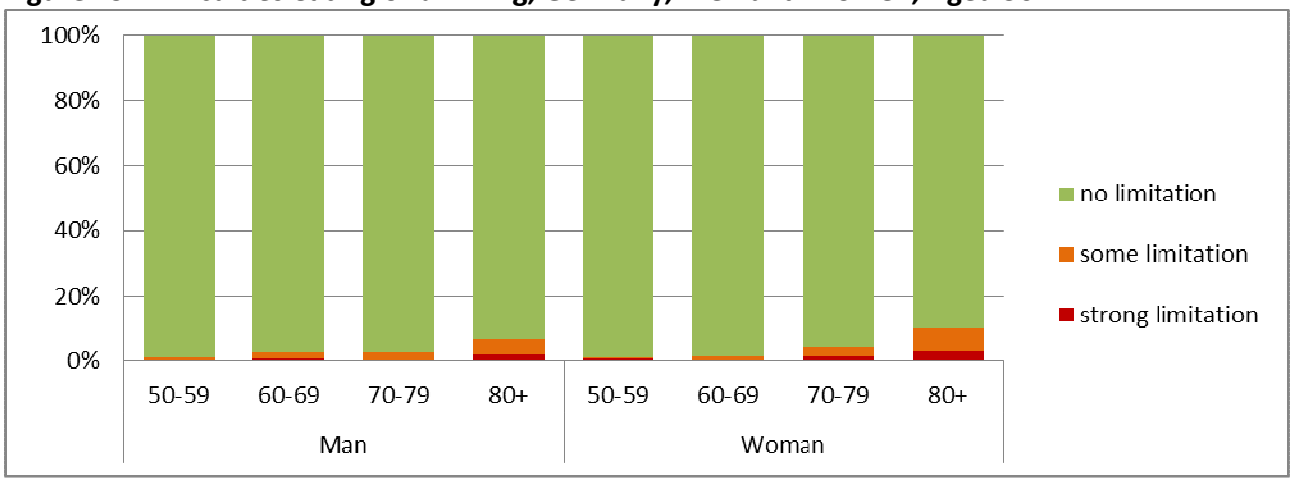
The most difficult from the "easier" and basic ADL is "bathing or getting dressed", with about 30% of people 80 years or older reporting some limitations in the German Ageing Survey (Figure 18). The least difficult ADL touched upon in the survey is "taking medication" with about 8% of people reporting having some difficulties.

Figure 18: Limitations bathing or getting dressed, Germany, Men and Women, Aged 50+



Source: German Ageing Survey (N men: 3510, N women: 3288)

Figure 19: Difficulties eating or drinking, Germany, Men and Women, Aged 50+

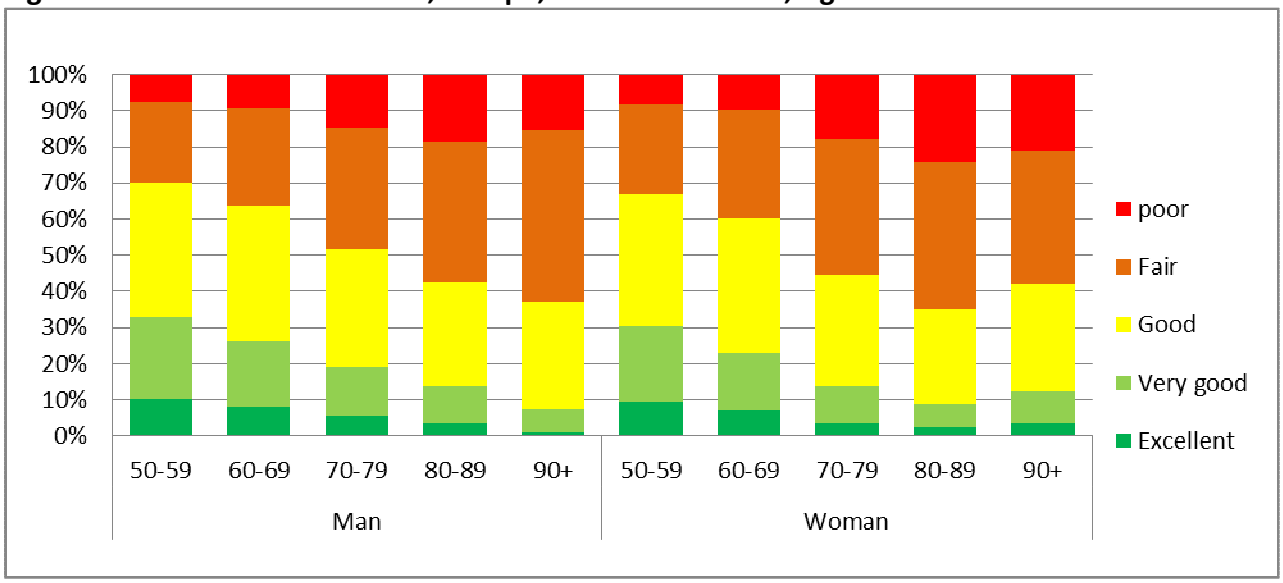


Source: German Ageing Survey (N men: 3510, N women: 3288)

4.3.4 General health condition in the target population in Europe

Looking at the general health condition the Share survey analyses showed that health is increasingly deteriorating with age and that woman report having a slightly worse state of health than men do **Figure 20**). More than 50% of men until the age of 80 report having "good", "very good" or "excellent" health. Amongst woman the same can be said only until the age of 69. That women report having poorer health status than men do is a well-known phenomenon (e.g. Kulminski et al. 2008, see also 3.2 Gender Differences).

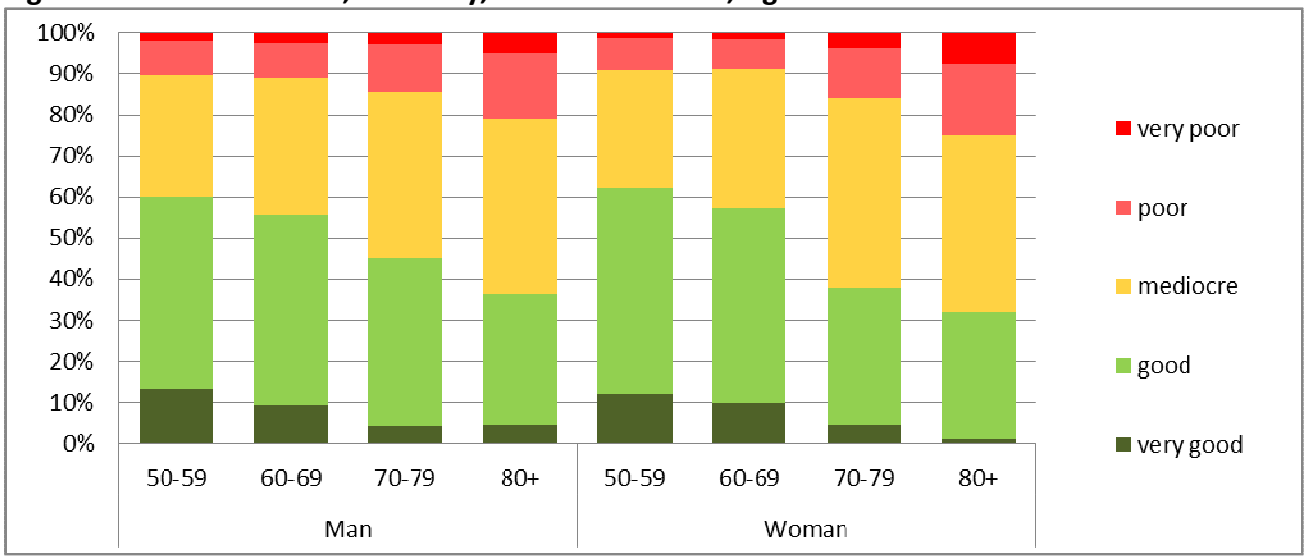
Figure 20: General health status, Europe, Men and Women, Aged 50+



Source: Share (N men: 21'633, N women: 27'297)

The general health status in the German population targeted for the WeTakeCare programme is remarkably good (Figure **21**). In either "good" or "very good" health are the majority of the targeted population over 50 years. Remarkable is also that there is almost no gender effect: both sexes indicate about the same health status.

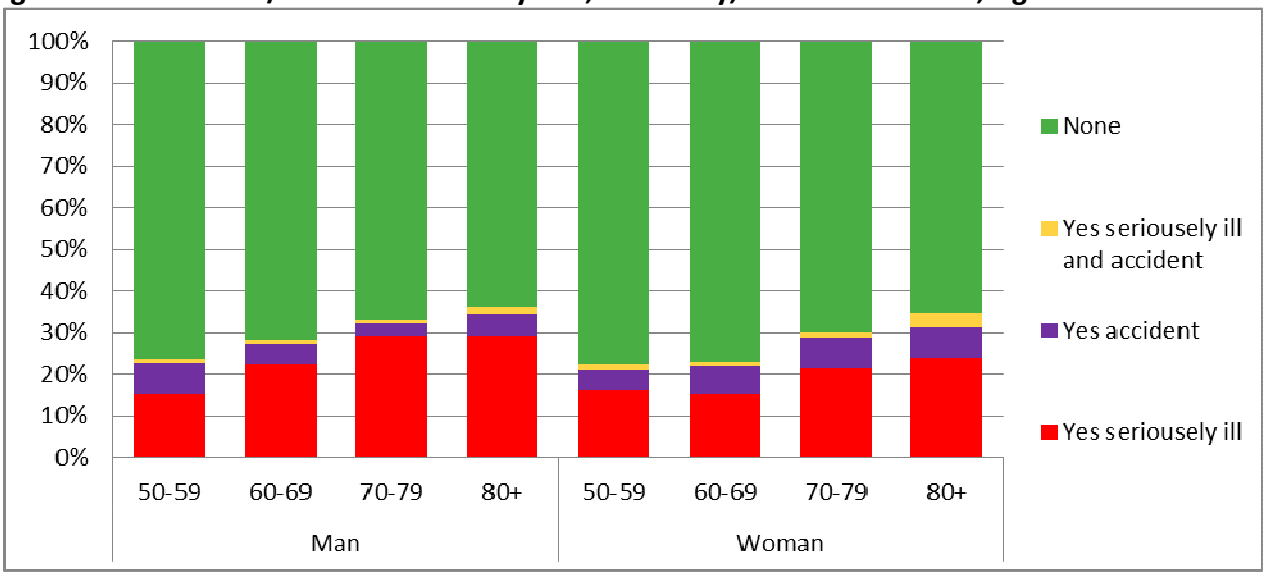
Figure 21: General Health, Germany, Men and Women, Aged 50+



Source: German Age Survey

In the German Age Survey respondents in the selected sample reported also about illnesses and/or accidents during the last six years. **Figure 22** shows that around 30% of men and 25% of woman 50 years of age or older had a serious illness and/or accident. Older people are more likely to have had an illness and/or accident during the last six years than younger people do. In about 60% of men and women the illness is on-going.

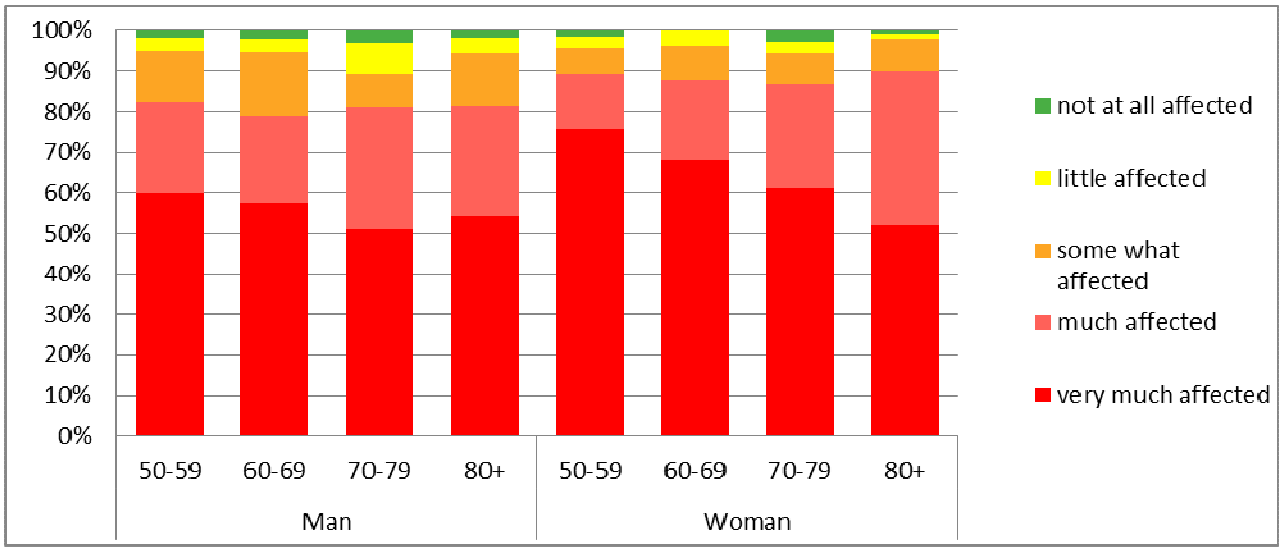
Figure 22: Illness and/or accident last 6 years, Germany, Men and Women, Aged 50+



Source: German Age Survey (N men: 3510, N women: 3283)

The same people were asked how much the illness was affecting them. 55% of men and 66% of women responded that the illness was affecting them greatly. Younger men and women (50 to 59 years of age) indicated greater percentages of being greatly affected than older people (70 years or older) (Figure 23).

Figure 23: Negatively affected through illness, Germany, Men and Women, 50 years and older

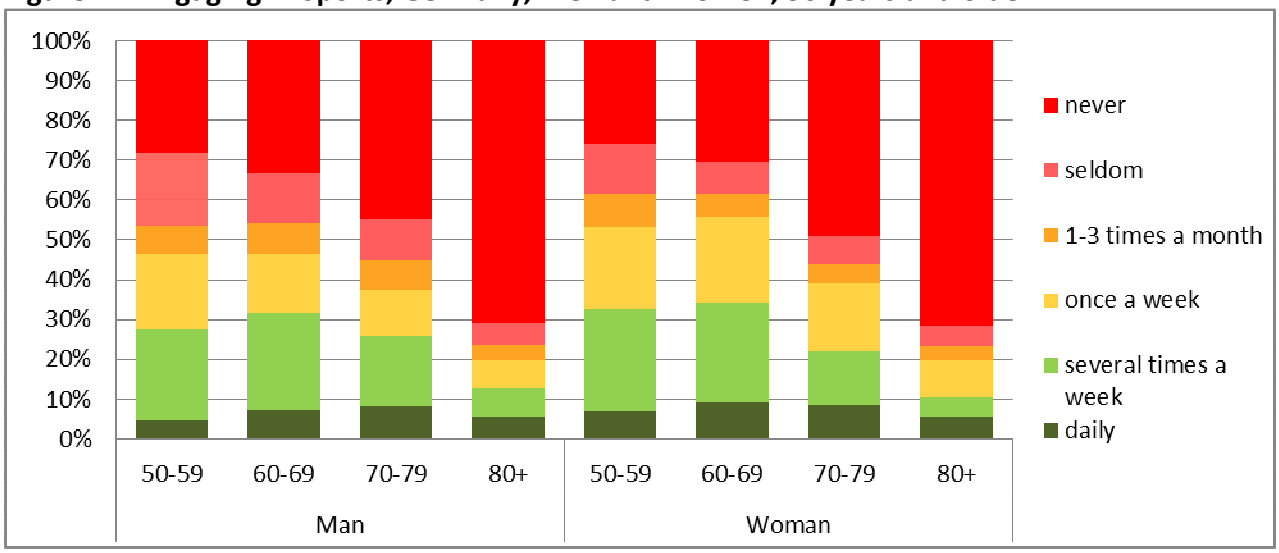


Source: German Age Survey (N men: 837, N women: 623)

4.3.5 Sports and physical activity of target population in Europe

The German Age survey shows that men are physically more active doing sports than women. More than half of German men and about 45% of German women aged 50 to 69 years engage in sports at least once a month. The data shows that men and women tend to become more physically active after retirement. However the percentage of people never engaging in sports is also quite high (25% at age 50 to 59 years) and increasing steadily with age.

Figure 24: Engaging in Sports, Germany, Men and Women, 50 years and older



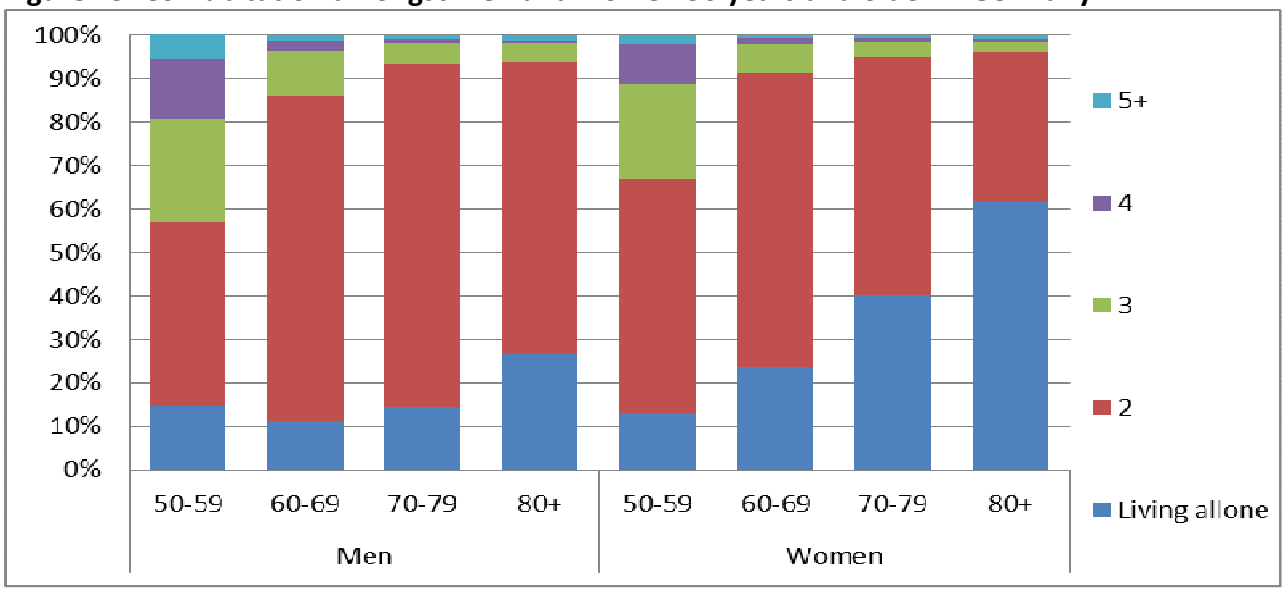
Source: German Age Survey

4.3.6 Housing and living circumstances of European target population 50 years and older

According to the Share data and the German Ageing Survey most people co-habit with someone else. Household size therefore is most commonly two people.

According to the German Ageing Survey 14% of male and 28% of female above the age of 50 in Germany are living alone. The percentage is increasing with age to 27% amongst males and 62% amongst females in the age category of 80 years or older.

Figure 25: Co-habitation amongst men and women 50 years and older in Germany



Source: German Age Survey (N men: 3’512 , N women: 3283)

4.3.6.1 Internet use in the target population in Germany

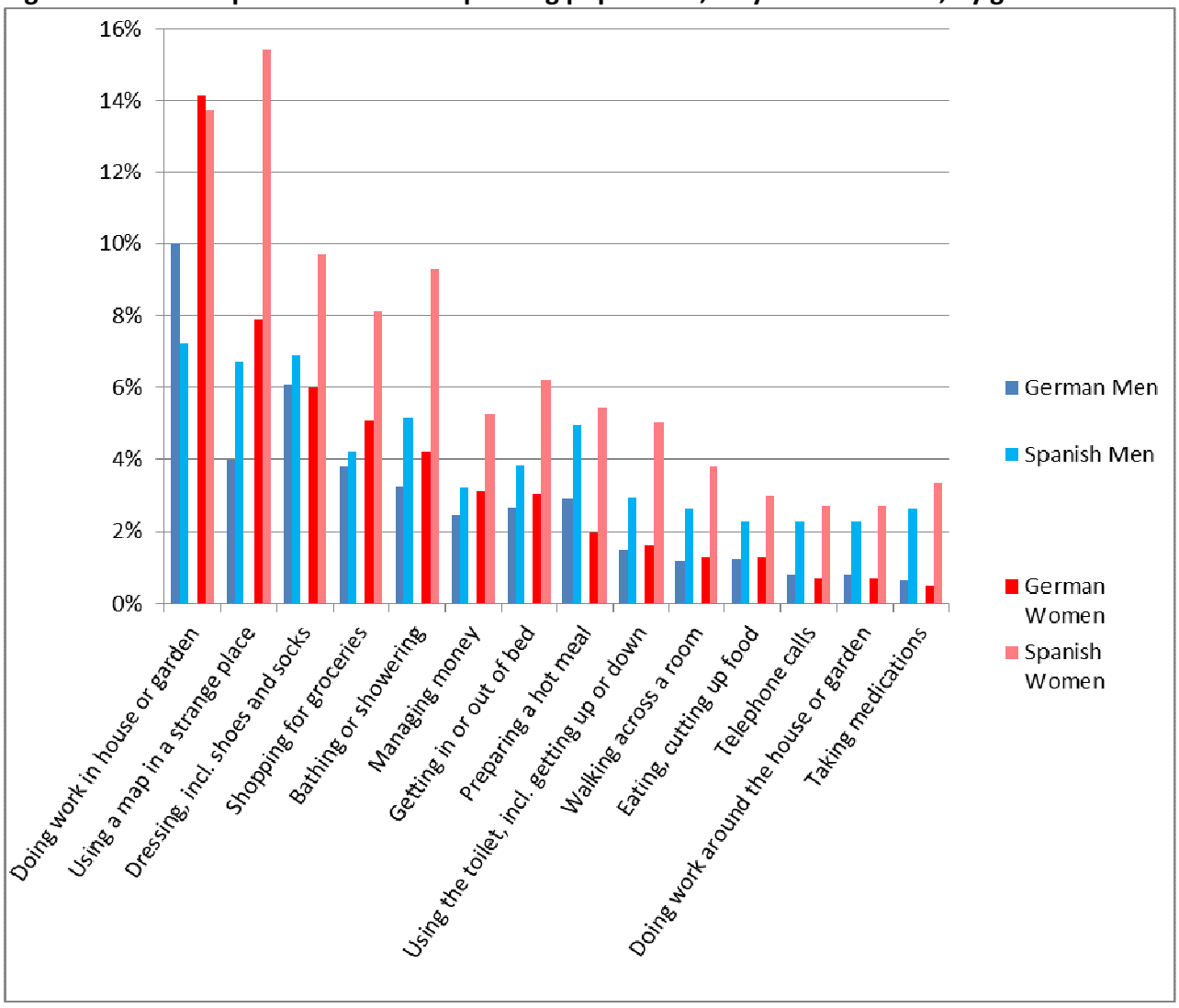
Around 60% of men and 50% of women in Germany have access to the Internet according to the German Ageing Survey. However while the bulk part of 50 to 69 years old people have access to the internet small percentages of the older generations have access. Especially women 70 years or older seem to have little access to the internet (70-79 years: 27%, 80+: 3%). The bulk part of male

internet users is daily or at least several times a week “on-line”, while women are less frequently “on-line”.

4.3.6.2 Cultural differences in ADL performance in Spanish and German speaking people

Comparing German speaking people to Spanish speaking people it is obvious that a higher percentage of Spanish speaking respondents report difficulties performing ADL compared to German speaking respondents (**Figure 26**). Especially great is the difference between both female populations: the difference between Spanish speaking women and German speaking women is remarkably great.

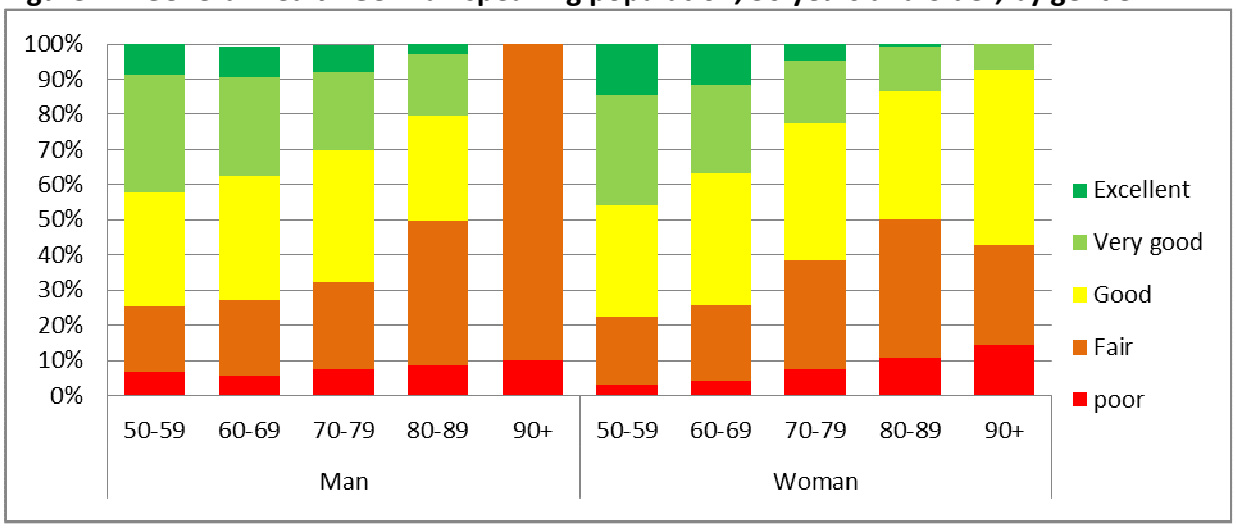
Figure 26: ADL of Spanish & German speaking population, 50 years and older, by gender



Source: Share (N men: 21’633, N women: 27’297)

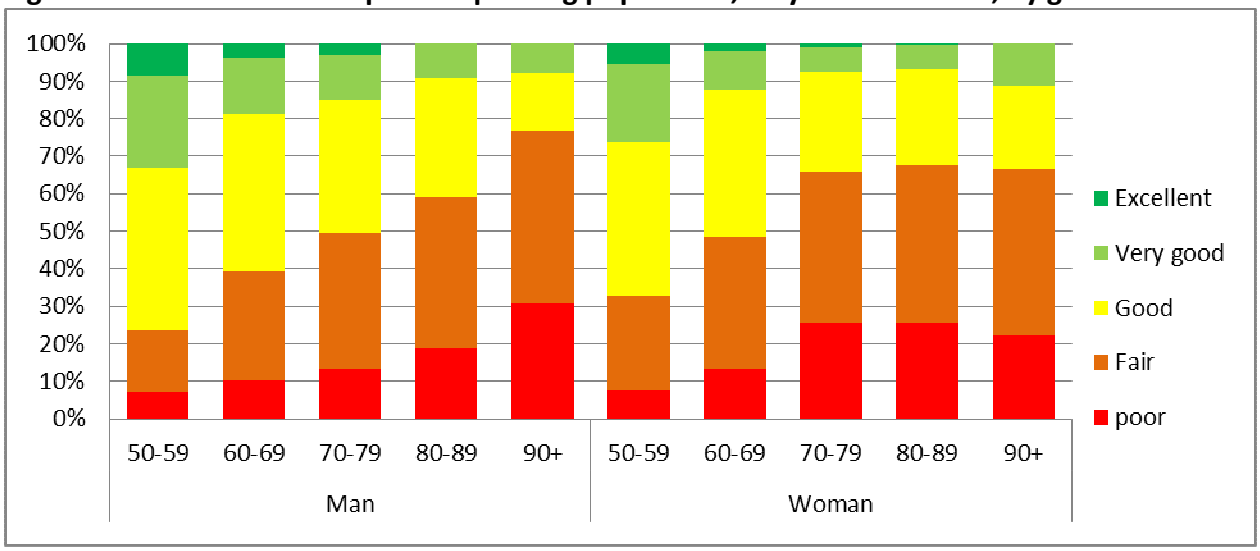
Looking at the general health status of both populations one can observe that Spanish speaking people report poorer health than German speaking people do. Once more Spanish speaking women report the worst health status among the four population groups with 16% of women over 50 years of age reporting poor health. In comparison, only 5% of German women report poor health. Amongst men the difference is not quite as large with 75 of German men reporting poor health and 11% of Spanish men.

Figure 27: General Health German speaking population, 50 years and older, by gender



Source: Share (N men: 21'633, N women: 27'297)

Figure 28: General Health Spanish speaking population, 50 years and older, by gender



Source: Share (N men: 21'633, N women: 27'297)

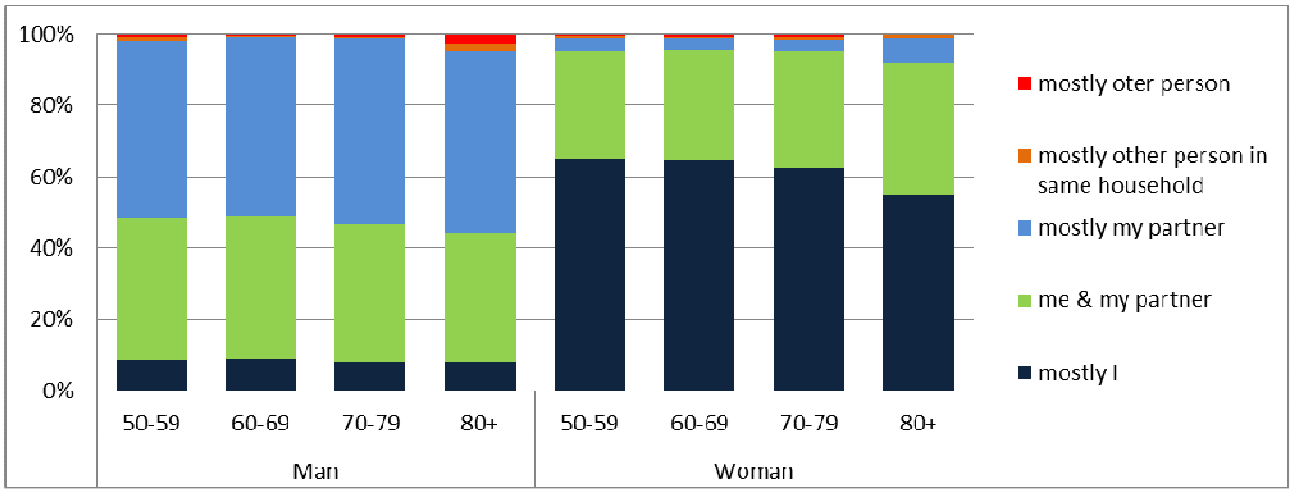
An explanation for the observed differences in ADL performance and health status gives Hendriks (2006) analysing the same SHARE data and finding large cross-country variations in reporting styles across Europe: the worst self-reported health was in Southern Europe (Spain and Italy) and the best in Scandinavia (Denmark and Sweden). This however is in contrast to real life expectancy (at birth) which is amongst the highest in southern Europe (Spain and Italy). He therefore undertook analysis to correct for the potential bias caused by cultural reporting differences. He found that Scandinavians over report their health statures and Southern Europeans underreport it. Furthermore he adjusted the health status according to the diagnosed diseases the surveyed people indicated in the questionnaire. He found that Switzerland and Austria had the highest percentage of people in perfect health while Italy and Spain had the lowest percentage. **Therefore it can be concluded; that some of the reported health differences are actual health status differences but that there is also a share of the difference explainable through reporting style in the respective culture.**

4.3.7 Gender Differences

As already mentioned before women indicate generally more difficulties with ADL and other tasks than man. This is a pattern visible in almost all ADL and tasks in all datasets analysed. Exceptions are the task of preparing a hot meal, doing laundry and doing light household chores. The item using a map in a strange place had the largest gender bias: women were twice more likely to report difficulties than men were (age 50 to 89). Most household chores are done by woman according to the German Ageing Survey. In the age categories of 50 years and above the role distribution seems to be still very traditional.

House hold chores are distributed very unevenly between the sexes. Women indicated to do most of the chores while men indicated that their partner was doing most of the chores. Help by another person within the household is very seldom reported (<1% amongst men and woman on average). Also external help is seldom used (<1% on average) but with men 80 years and above (3%).

Figure 29: Distribution of house hold chores amongst German men and women aged 50 years and older



Source: German Age Survey (N men: 3'006 , N women: 2'262)

4.4 Conclusions

Throughout this section, a short summary of the general findings of the data analysis and conclusion thereof are described.

4.4.1 Summary of Findings

The analysis of the datasets showed the following general trends in the target population for WeTakeCare.

Most important findings from data analysis of ADL in European population 50 years and older

- The target population of surveyed people in all datasets reported to be quite able and self-sufficient with almost no difficulties performing an ADL until the age of about 80.
- The older the age of the surveyed person the more frequent are reported problems

performing an ADL.

- The more strenuous a task is, the higher is the percentage of people indicating having difficulties.
- Most problems were reported doing strenuous motor tasks such as climbing stairs, lifting, carrying or moving heavy objects, vacuuming etc.
- A higher percentage of difficulties were reported doing complex ADL compared to simpler tasks.
- A cultural effect can be observed: a higher percentage of Spanish speaking respondents indicate having difficulties compared to German speaking respondents. This is in part a real difference in health status.
- A gender effect can be observed: a higher percentage of women indicate having difficulties performing an ADL or motor task than men do, with exceptions only in typical household chores such as cooking or doing laundry. Also sport is more popular amongst men.
- Internet use is sparse in the population over 70 years of age especially amongst women.

5 Focus Group Interviews

According to the execution planned in T 1.1. Identification of needs and requirements analysis the quantitative method of focus-group interviews was used. The aim was to collect **information on specific ADL tasks** causing difficulties and needing physical support by caregivers, as well as to gain general understanding of the **interest, perceptions and difficulties of use of the WeTakeCare system**.

5.1 Method

The **focus group technique** can be defined as a carefully **planned discussion** designed to obtain qualitative information on a specific area of interest, in a **permissive atmosphere** (not directive). It is a method for obtaining perceptions from a group of people about a product or service, based on a group interview technique. Participants express freely what they think about the subject matters and discuss according to an established order, respecting their turns.

Forces-group interviews are usually small groups of 5-10 people, who were selected according to a common - for the object of inquiry relevant - interest or basic characteristic. These participants take part in a single discussion, which is limited in time about a specific subject. Key issues and questions to be discussed in the group are prepared. The participants then are asked to discuss the key issues during a certain period of time. The discussion is relaxed, comfortable and often successful for participants as they are able to **share their ideas**. (Krueger, 1991: 24)[3]. A moderator leads through the discussion to give room for all participants otherwise the discussion is free and frank. Ideally there is enough room to incorporate issues into the discussion, which come up during the discussion amongst the group members. The goal of focus-group interviews is to gain information and opinions to ideas, projects or products through the analysis of answers and group dynamic processes.

This qualitative and participative method seems especially adequate since for the development of new technologies a user-centred approach is regards as essential (Compagna et al. 2009).

In addition to the information collected from the literature review and data re-analyses focus group interviews were held to collect additional information on the following objectives:

- To obtain **general information** about a field that you are not familiar with.
- To **understand the user's behaviour** toward a product/service, by focusing on "the why of things", and not quantifying them.
- To contribute with **new knowledge** and relevant information to produce a new product/service or redesigning an existing one.
- To determine **behaviours, attitudes, opinions, beliefs, motivations, habits**, etc.
- To **identify new concepts and uses** of products and services.
- To restrict the number of possible **directions for further research**.

Therefore 6 focus group interviews were conducted with end-users (elderly people, relatives providing care), 3 in Switzerland and 2 in Spain, as well as one group with professionals working with elderly people (OT's, home care nurses, social workers).

[3] KRUEGER, R. A. (1991). El grupo de discusión. Guía práctica para la investigación aplicada. Ed. Pirámide. Madrid.

The focus groups were organised according to user groups:

- **User group 1, elderly people:** 3 focus-group interviews with elderly people were conducted in November 2013. The three focus-group interviews were composed as follows: One focus-group interview was held in Valencia, Spain hosted by IBV with 9 elderly participants. In Switzerland the focus group interviews were hosted by the ZHAW. The first focus group was conducted in Winterthur with 8 participants (3 male, 5 female) of the age 70 years or older. The other focus group took place in Berne with 6 participating women.
- **User group 2: Relatives**
  Two focus group interviews with relatives of elderly people were held. The first in Valencia, Spain with 9 participants, the second in Winterthur, Switzerland with 8 participants (2 men, 6 women).
- **User group 3: Professionals**
  One focus group with 7 participating female professionals was held in Winterthur, Switzerland.

5.2 Procedure

Throughout this section, the procedure of organising and carrying out the focus groups in Spain and Switzerland are described.

5.2.1 Organisation of focus-group interviews

Participants were sought after with the following strategies:

- Letters were sent to various physical therapists, occupational therapists, clinics, health institutions, consulting agencies for caring relatives in the greater Zurich area. Professionals were asked to participate in the focus group for professionals.
- The advisory board provided addresses of elderly people and professionals possibly interested in participation in a focus group interview. Invitation letters were sent to these people informing about the project and asking for participation in one of the focus groups.
- Letters were also sent to institutions active in the field of support for elderly people and elderly care e.g. University of Zurich, Institute of Gerontology and self-help groups e.g. Pro Senectute. These institutions were used as multiplier for our search for participants.
- An advisory board member distributed invitation letters in a housing cooperative for elderly. Members of the housing cooperative formed one entire focus group.
- In several newspapers and journals appeals for participants were published with contact information.
- Appeals for participants were sent internally to all members of the ZHAW Department of Health for participants of the elderly focus group.
- Appeals were posted in public buildings and grocery stores.
- Furthermore personal contacts were used to find focus group members.

5.2.1.1 Focus group interviews in Switzerland

All participants were assured anonymity and were informed about the study goals, the procedure of the focus group interviews and the collection of their answers. All participants were asked to sign a written consent for participation and also to record the interviews digitally and take pictures

during the session. All participants agreed to have the discussion recorded but one participant. The elderly focus group in Berne therefore was not recorded. All focus group interviews were protocolled.

All focus group interviews in Switzerland took place in November 2013.

5.2.1.2 Focus group interviews in Spain

Participants in the focus groups have been recruited in collaboration with the Department of Social Services and Elderly People of Mislata's council (Valencia).

5.2.2 Objectives of the focus group interviews

1. **Needs of end-users:**

a. To identify the most important problems of elderly people and their caregivers in performing Activities of Daily Living (ADL), that could be supported by the WeTakeCare system.

2. **Requirements of the system:**

a. To define the contribution of the WeTakeCare system to the collaborative re-training process.

b. To define design criteria of the application, focusing on aspects such as usability and acceptance.

3. **Perceptions related to the system:**

a. Understanding the interests, perceptions and difficulties about the WeTakeCare system.

5.2.3 Outline of the focus group interviews

The focus group discussions were always moderated by one researcher while the other was writing protocol. The procedure always started with a short introduction to the project and with an introductory round. After the first section with discussions to limitations in ADL performance a video of the Kinect product and the use of Kinect as a training or rehabilitation device were shown to the group in order to give the participants an impression about the planned WeTakeCare product. After the video sequence the discussions continued about needs and requirements of the product. A short coffee break was held in each focus group session.

The following questions were asked to the focus groups as a starting point for the discussion. Table 8 summarises the questions asked to each user group in the focus group interviews with elderly people, caregivers and professionals.

Table 8: Questions asked to each user group in the focus group interviews

Questions	User Group 1: Elderly People (SP)	User Group 2: Relatives (CH)	User Group 3: Professionals (CH)
ADL and compensating strategies	• What ADL bear difficulties? • What are the specific difficulties in performing ADL? • What kind of devices and compensating strategies are used to perform these activities? • Do you consider it possible to improve the performance of these tasks by yourself through training or change of strategy?	• With what ADL needs the relative help? • What are the difficulties in providing help/support with ADL? • What kind of devices and compensating strategies are used to perform these activities provide help/support? Is technology used?	• What ADL are the most common healthy elderly people experience difficulties with? • What are the difficulties people experience with these ADL? • What ADL are the most crucial to maintain? • What strategies do you know to compensate these difficulties? • What experience have they made in training the ADL? • What do you consider important?
Burdens of care giving	--	• What are your burdens/stress factors in daily live? • How do you relax and regain energy	--
Impressions about the Kinect video	• What are your first impressions regarding the video? • Now having seen the video could you imagine yourself using a special Kinect programme to improve performance of activities of daily living?	• Now having seen the video do you think it possible that you would use a special programme to make your daily life easier?	--

Questions	User Group 1: Elderly People (SP)	User Group 2: Relatives (CH)	User Group 3: Professionals (CH)
Functionalities of the program	• What function should the programme have to support you in your daily life? (e.g. training part for fitness, organizer, memory function, call friends, …) • What would you like to do with it? • How would you incorporate it in your daily routine? When would you want to use it during the day? (start in the morning …)	• What functions should the programme have to support you and your relative in your daily life? (e.g. memory function, training units and strategies, connect with friends or professional help…) What would you like to do with it? • How could you incorporate it in your daily routine?	• What function should the programme have? (e.g. memory function, connect relatives, user users or professionals, …) • What are important aspects for you to use the program? (interface, features, design) • What are important aspects for the usability? (e.g. hearing and vision loss, interface, selection of training units and activities, feedback and rewarding system
Expected hindrances	• What kind of difficulties are to be expected in the apartments /houses that hinder the use of WeTakeCare (space, noise etc.)?	• What kind of difficulties are to be expected in the apartments /houses that hinder the use of WeTakeCare (space, noise etc.)?	• What kind of difficulties are to be expected in the apartments /houses that hinder the use of WeTakeCare (space, noise etc.)? • What risks have to be considered?
Support material	• What support material could be helpful? How should it be presented (written, visual, audio…)	• What support material could be helpful?	• What support material could be helpful?

Questions	User Group 1: Elderly People (SP)	User Group 2: Relatives (CH)	User Group 3: Professionals (CH)
Technology in use	• Which of the following systems are in youse by the relative and by the elderly person: Internet, computer, TV, gaming console, exercising DVD (e.g. Yoga, Pilates), smart phones, other training device (e.g. home trainer)	• Which of the following systems are in youse by the relative and by the elderly person: Internet, computer, TV, gaming console, exercising DVD	--
Use of such a program	• Final question: If the WeTakeCare program is tailored like we imagined it today, would you like to use it?	• the WeTakeCare program is tailored like we imagined it today, would you like to use it?	--

Table 9 summarises the composition of the focus groups with elderly people, caregivers and professionals held in Switzerland and Spain.

Table 9: Composition of the focus groups with elderly people, caregivers and professionals

	Elderly People Group 1	Elderly People Group 2	Elderly People Group 3
Technical staff	• 1 moderator • 1 observer	• 1 moderator • 1 observer	• 1 moderator • 1 observer
Participants description	• Gender and age ○ 4 women aged 62-80 years ○ 5 men aged 68-78 years • Frailty level ○ 6 participants with mild frailty ○ 3 participants with moderate frailty	• Gender and age ○ 5 women aged 82-83 years ○ 3 men aged 70-75 years • Frailty level ○ 4 participants with limitations and with none to mild frailty ○ 4 participants with limitations and moderate frailty	• Gender and age ○ 6 women aged 65 - 82 years • Frailty level ○ 5 participants with non to light frailty ○ 1 participant with moderate frailty
Session profile	• 9 participants • 2 hours session • November 8th, 2013	• 8 participants • 2 ¼ hours session • November 14th, 2013	• 6 participants • 2 ¼ hours session • November 21st, 2013

	• Mislata's City Hall, Valencia, Spain	• Meeting room at the ZHAW in Winterthur, Switzerland	• Meeting room at Spitex location in Berne, Switzerland

Table 10 summarises the characteristics of participants in the focus group interviews for caregivers and professionals.

Table 10: Characteristics of participants of focus groups with caregivers and professionals

	Caregiver Focus Group 1	Caregiver Focus Group 2	Professional Focus Group
Technical staff	• 1 moderator • 1 observer	• 1 moderator • 1 observer	• 1 moderator • 1 observer
Participants description	• Gender and age ○ 6 women aged 46-69 years ○ 2 men aged 55-65 years • Frailty level ○ 3 users have relatives with mild to moderate frailty ○ 3 participants have relatives with severe frailty ○ 2 participants have relatives with severe frailty, who live in nursing homes	• Gender and age ○ 9 women aged 54-65 years ○ 3 men aged 70-75 years • Frailty level ○ 6 participants caring people with moderate frailty ○ 6 participants caring people with severe frailty	• Gender and age ○ 7 women aged 33-60 years • Profession ○ 1 social worker/gerontologist ○ 3 nurses of Spitex (home nursing service in Switzerland) ○ 2 OT's specialised for geriatric patients
Session profile	• 8 participants • 2 hours session • November 14th, 2013 • Meeting room at the ZHAW in Winterthur, Switzerland	• 9 participants • 2 hours session • November 15th, 2013 • Mislata's City Hall (Valencia, Spain)	• 7 participants • 2 hours session • November 28th, 2013 • Meeting room at the ZHAW in Winterthur, Switzerland

5.3 Results

Table 11 and Table 12 show outstanding ADL which are a challenge for end-users, the difficulties related to these ADL, as well as the tools applied to properly perform these tasks as expressed by elderly people, caregivers and professionals.

Table 11: Basic Activities of Daily Living (BADL).

BADL	DIFFICULTIES (elderly people)	RESOURCE/STRATEGIES (elderly people)	RESOURCE/STRATEGIES (caregivers/professionals)
Bathing, showering, hair washing, hair combing, making up, shaving (PERSONAL HYGIENE)	• Do not reach certain body parts. • Do not have strength enough. • Do not have mobility enough. • Are afraid of falls.	• Exercising and stretching. • Use of technical/non-technical aids (back brush; small towels).	• Task supervision. • To remind the process and its steps/stages. • To adjust the water temperature. • To help to step into or come out of the shower/bath. • Use of technical/non-technical aids (plastic chair in the shower; stool to step into or come out the bath; grab bars). • Complete body washing. • To wash certain unreachable body areas for the person cared for.
Put on/off shoes, socks, stockings (DRESSING / UNDRESSING)	• Do not reach feet. • Do not have strength enough. • Do not have mobility enough. • Do not have necessary sensation in fingertips.	• To lift the leg and set the foot on a chair or similar. • Use of unlaced shoes or shoes without buckles. • Use of technical/non-technical aids (shoehorn, stocking pullers, use gloves). • To ask for help to another person.	• To put on/off the shoes or socks while the person cared for is seated (older person seated in front of the caregiver seated as well). • Use of technical/non-technical aids (shoehorn,).

BADL	DIFFICULTIES (elderly people)	RESOURCE/STRATEGIES (elderly people)	RESOURCE/STRATEGIES (caregivers/professionals)
Go to the bathroom, sprucing, put on/off diapers (BOWEL AND BLADDER MANAGEMENT)	• Do not remember the process. • Do not reach certain body parts. • Do not have strength enough. • Do not have mobility enough. • Are in danger of falls.	• Install handles next to the toilet.	• Use of protectors in the bed of the user cared for. • Direct transfer (if necessary) without the help of supporting tools. • Good back-protection management for care givers.
EATING	• Do not remember the process of eating by oneself. • Do not have strength enough. • No to be able to keep the right position of cutleries. • No to be able to cut, poke, etc.	• Use of technical/non-technical aids (special cutlery).	• Task supervision. • To feed the person cared for. • Use of technical/non-technical aids (special cutlery, bib).
Grabbing, nails cutting, writing, opening/closing caps (FINE MOTOR SKILLS)	• Loss of sensitivity (sense of touch). • Do not have strength enough. • Do not have accuracy enough.	• Use of technical/non-technical aids (bottle opener, tongs, etc.). • To ask another person to do it.	---
Taking Medication	• Do not remember intake. • Do not remember dosage. • No to be able to open wrapping.	• Use of technical/non-technical aids (medication dispenser, alarm etc.).	• Task supervision. • Reminding

BADL	DIFFICULTIES (elderly people)	RESOURCE/STRATEGIES (elderly people)	RESOURCE/STRATEGIES (caregivers/professionals)
Walking, going up/downstairs (FUNCTIONAL MOBILITY)	• Stumbles or falls due to weakness, joint problems, visibility problems or distraction. • Have difficulties with balance. • Feeling pain.	• Exercising and stretching. • Install hand rail in stair cases and handles. • Mark first and last steps of staircases white for better visibility. • Install automatic motion detector for light in stair area. • Install automatic door opener. • Use a mat for door for threshold. • Use of technical aids (walking stick, rollator)	---
Appointments management, making phone calls (ADL requiring to MEMORIZE-REMEMBER)	• Not to be able to remember appointments, obligations or similar. • Not to be able to perform tasks with technological devices.	• To join courses focused on memory. • To practise hobbies (e.g. reading, philately, jigsaw puzzles, alphabet soups). • To take medication. • Use of technical/non-technical aids (agenda, alarm, etc.).	• Task supervision . • Reminding.

Additionally, Table 12 compiles the equivalent information for **Instrumental Activities of Daily Living (IADL)**.

Table 12: Instrumental Activities of Daily Living (IADL).

IADL	DIFFICULTIES (elderly people)	RESOURCE/STRATEGIES (elderly people)	RESOURCE/STRATEGIES (caregivers/professionals)
COOKING	• Do not know the process. • Do not have strength enough. • Do not have energy enough. • No to be able to cut, poke, keep positions, handle burdens, etc.	• Use of technical aids (mixer, kettle, microwave).	• Task supervision. • To perform the task. • To share the task with the person cared for. • To remind the process and its steps/stages. • To supply the ingredients.
Housekeeping chores (CLEANING)	• Do not know the process. • Do not reach certain house areas, particularly top/bottom areas. • Do not have strength enough. • Do not have mobility enough. • Do not have agility enough. • Afraid of falls.	• Exercising and stretching. • Use of technical/non-technical aids (little bench, stool).	• To perform the task[4]. • To delegate cleaning tasks to a relative or a cleaning person.
Housekeeping chores (WASHING)	• Do not know the process. • Do not have strength enough. • Do not have agility enough • Afraid of falls.	• Exercising and stretching • Use of technical/non-technical aids (tumble dryer, laundry rack).	• To perform the task[5]. • To delegate cleaning tasks to a relative or a cleaning person.

[4] Male caregivers do not perform cleaning tasks. A third person is usually in charge of executing them.
[5] Male caregivers do not perform cleaning tasks. A third person is usually in charge of executing them.

IADL	DIFFICULTIES (elderly people)	RESOURCE/STRATEGIES (elderly people)	RESOURCE/STRATEGIES (caregivers/professionals)
SHOPPING	• Do not know the process. • Do not have strength enough. • Do not have mobility enough. • No to able to handle burdens.	• To carry the shopping bag by supporting it on the shoulder. • Use of shopping cart. • To ask another person to do it. • Use home shopping service	• To perform the task. • Use of shopping cart. • Use home shopping service
USE OF ELECTRICAL APPLIANCES	• Do not know the process. • Do not reach certain areas (particularly top/bottom areas). • Do not have strength enough. • Do not have mobility enough. • Do not have motor skills enough.	---	• To perform the task.
MAKING THE BED	• Do not know the process. • Do not reach certain areas (particularly bottom areas). • Do not have strength enough. • Do not have mobility enough. • Do not have agility enough.	---	• Task supervision. • To perform the task. • To share the task with the person cared for.
Gardening	• Do not have strength enough. • Do not have mobility enough. • Do not have agility enough.	• Use of technical/non-technical aids (sprinklers, robot mower, etc.).	• To perform the task. • To share the task with the person cared for. • To delegate the tasks to a gardener

IADL	DIFFICULTIES (elderly people)	RESOURCE/STRATEGIES (elderly people)	RESOURCE/STRATEGIES (caregivers/professionals)
ADMINISTRATIVE TASKS	• Do not know the process.	• Ask for help.	• To perform the task.

Elderly dependents perform ADL autonomously as far as they are able. The main **tasks they try to keep performing** until the last minute in a self-sufficient way are those in relation with**: personal hygiene, bowel and bladder management, eating, dressing/undressing and functional mobility**.

Most important aspects to consider around ADL

- The main **difficulties** affecting elderly people and derived from ADL are based on:
  - Forgetting the process of performing them or never have done the task before (e.g. cooking or cleaning).
  - The lack of strength, agility and mobility.
  - The incapability of reaching certain locations involved in the task.
  - Performance of a task is painful.
- The most relevant **strategies/resources** expressed by **elderly people** with low/medium level of disabilities or frailty can be summarised in:
  - **Practising exercises for health maintenance (e.g. flexibility, strength, resistance, endurance).**
  - **Using certain tools –technical and non-technical aids– that allow them to perform the activities in an easier way (e.g. back brush, shoehorn, bottle opener, stool).**
  - **Implementing some useful 'tricks' in order to get a successful result from the task required (e.g. supporting the shopping bag on the shoulder, using of unlaced shoes, setting the foot on a chair to put on/off a shoe or sock**).
- On their behalf, **caregivers** tend to carry out the next following key **strategies/resources** which are classified according to the level of the participation in them (this involvement use to be proportional to the dependence degree of the elderly person):
  - **To direct perform the tasks by themselves or delegate to a third person.**
  - **To share the tasks with the person cared for.**
  - **To help the elderly person in specific moments throughout the activity performance.**
  - **To remind or explain the process related to the tasks, giving information to the elderly person about the steps to follow.**
  - **To supervise the task while it is being performed** by the person cared for.
- Similarly to elderly people, **caregivers use tools** to facilitate the execution of activities with their people cared for (e.g. stool, grab bars, shoehorn, and bib).

Another important issue is the **emotional condition of the caregivers**. As they are in charge of caring other people, this means the obligation of bearing **burdens or stress factors in their daily lives**. Table 13 list the emotions experienced by caregivers, as well as some of the strategies performed to balance those feelings.

Table 13 Emotions and strategies to bear stress factors in daily life

EMOTIONS (+ / -)	STRATEGIES
• **(+) Satisfaction from helping** • **(–) Exhaustion (physical and psychological)** • **(–) Sadness** • **(–) Mood swings** • **(–) Stress due to tasks accumulation** • **(–) Feeling of duty (hard routines)** • **(–) Feeling of guilt** • **(–) Losing the temper** • **(-) Problem focus** • **(-) Feeling of being overwhelmed**	• Going for a walk • Practising hobbies • Meeting with friends • Leaving home • Relaxing bath before going to bed • Personal time (e.g. after lunch) for reading, watching TV, etc. • Doing something both care giver and cared for person enjoyed • Share task/responsibility with others • Sports • Relaxing exercises (Autogenetic Training)

5.3.1 Training of ADL

Elderly people and caregivers in Spain, **considered it in general possible to improvement the performance of ADL** through training or new strategies. According to their opinions, the ADL that could be re-trained (or their performance could be improved) are those related to **physiological and functional activities** required throughout the day, that is BADL, with the aim of keeping or recovering the skills to perform these tasks. In Switzerland the elderly people were more of the opinion that training should be performed to maintain functions or to learn how to do tasks in a different way to regain functionality.

At the same time, **other supplementary activities** emerged from the focus groups sessions. However, this set of activities would be addressed to **caregivers and their role** helping elderly people.

Table 14 details the **activities susceptible to train for both segments of end-users**, in accordance with the feedback coming from the Spanish focus groups sessions. Information about elderly people is completed with the minimum desirable level of performance to achieve for each activity, differentiating between users with mild-moderate frailty (MMF) and users with moderate-severe

frailty (MSF) according to their care givers. Information about caregivers points out areas they are interested in receiving help or advise.

Table 14: Activities susceptible to be trained for elderly people

ELDERLY PEOPLE		
Activities	**Performance level of the activity (MMF)[6]**	**Performance level of the activity (MSF)[7]**
• **Eating**	Total	Total
• **Personal hygiene**	Total	Partial
• **Dressing / Undressing**	Total	Partial
• **Housework**	Total	Partial
• **Memorize – Remember**	Total	Partial
• **Functional mobility**	Total	Partial

Table 15: Activities susceptible to be trained for care givers

CAREGIVERS
Activities
• **Transferring, displacements of the person cared for.**
• **Healthy postures**
• **Healthy eating habits**
• **Psychological support**
• **Relaxing exercises**
• **Stretching exercises**
• **Information about care giving**

5.3.2 Reflect on training with Kinect technology

After watching the video, end-users expressed different opinions depending on the session. **Elderly people** in Spain stated a **good perception** of the technology, whereas in Switzerland one group was much more critical and expressed a lot of scepticism in regard to space needed, safety and usefulness of such a program. However, the second group in Switzerland was more open to

[6] Mild – Moderate Frailty (MMF) users

[7] Moderate – Severe Frailty (MSF) users

such a program and saw the product as animating. The wish was expressed to be able to build groups to use the program together.

The **caregivers** in Spain showed their **scepticism** about the product, however caregivers in Switzerland were optimistic but stressed the point that such a program should not be stigmatizing for elderly.

The **professional** group in Switzerland found the idea of such a program interesting und perceived it as useful. However, they stressed the point that the learning process for elderly is slow. Moreover they pointed out safety issues and that the program needs a good fit to target population. The most relevant data given by all three groups is specified in the table below.

Table 16: Issues about training with Kinect technology for elderly people

	ELDERLY PEOPLE IN SPAIN	ELDERLY PEOPLE IN SWITZERLAND
Impressions (adjectives)	Wonderful, great, necessary, interactive, effective	Good thing, different in reality, discipline necessary, too fast
Similar tools	Do not know anything similar. Just TV programs showing live exercising like sports DVD such as Yoga or Pilates.	Do not know anything similar. Just sports DVD such as Yoga or Pilates.
Willingness to use	Green cards = 5 ; Red cards = 3 ; DK/DA(*) = 1	Green cards = 4 ; Red cards = 10
Positive attributes (+)	• Better well-being (improving the quality of life). • Motivation.	• Good for fall prevention and to keep up mobility
Negative attributes (-)	• Would not have patience enough to practise the exercises in front of the TV. • Would not have perseverance enough. • Would not make an effort to complete the exercises. • Would not use it by them at home (lonely).	• Would not like to practise in front of the TV, rather go outside. • Afraid of doing exercises wrong. • Would not have the space for the exercises. • Would not use it by them at home.
Desirable context of using	• Not at home (e.g. social clubs) • Collectively • Leaded by an instructor	• Collectively in a group but also exercise alone • Exercise at home or in an organisation that provides courses • Lead by an instructor (for the first few times)

(*) DK/DA = Do not know / Do not answer

In the **elderly group in Spain**, the spontaneous assessment of the technology was slightly better than the vote with cards, because the enthusiasts overshadowed the rest of the participants. Anyway, the voting results in a good reception of the proposal since most of the elderly (5 in 9) picked the green card. Some of the comments emerged along this part of the session noted that the **commitment of using** the application is connected to take this kind of task as:

- A **duty or obligation** (e.g. similar to joining a course, with a specific schedule and sessions).
- A **'competitive incitement'**, by doing the training collectively (with partners).

In the **elderly groups in Switzerland**, the spontaneous assessment in the first group was very dismissive. The elderly had trouble to follow the Kinect spot, it was too fast. Most of the response was therefore overshadowed by the impression of that particular video of Kinect. Most people prefer to go outside to do exercises or to go to a club to do exercises together. They felt that the exercises they already do are enough to keep them in good enough shape. The group had trouble to imagine themselves using such a device. The second group however was more receptive to the idea of a training tool with Kinect, with all 4 out of 6 persons willing to be part of the trials. The aspect of competiveness was intensively discusses in the second group as some members felt it should not be competitive in nature that improvements should rather be measured in comparison to earlier results. Similar to the focus group in Spain participant though:

- A **daily routine,** training should be incorporated in daily life.
- A **motivating incitement**, by measuring improvements and with encouragement of the programme
- Doing the training **collectively in a group**.

Table 17: Issues about training with Kinect technology for caregivers

	CAREGIVERS IN SPAIN	CAREGIVERS IN SWITZERLAND
Impressions (adjectives)	Good, useful / un useful	Motivating, interesting
Similar tools	Do not know anything similar. Just TV programs showing live exercising like sports DVD such as Yoga or Pilates.	Do not know anything similar. Just sports DVD such as Yoga or Pilates.
Willingness to use	Green cards = 12 ; Red cards = 0 ; DK/DA(*) = 0	Green cards=12; Red cards = 1, DK = 1
Positive attributes (+)	• Useful for caregivers. • Useful for elderly people with motor skills problems. • Can be used in a certain moment/situation.	• Good motivator for elderly to stay mobile. • Good for people with beginning frailty.
Negative attributes (-)	• Not useful for elderly people with severe frailty.	• Should not be stigmatizing.

Desirable context of using	• Not at home (e.g. social clubs) • Collectively • Leaded by an instructor	• Use together in the nursing home. • Collectively

(*) DK/DA = Do not know / Do not answer

Regarding the **caregiver group in Spain**, a group was critical with the technology due to the **drawback** about using it with the person cared for, particularly **those who were in charge of relatives with severe disabilities**. However, all of them expressed that they liked the application (12 green cards resulting from the vote)[8].

In **Switzerland the caregiver group** spontaneously listed a number of additional functions for the program, which they thought would be very helpful for their elderly parents.

Table 18: Issues about training with Kinect technology for professionals

PROFESSIONALS IN SWITZERLAND	
Impressions (adjectives)	Good, useful
Similar tools	• Know something similar for exercises for elderly people with the support of an IPad. • Know program with Kinect in rehabilitation.
Willingness to use on the job	Green cards = 7, red cards = 0
Positive attributes (+)	• Useful for caregivers. • Useful for elderly people with motor skills problems. • Can be used in a certain moment/situation.
Negative attributes (-)	• Neighbours could be bothered with noise. • Lack of space to do exercises in elderly people's houses/flats. • Elderly people have difficulties to change their routines and try new things.
Desirable context of using	• In rehabilitation • Collectively or individually • Introduced/lead by an instructor

(*) DK/DA = Do not know / Do not answer

[8] This result can indicate certain bias. Maybe caregivers voted positively because they thought this result (a good impression of the technology) was the expected one.

Most important aspects to consider around training with Kinect tech.

- **First impressions** reveal that the technology is perceived as **interesting and useful**.
- Neither elderly people nor caregivers are familiar with this class of application. They do not know anything really similar. However professionals do know programs which are similar for rehabilitation or for mobile use.
- **By majority in favour of using the application** as a way to improve skills to perform daily tasks and to use the application as a training to prevent the loss of skills and mobility.
- Main **positive attributes**:
  - Improvement of well-being.
  - Improvement of body functions.
  - Useful for caregivers.
  - Useful for elderly people with mild or moderate disabilities.
- Main **negative attributes**:
  - A commitment based on an obligation is required to count on the involvement of elderly people with more autonomy.
  - Do not like to use the technology alone.
  - Useless for elderly people with severe disabilities.

5.3.3 Functionality of system: Key features

Table 19 breaks down the **features** that end-users would like to find **incorporated in the system**. Items are grouped by relevance (maximum relevance first) in each target segment considered.

Table 19: Key features in WeTakeCare system

ELDERLY PEOPLE	CAREGIVERS	PROFESSIONALS (ON BEHALF OF ELDERLY PEOPLE AND CAREGIVERS)
• **Exercises/Activities** addressed to improve **agility, stretching** (e.g. Yoga practising). • **Exercises/Activities** addressed to improve **mental abilities** (memory, attention). • The program should be able to follow an **individual**	• **Relaxing exercises/activities**. • **Exercises/Activities** addressed to improve **mental abilities** (memory, attention). • **Exercises/Activities** addressed to improve **agility, mobility, strength and stretching** (e.g. Yoga practising).	• **Show transferability to daily life.** • **Explain** what the **exercise is good for.** • The program should be able to follow **an individual training plan.**

ELDERLY PEOPLE	CAREGIVERS	PROFESSIONALS (ON BEHALF OF ELDERLY PEOPLE AND CAREGIVERS)
training plan. • **Relaxing and breathing exercises/activities**. • **Feedback** implementation **to inform** user how he/she is performing the exercise, or **to encourage**. • **Real videos**, with an instructor leading the exercises/activities. • **Videogames**, where users are represented by avatars and must complete a task. • Only interested in core features, **no extra functionalities** like organizer, video call service, etc.	• **Training programs or video tutorials**. • **Feedback** implementation **to inform** user how he/she is performing the exercise, or **to encourage**. • **Organizer**.	

5.3.4 Requirements of system

After identifying the features to be considered in the system, Table 20 gathers other **requirements that WeTakeCare application should fulfil** in accordance with end-users demands. Requirements in the table are **listed in two groups**, on one hand those which refer to the **integration** of the system in the user routine, and on the other hand those related to its **usability**.

Table 20: Requirements of the WeTakeCare system

	ELDERLY PEOPLE	CAREGIVERS
INTEGRATION	• Consider a **different from home implementation** of the system, including an **instructor**. • Consider a **collective practising** of the system. • At home (if necessary) it should require a limit dedication of **10-15 minutes per day**. • The most convenient moment	• Consider a **different from home implementation** of the system, including an **instructor**. • Consider a **collective practising** of the system. • Limit dedication of **15-20 minutes per day**. • At home the most convenient moment to use it would be **morning time or after lunch**

	during the day to use the system would be **morning time**.	(alone practising).
USABILITY	• **Short exercises/activities** (avoiding boredom). • **Simple exercises/activities**, with levels of difficulty. • **Adjustable sound volume**. • Screen instructions with clear **examples**.	• **Unhurried pace of exercises/activities**. • **Simple exercises/activities**, with levels of difficulty. • **Adjustable sound volume**. • **Appealing and enjoyable** interface design. • Feedback based on **suggestions and advices**.

5.3.5 Technologic systems/devices in use

In order to find out if end-users are familiar with diverse technology of daily life, elderly people and caregivers were asked whether some **systems** are **in use at home and their experience in usage** (basic user or advanced user). Table 21 summarizes the technology used by the participants of both focus groups in Spain.

Table 21: Distribution of technologic systems/devices in use in Spanish focus groups

	Internet		Computer		Gaming console		Mobile phone		TV	Sports DVD	Devices for home training
	B.U.	A.U.	B.U.	A.U.	B.U.	A.U.	B.U.	A.U.			
Elderly people (9) in Spain	3	2	0	2	0	0	5	2	9	0	4
Caregivers (12) in Spain	3	0	2	0	0	0	10	2	12	0	3
TOTAL [#]	8		4		0		19		21	0	7
TOTAL [%]	**38%**		**19%**		**0%**		**90%**		**100%**	**0%**	**33%**

B.U. = Basic User ; A.U. = Advanced User

In Spain the **most used devices are TV and mobile phone**, though regarding the last one end-users take advantage by majority of its basic features (calling and text messaging). Similarly, **Internet is mainly used out of home and for basic functions** (e-mailing, web surfing). Home training devices

are available in 33% of cases, however these are underused. Additionally, only 19% of end-users have computers, whereas gaming consoles and sports DVD are not used in any case.

Table 22: Distribution of technologic systems/devices in use in Swiss focus groups

	Internet	Computer / Laptop	Gaming console	Tablet	Mobile phone	Smartphone	TV	Sports CD/DVD	Devices for home training
Elderly people (8) in Switzerland	7	8	0	4	7	1	8	1	1
Elderly people (6) in Switzerland	4	4	0	1	4	2	6	0	1
Caregivers (8) in Switzerland	8	8	0	2	4	4	5	3	n.a.
TOTAL [22]	19	20	0	7	15	7	19	4	2
TOTAL [%]	**86%**	**91%**	**0%**	**32%**	**68%**	**32%**	**86 %**	**18%**	**9%**

Table 22 summarizes the technology used by participants of focus groups in Switzerland. The **most used devices are TV, mobile phones and computers**. Most focus group participants are computer/Internet literate to some degree. Others have access to the Internet though a third person. Tablets are in use by almost ¼ of participants. Home training devices are only rarely available more popular are CD or DVDs to do exercises such as Yoga. Gaming consoles are not used in any case.

5.3.6 Willingness to use tailored WeTakeCare programme in focus group participants

Facing the final question about the willingness to use the WeTakeCare programme if was tailored like it is imagined today, participants wrote down their names on colour cards. Table 23 shows the results obtained.

In Spain almost 90% of elderly people stated they are initially interested in participating in future trials, although in general this willingness would be conditional on a different from home implementation of the programme. **In Switzerland the interest for participation** in a trail is

somewhat lower: only **50%** of participants in the elderly group were interested in participating in a trial. No change of the setting was discussed, however the Kinect box would have to be installed by someone and shown to the participants.

Table 23: Distribution of willingness to use WeTakeCare programme in Spain and Switzerland

	ELDERLY PEOPLE IN SPAIN	ELDERLY PEOPLE IN SWITZERLAND	CAREGIVERS IN SPAIN	CAREGIVERS IN SWITZERLAND, N=8
Green cards	15	7	6	6
Red cards	8	7	6	1

Caregivers in Spain were on the other hand more reluctant to participate: **50% of caregivers gave their approval** to be contacted for trials, mainly those who are not in charge of elderly with severe frailty or disabilities. In Switzerland results were quite similar: 7 elderly people and 6 caregivers were interested to serve as test persons.

5.4 Conclusion

5.4.1 Summary of findings

- Focus group interviews confirmed the information from data: elderly people in Spain reported more and severe limitations in performing ADLs than Swiss people did.
- Some of the caregiver reported severe problems in memory of the elderly that resulted in not remembering how to perform a task. Basic ADLs like eating, drinking, bathing and toileting were reported as difficult.
- Limitations in Swiss population were moderate and often related to mobility, dressing, cleaning and preparing food.
- All participants could not image the elderly installing and using the WeTakeCare program without help.
- Participants liked the idea to practice with partner or in a group. The Swiss caregiver recommended to use the program also in nursing homes because there are only little entertaining and training possibilities.
- Caregivers in Switzerland were interested on gaming and training with their relatives online from a distance.
- Caregivers need release from caring by: information, communication and contact to others, relaxing activities and training for their own health conditions.

6 Conclusion of Results

6.1 Summary of Results

Performing ADLs and IADLs independently or with little help is important for an ageing generation in Europe. To remain capable in performance people need to stay active and adaptable to changes in their health conditions. Activities and body functions need to be trained but also new ways of performing routines have to be learned. That includes often the use of assisted devices. Theories of change management support the relationship between cognitive believes and commitment to training. Learning theories show that fun, feeling of success and positive body experience foster the dedication to training and learning. Theories of motor learning provide the knowledge for creating effective training exercises. Virtual training in a simulation environment has positive effect on performance. Educational and technical aspects have to be considered for creating the simulation environment.

Eight studies could be included in the literature review about difficulties of ageing populations in Europe in performing ADLs. All eight included studies reported “walking outdoor” (which includes activities such as “do grocery shopping”, “go for a walk”, “walk a block”) as the most often mentioned problematic task for older people. Constraints in the tasks “bathing/showering” were mentioned in five from eight studies. “Dressing upper/lower body” was also noticed as problematic by elderly in four different studies.

Four data sets from surveys conducted in European population 50 years and older have been analysed. The target population of surveyed people in all datasets reported to be quite able and self-sufficient with almost no difficulties performing an ADL until the age of about 80. The older the age of the surveyed person the more frequent are reported problems performing an ADL. The more strenuous a task is, the higher is the percentage of people indicating having difficulties. Most problems were reported doing strenuous motor tasks such as climbing stairs, lifting, carrying or moving heavy objects, vacuuming etc. A higher percentage of difficulties were reported doing complex ADL compared to simpler tasks. A cultural effect can be observed: a higher percentage of Spanish speaking respondents indicate having difficulties compared to German speaking respondents. This is in part a real difference in health status. A gender effect can be also be noticed: a higher percentage of women indicate having difficulties performing an ADL or motor task than men do, with exceptions only in typical household chores such as cooking or doing laundry. Also sport is more popular amongst men. Internet use is sparse in the population over 70 years of age especially amongst women.

Focus group interviews conducted in Spain and Switzerland confirmed the information from data: elderly people in Spain reported more and severe limitations in performing ADLs than Swiss people did. Some of the caregiver reported severe problems in memory of the elderly that resulted in not remembering how to perform a task. Basic ADLs like eating, drinking, bathing and toileting were reported as difficult. Limitations in Swiss population were moderate and often related to mobility, dressing, cleaning and preparing food. All participants could not image the elderly installing and start using the WeTakeCare program without help. Participants liked the idea to practice with partner or in a group. The Swiss caregiver recommended using the program also in nursing homes because there are only little entertaining and training possibilities. Some caregivers in Switzerland were interested on gaming and training with their relatives online from a distance. Caregivers wanted support in caring through information, communication and contact to others. They need release from the daily burden through relaxing activities and training for their own health conditions.

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Annex A Summary of Articles of Literature Review

A.1 Summary of Articles of Literature Review

Outcome Literature Review

Citation	Year	Title	Kind of study, Methods	Objectives	Results	Conclusions
Kaldalen A. Marcusson J. Nagga K. Wressle E.(2012) "Occupational Performance Problems in 85 year old Women and Men in Sweden, OTJF (Therefore, N.H., (32), 2, 30-38	2012	Occupational Performance Problems in 85-year-old Women and Men in Sweden	Cross-sectional study , Questionnaire ((EQ-5D) , Interview, Assessments (Instrumental Activity Measure,IAM; Minimental state Examination, MMSE; Canadian Occupational Performance Measure, COPM; Geriatric Depression Scale, GDS.20)	This study focused on physical, cognitive and environmental factors in 85-year old individuals an their ability to perform meaningful activities. This study is part of the Swedish population study ELSA 85, which comprised all people born in 1922 and living in Linköping municipality (n=650 at baseline). The major aim of ELSA war to characterize and define evidence-based knowledge on how best to plan, design and provide health care for the oldest old. In this study there 380 participate (60%women)	Compared to men, a larger proportion of women were living alone, more often used the transportation service, personal alarms and mobility assistive technology. Men drove a car to a greater extent than women (64%vs.9%). According to the Assessment IAM for women , cleaning was the most frequently reported occupational performance problem, for men travelling. The second most frequently reported problem was walking outdoors for women(especially Problems with large-scale shopping) and cleaning for men In third place women reported travelling an men walking outdoors. which refers to walking long distances, walking fast, walking uphill and walking in the dark. In terms of self-care women have more difficulties in showering and bathing while men emphasize more problems in dressing/undressing.	The main findings are threat women experienced poorer heath and more occupational performance problems compared to men. Mobility -related problems seem to be gender specific; Transportation, shopping an cleaning difficulties were more common among women, while men identified more outdoor life activities as problematic. Shopping problems can be related to transportation problems, both of which were more common among women than men, who were still driving a care to a greater extent. Occupational therapists need to address interventions planning based on the individual's perception of meaningful occupations and environmental considerations.
Holstein B. Due P. Almind G. Avlund K.(2007), "Eight-year change in functional ability among 70-95-year-olds" Scandinavian Journal of Public Heath, (35); 243-249	2007	Eight-year change in functional ability among 70-95-year-olds	Longitudinal observation study; A random sample of 1835 non-institutionalized persons aged 70-95 years were invited to participate in a questionnaire-based prospective study of health and living conditions. Baseline n= 1231; 1990:n= 911 1995: n=542 Participants and non-participants were compared by sex, age, municipality, and household composition. Functional ability was measured identically in the three surveys by a modified version of the WHO Functional Ability Questionnaire.	The study describe stability and change in functional ability among non-institutionalized old people in relation to sex age, and household composition during two subsequent four-year observation periods (1986-1995) Baseline n= 1231; 1990:n= 911 1995: n=542	More women than men live alone, and the population increases with age. The proportion who were independent of help was 61% in survey I, 52% in survey II, 44% in survey III. Difficulties in everyday activity were most prevalent for heavy housework, shopping, travel by bus/train, and walking for 15min at a brisk pace. It is also shown that older age is related to deterioration in functional ability from study 1-2. Apart from that, neither sex, age, household composition nor family social class were significantly associated with deterioration in functional ability. The majority of participants was independent of help in the two first surveys. There were not a single activity in which the majority of the participants needed help, even in the third survey when the participants had reached a very advanced age. The study shows only minor sex differences. The results also demonstrated that deterioration in old age fist of all manifested itself in mobility and the more outgoing IADL (Instrumental Activities of Daily Living) activates such as walking, travelling by bus/train, shopping and doing heavy housework . In contrast the changes in PADL (Physical Activities of daily living activates were small e.g. dressing/undressing, washing, bathing, getting to toilet.	A notable minority of elderly persons shows improvement in their functional ability during both four year observation periods and a large proportion had unchanged functional ability over the tow periods. This suggest a potential for further improvement during systematic training, rehabilitation, and health promotion efforts among elderly persons.

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Zingmark M, Bernspang B ,"Meeting the needs of elderly with bathing disability", Aust Occp There J, Jun; (2011) 58(3):164-71	2011	Meeting the needs of elderly with bathing disability	A quasi experimental non equivalent control group design was used in which participants with reported difficulties in bathing were recruited consecutively from two municipalities. The clients in the intervention group routinely received occupational therapy , whereas clients in the control group received assistance from a home help for bathing. Activities of daily living, quality of life and home-help allocation were assessed at the baseline and after 15 weeks.	The purpose of this study was to compare two groups being provided with home heath care by their municipality to help with bathing. Clients in the intervention group received occupational therapy interventions, whereas clients in the control group received ordinary home help services provided by the local municipality.	In this study the clients in both groups revealed an improvement in their ability to perform actions related to bathing. These results are not helpful for our project but the self reported difficulties the participants have at the beginning of the study.	Interesting for our project is not the difference between the two groups, but the data of the baseline. In this study the clients were asked to describe their ability to perform each action using a four-point scale. Each activity consists of several hierarchical ordered actions and incorporates between different tasks. Most participants (intervention+control group) point out difficulties in "pedicuring", "washing body", "washing hair", "putting on socks and shoes", "walking from one floor to another". Severe problems are reported in "walking in and out of house; walking in neighbourhood", "manicuring" , "dress lower trunk" and "dress upper trunk".
Johannson K. Lilja M. Petersson I. Borell L. "Performance of activities of daily living in a sample of applicants for home modification service" Scandinavian Journal of Occup. Therapy;(2006)	2006	Performance of activities of daily living in a sample of applicants for home modification	Data were collected through interviews at participants homes in one urban municipality in Sweden. (n=102) Data on demographics , housing, earlier modifications, time in present housing, and formal support were collected using a structured questionnaire. The Functional Independence Measure (FIM) was used to collect data on the level of functional independence in activities of daily living. Part I of Client Clinician Assessment Protocol was used to collect data	The aim of the study is to examine the relationship between performance of activities of daily living, housing and living situation, and the home modification applied for in a sample of home modification applicants. Further the aim was to examine differences in performance of activities of daily living between subgroups with different social support.	According to FIM outcomes high levels of independence were reported by the participants in all activities of daily living. Median value lower than 7 (total independence) only found in activities related to bath/shower, transfer to toilet, walking/wheelchair and stairs. The activities reported as most difficult (Md=3) were managing stairs and getting in and out of the house. High levels of difficulties (Md=4) were also reported in the activities dressing lower, bath/showering, walking a block, getting in an dout of bed, getting in and out of car , doing grocery shopping and light housework	The findings generally highlight the importance of including aspects of difficulty al well as aspects of independence .
Sonn U." Longitudinal studies of dependence in daily life activities among elderly persons" Scand J. Rehab Med Suppl. (1996)34:1-35 (Abstract only)	1996	Longitudinal studies of dependence in daily life activities among elderly persons	Longitudinal observation Study	To examine the relationship between the ability in activities of daily living, use of assistive devices, and relation to functional limitations and impairment among persons between 70 and 76 years of age within the Intervention study of Elderly in Göteborg/Sweden.	Most participants (83%) were independent in all activities at age 70 (n=617). Among survivors followed longitudinally the incidence of disability was 8%between 70-73 and 26% between 73 and 76 years of age. Dependence at age 70 should predict mortality as institutionalization. No sex differences were found. Assistance given by relatives dominated. One fifth at age of 70 and almost half of the population at age 76 used assistive devices in daily life activities.	Physical impairments and functional limitations had a considerable impact on dependence in daily life activities as persons dependent in ADL had lower maximal walking speed, grip strength, knee extensor strength , stair-climbing capacity and forward reach than those who were independent in ADL. Walking speed in both women and men and a sight impairment in men had the greatest influence on dependence in ADL.

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Droogleever F.J."Daily life of elderly women in a rural area in The Netherlands", Geojournal (1999) 48:187-193	1999	Daily life of elderly women in a rural area in The Netherlands	Survey among 506 elderly women	The article examines the participation in social activities by elderly women in a rural area in the eastern part of The Netherlands	Older people needs support in "driving" because 50% of the women have no driving licence. Furthermore they need help in "repairs" , "kitchen work" and "cleaning"	Most elderly women are remarkably fee from constraints on their daily living activities. The results reflect coupling constraints in the lives of elderly women dependent on outside help.
Nybo H., Gaist D. Jeune B , McGue M , Vaupel J, Christensen K."Functional Status and Self-Rated Health in 2262 Nonagenarians: The danish 1905 Cohort Survey", American Geriatrics Society(2001) 49:601-609	2001	Functional Status and Self-Rated Health in 2262 Nonagenarians: The danish 1905 Cohort Survey	A cross-sectional survey of all Danes born in 1905 (92-93), carried out August to October 1998. Five items covering Katz`s ADL index-bathing, dressing, toileting, transfer, and feeding-were used to construct a three level five -item ADL scale. "Not disabled" was defined as independent in all items, "moderatelyy disabled" was defined as independent in one or two items, and "severely disabled" as dependent in three ore more items.	The objectives of this paper is to descibe the functional capabilities and health of nonagenarians by using three different sets of measurements: Self-reported measures of activities of daily living, objective tests of pysical performance , and self-rated health. Furthermore the researcher compare results on these measures to investigate whether the association between self-perceived and performance basedmeasures of pysical function which is shown in surveys of younger old people, can also be found among the very old. Finaly the association beween self-rated health and ADL function is examined.	Men from the 1905 cohort managed on average, all ADL activites better than woman and scored higer than woman on the functional ability scales. According to the five-item ADL scale, 50,1% of the men and 40,7% of the women were classified as non disabled. Following ADL are reported as the most strenous for the men as well as for women:Most difficulties are reported in "run 100meters", "Walk in bad weather/good weather" and "do hard exercises". Within the agility scale, the most straining activity is "cut toenails" and "take a bath" before "cut fingernails" and " wash hair" as well as "take socks and shoes on and off"	Despite their lower mortality , women were more disabled than men and did not perform as well as men int he physical perfomance tests. Finally , nonagenarian men tend still to be living in the social context that characterized most of their adult lives because a lafger proportion of the men lifed independently and were still married and thus had the responsibility fo doung some of the more demanding tasks in the houshold (e.g. cutting the grass etc.) Even if these tasks are fairly easy in absolite terms they may have a training effect, thus maintaining strength at a higher level.