

Velferdsteknologi for å støtte selvstendige liv for eldre og voksne med nedsatt funksjonsevne

Notat fra Kunnskapssenteret
Systematisk litteratursøk med sortering
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Nasjonalt kunnskapssenter for helsetjenesten
Oslo, desember 2014

Hovedfunn

Nasjonalt kunnskapssenter for helsetjenesten fikk i oppdrag av Husbanken og Norsk Sykepleierforbund å utføre et systematisk litteratursøk med påfølgende sortering av mulig relevante publikasjoner. Oppdraget var å finne empiriske studier om velferdsteknologi for å støtte selvstendig liv blant eldre og voksne med nedsatt funksjonsevne som bor hjemme. Denne rapporten er den første av to, og inkluderer forskning om trygghets- og sikkerhetsteknologi, kompensasjons- og velværeteknologi og teknologi for sosial kontakt. Den andre rapporten som identifiserer forskning om tiltak for pleie og omsorg blir gjennomført i 2015.

Metode

Vi utarbeidet søkestrategi for et systematisk litteratursøk. Det ble søkt i relevante databaser, og etter grå litteratur. Søket ble utført i september 2014. To forskere gikk uavhengig av hverandre gjennom identifiserte referanser og vurderte relevans i henhold til inklusjonskriteriene. Inkluderte referanser ble sortert etter studie-, tiltaks-, og populasjonskarakteristika.

Resultater

Vi identifiserte totalt 5241 referanser. Av disse ble 189 vurdert til å være mulig relevante.

- Vi identifiserte 21 systematiske oversikter som undersøkte effekten av eller erfaring med trygghets- og sikkerhetsteknologi (4), kompensasjons- og velværeteknologi (3), teknologi for sosial kontakt (3), og velferdsteknologi generelt (11). Oversiktene ble publisert mellom 2000 og 2014.
- Vi identifiserte 19 randomiserte kontrollerte studier, 21 andre eksperimentelle studier, 48 observasjonsstudier, 36 kvalitative studier, 12 studier som brukte blandete metoder, og tre studier som undersøkte kostnadseffektivitet. Studiedesign var ikke oppgitt i 29 studier.
- De fleste studiene undersøkte tiltak rettet mot eldre (88) eller voksne med nedsatt funksjonsevne (48). De resterende undersøkte tiltak rettet mot personer med demens eller kognitiv svikt (29), eller voksne med kronisk sykdom (12). I seks studier undersøkte man effekt på eller erfaringer hos omsorgsgivere. Fire studier oppga ikke populasjon.

Vi har sortert mulige relevante studier, men vi har hverken lest studiene i fulltekst, vurdert den metodologiske kvaliteten eller analysert funnene.

Tittel:

Velferdsteknologi for å støtte selvstendig liv for eldre og voksne med nedsatt funksjonsevne

Publikasjonstype:

Systematisk litteratursøk med sortering

Systematisk litteratursøk med sortering er resultatet av å

- søke etter relevant litteratur ifølge en søkestrategi og
- eventuelt sortere denne litteraturen i grupper presentert med referanser og vanligvis sammendrag

Svarer ikke på alt:

- Ingen kritisk vurdering av studienes kvalitet
- Ingen analyse eller sammenfatning av studiene
- Ingen anbefalinger

Hvem står bak denne publikasjonen?

Kunnskapssenteret har gjennomført oppdraget etter forespørsel fra Husbanken og Norsk Sykepleierforbundet

Når ble litteratursøket utført?

Søk etter studier ble avsluttet september 2014.

Key messages

The Norwegian Knowledge Centre for the Health Services was commissioned by the Norwegian State Housing Bank (Husbanken) and the Norwegian Nurses Organization (NSF) to identify and map existing empirical research on welfare technology to support independent living. This is the first of two reports, and includes studies that examine technology for safety and security, technology for wellness and well-being and technology for social contact. A second report identifying studies related to technology in acute care and self-management of illness will be conducted in 2015.

Method

We developed a search strategy, and conducted a systematic search of relevant databases in September 2014. Two researchers independently went through identified references to assess inclusion according to predefined criteria. We sorted potentially relevant references according to study, intervention, and population characteristics.

Results

We identified 5241 studies through the literature search. Of these, we assessed 187 as being potentially relevant:

- We identified 19 systematic reviews that examined technology for safety and security (4), technology for welfare and wellness (3), technology for social contact (3), and welfare technology in general (3). The literature search for the included reviews were conducted between 2006 and 2012. Search dates were not available for ten of the reviews.
- We also identified 19 randomized controlled trials, 21 other experimental studies, 48 observation studies, 36 qualitative studies, 12 mixed-methods studies, and three cost-effectiveness studies. Study design was not reported for 29 studies.
- The majority of the studies examined interventions targeting older adults (88) or adults with disabilities (48). The other studies looked at studies targeting persons with dementia or cognitive decline (29), or adults with chronic illness (12). In six studies the effect on or experiences of caregivers was investigated. Details related to the population were not available for four studies.

We have sorted and listed all possibly relevant studies, but we have neither read the papers in full, critically appraised their methodological quality, nor synthesised their conclusions.

Title:

Welfare technology to support independent living for older adults and adults with disabilities

Type of publication:

Systematic reference list

A systematic reference list is the result of a search for relevant literature according to a specific search strategy. The references resulting from the search are then grouped and presented with their abstracts.

Doesn't answer everything:

- No critical evaluation of study quality
- No analysis or synthesis of the studies
- No recommendations

Publisher:

Norwegian Knowledge Centre for the Health Services

Updated:

Last search for studies: september 2014.

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Forord

Nasjonalt kunnskapssenter for helsetjenesten fikk i oppdrag fra Husbanken og Norsk Sykepleierforbund å finne studier på velferdsteknologi som har til hensikt å legge til rette for at eldre og personer med nedsatte funksjonsevner kan leve selvstendig i sitt eget hjem.

Prosjektgruppen har bestått av:

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Bakgrunn

Velferdsteknologi er «et relativt nytt begrep og føyer seg inn i rekken av mange begreper som med ulik innretning beskriver teknologiske løsninger som enkeltindivider kan nyttiggjøre seg for økt egenmestring, samfunnsdeltakelse og livskvalitet» (1), s. 11. Begrepet ble introdusert av den danske sosialministeren våren 2007, og ble raskt adoptert av flere for å beskrive teknologiske hjelpemidler rettet mot eldre, personer med kroniske sykdommer eller nedsatt funksjonsevne i forskjellige former og grader (1). Velferdsteknologi kan defineres som ”teknologisk assistanse som bidrar til økt trygghet, sikkerhet, sosial deltagelse, mobilitet og fysisk og kulturell aktivitet, og styrker den enkeltes evne til å klare seg selv i hverdagen til tross for sykdom og sosial, psykisk eller fysisk nedsatt funksjonsevne.” (2).

Fram til 2030 vil gruppen eldre over 60 år øke og utgjøre 26% av den totale befolkningen (3). I 2012 ble hver sjettede elev fra ungdomskolen utdannet innen helse- og omsorgsarbeid. I 2035 må hver tredje elev utdannes innen helse- og omsorgsarbeid for å dekke behovene knyttet til en aldrende befolkningen (4). Gitt det økende presset som forventes innen helsetjenesten i framtiden er det ønskelig at eldre blir boende hjemme lengst mulig. Den norske boligmassen er imidlertid i liten grad tilrettelagt for at eldre kan bli boende hjemme inn i alderdommen. Den økende gruppen friske og aktive eldre behøver ikke nødvendigvis sykehjemsplass, men en bolig de kan bo lenge i (5).

I den forrige regjeringens ”Omsorgsplan 2015” står implementering og bruk av velferdsteknologi som et sentralt moment (2). Velferdsteknologi kan blant annet øke et individs selvstendighet, gjøre det mulig for folk å bo bedre og lenge hjemme, og støtte borgere til å leve et sunnere liv med bedre livskvalitet (6). Teknologi som skaper større trygghet hos brukeren kan også avlaste pårørende for unødvendig bekymring.

Eksempler på velferdsteknologi/teknologisk assistanse

Trygghets- og sikkerhetsteknologi: Alarmer (varme/brann, komfyrvakt, vann, besøk av uvedkommende), varsling ved unormale hendelser (fall, døgnrytme, aktiviteter ol.), tilkalling av hjelp (behov for assistanse eller pleie/omsorg), sporing av person utenfor hjemmet (demente som ikke finner veien hjem).

Kompensasjons- og velværeteknologi: Rullestol, rullator, høreapparat, forflytningsheiser, toalett m/spyl tørk osv. for å ivareta egen personlig hygiene, omgivelseskontroll v/fjernstyring av lys, varme, vinduer, dører, komfyr, spillteknologi til hjelp i trening (Wii, X-Box osv.), hjelp til å huske (medisindosetter som gir beskjed når medisinen skal tas, memoplanner osv.), robotstøvsuger.

Teknologi for sosial kontakt: Videokommunikasjon (PC, Skype osv.), webtjenester (nettsamfunn som Facebook, Twitter osv.), robotteknologi (tekniske kjæledyr som f.eks. Paro osv.).

Teknologi for behandling og pleie: Hjemmebehandling via PC m/berørings skjerm og kamera, kommunikasjon med helsepersonell, egenregistrering av kliniske data, sensorteknologi (blodtrykk, vekt, blodsukker osv.) (7).

En utfordring knyttet til forskning på velferdsteknologi er terminologi. Som Martin (2008) skriver i sin systematiske oversikt om «Smart home»-teknologi:

...«ambiguity exists around how academics, service providers and service users categorise the integration and use of electronic assistive technology.

Sometimes a descriptor of the created environment is used, for example, a 'smart home', though this is not a homogenous term and on comparison the technologies within studies may vary quite dramatically. Others report in terms of a service descriptor and define, for example, 'telecare' or 'telehealthcare' to support a particular population of disabled people.»(8), s. 3.

På bakgrunn av denne utfordringen har vi sortert tiltakene som er undersøkt i de inkluderte studiene etter hva de er rettet mot (for eksempel å hjelpe med sosial kontakt eller å øke mobilitet).

Det finnes svært mye forskning på de ulike typene teknologi nevnt ovenfor. Derfor har vi delt denne bestillingen i to rapporter. I denne første rapporten har vi inkludert mulig relevante studier som undersøker effekt av eller brukeres/omsorgsgiveres erfaring med trygghets- og sikkerhetsteknologi, kompensasjons- og velværeteknologi, og teknologi for sosial kontakt. I den andre rapporten skal vi inkludere mulig relevante studier som undersøker effekt av eller brukeres/omsorgsgiveres erfaring med teknologi for behandling og pleie. Prosjektet ble delt opp på denne måten av to årsaker: (1) teknologi for behandling og pleie kan ha en annen målgruppe enn de andre kategoriene velferdsteknologi, og (2) utfallene knyttet til teknologi for behandling og pleie er ofte mer medisinske enn utfallene knyttet til de andre kategoriene. De tre første kategoriene har ofte som mål å forebygge akutte situasjoner der en person må flyttes eller innlegges på sykehus, mens den siste kategorien har ofte som mål å erstatte legetimer eller forebygge reinnleggelse på sykehus.

Styrker og svakheter ved litteratursøk med sortering

Ved litteratursøk gjennomfører vi systematiske litteratursøk for en gitt problemstilling. Resultatene fra søket blir i sin helhet overlevert oppdragsgiver, eller vi kan gjennomgå søkeresultatet før overleveringen og sortere ut ikke-relevante artikler. Dette gjøres basert på tittel og eventuelt sammendrag. Artiklene innhentes ikke i fulltekst. Det gjør at vi kan ha inkludert titler som ville vist seg ikke å være relevante ved gjennomlesning av fulltekst. Vi kan også ha gått glipp av potensielt relevante studier. Andre måter å identifisere studier på, som søk i referanselister og kontakt med eksperter på fagfeltet er ikke gjennomført i dette oppdraget. Vi har ikke kvalitetsvurdert artiklene.

Ved en full forskningsoppsummering ville vi ha innhentet artiklene i fulltekst for endelig vurdering opp mot inklusjonskriteriene. Inkluderte studier ville så blitt kvalitetsvurdert i henhold til våre sjekklister og resultater sammenstilt og diskutert.

Begrunnelse for valg av søkestrategi

Vi har søkt i elektroniske kilder, og etter grå litteratur. Søket er gjort for hele tidsperioden databasene dekker bakover i tid. Vi har ikke hatt begrensninger på studiedesign.

Problemstilling

I prosjektet har vi søkt etter litteratur som skal belyse effekt av eller erfaringer med velferdsteknologi for hjemmeboende eldre eller voksne med nedsatte funksjonsevner.

Det betyr at vi ikke svarer på spørsmål knyttet til hjelpemidler for personer som bor hjemme med akutte sykdommer; telemedisinske tiltak som erstatter legebesøk; eller andre teknologiske tiltak som ikke har til hensikt å hjelpe eldre og personer med nedsatt funksjonsevne med å bo i sitt eget hjem lengst mulig.

Metode

Dette prosjektet er skilt i to rapporter. Begge rapportene baseres på ett litteratursøk, som ble planlagt og gjennomført av en forskningsbibliotekar sammen med prosjektlederen. Resultatet fra søket ble brukt som basis for begge rapportene.

I denne første rapporten er det fokus på studier som ser på trygghets- og sikkerhetsteknologi, kompensasjons- og velværeteknologi, og teknologi for sosial kontakt. Den andre rapporten vil fokusere på studier som undersøker omsorgs- og pleieteknologi.

Litteratursøking

Vi søkte systematisk søk etter litteratur i følgende databaser:

- Campbell Library
- Cinahl
- Cochrane Database of Systematic Reviews
- Database of Abstracts of Reviews of Effects (DARE)
- Embase
- Health Technology Database (HTA)
- ISI Science/Social Science Citation Index
- PubMed
- MEDLINE
- SSRN – Social Science Research Network e-library
- Social Services Abstracts
- Social Care Online
- Sociological Abstracts

Forskningsbibliotekar Ingvild Kirkehei, i samarbeid med prosjektleder Heather Munthe-Kaas, planla og utførte samtlige søk. Den fullstendige søkestrategien finnes i vedlegg 1. Søk etter studier ble avsluttet september 2014. Søket var sammensatt av emneord og tekstord for ulike typer velferdsteknologi kombinert med begreper for «hjemmeboende» og «independent living». Søket ble videre avgrenset med sensitive søkefiltre for systematiske oversikter og primærforskning.

Inklusjonskriterier

Populasjon:	Eldre og voksne (over 18 år) som har nedsatt funksjonsevne og som fortsatt bor i eget hjem.
Tiltak:	Velferdsteknologi (teknologiske løsninger) i hjemmet som skal bidra til trygghet, sosial og kulturell deltakelse, mobilitet og å forebygge innleggelse i sykehjem: Trygghets- og sikkerhetsteknologi; kompensasjons- og velværeteknologi; teknologi for sosial kontakt.
Sammenlikning:	Ingen sammenlikning/sammenliknet med ingen tiltak eller andre typer tiltak.
Utfall:	Utsatt innflytting i omsorgsbolig, sykehjem osv.; redusert tjenestebehov, pasienters/pårørendes eller helsepersonells tilfredshet med tjeneste/apparat/utstyr, utfall relatert til livskvalitet, kostnader, helsepersonells arbeidsmengde
Studiedesign	Systematiske oversikter, empiriske studier, kvalitative studier
Språk:	Ikke presisert

Eksklusjonskriterier:

Vi inkluderte ikke studier som:

- har undersøkt sykehjem, aldershjem, sykehus, omsorgsboliger osv. som har som funksjon å gi aktiv behandling eller være et hjem for pleietrengende som ikke kan bo hjemme,
- har fokus på teknologi for pleie og omsorg,
- har fokus på elektronisk journalføring, lege-pasientforholdet,
- har fokus på teknologi mot innbrudd (f. eks.. overvåkningskamera).
- har fokus på tiltak for å erstatte legebesøk eller innlegging i sykehuset (e.g. selvpleie/behandling, rehabilitering)
- har fokus på helsekommunikasjon (e.g. teknologi for øke kunnskap om sykdommer)
- har fokus på tiltak for å diagnostisere sykdom
- har fokus på tiltak rettet mot palliativ omsorg
- har fokus på tiltak rettet mot omsorgspersoner i hjemmet (e.g. psykoterapi over internett for å forebygge depresjon hos omsorgspersoner)
- er kasus-studier med fem eller færre deltakere
- har fokus på testing eller gjennomførbarhet av en spesifikk teknologi

Artikkelutvelging

To forskere gikk gjennom alle titler og sammendrag for å vurdere relevans i henhold til inklusjonskriteriene. Vurderingene ble gjort uavhengig av hverandre og sammenlignet i etterkant. Der det var uenighet om vurderingene, ble inklusjon eller eksklusjon avgjort ved konsensus. Der det ikke var mulig å ta en avgjørelse ut fra tittelen, eller der sammendrag ikke var tilgjengelig, ble studien ekskludert grunnet manglende informasjon. Utvelging av litteratur ble kun gjort basert på tittel og sammendrag. Vi leste ikke artiklene i fulltekst.

De inkluderte studiene ble sortert etter 1) studiedesign, 2) type velferdsteknologi, 3) populasjon, og 4) studieår.

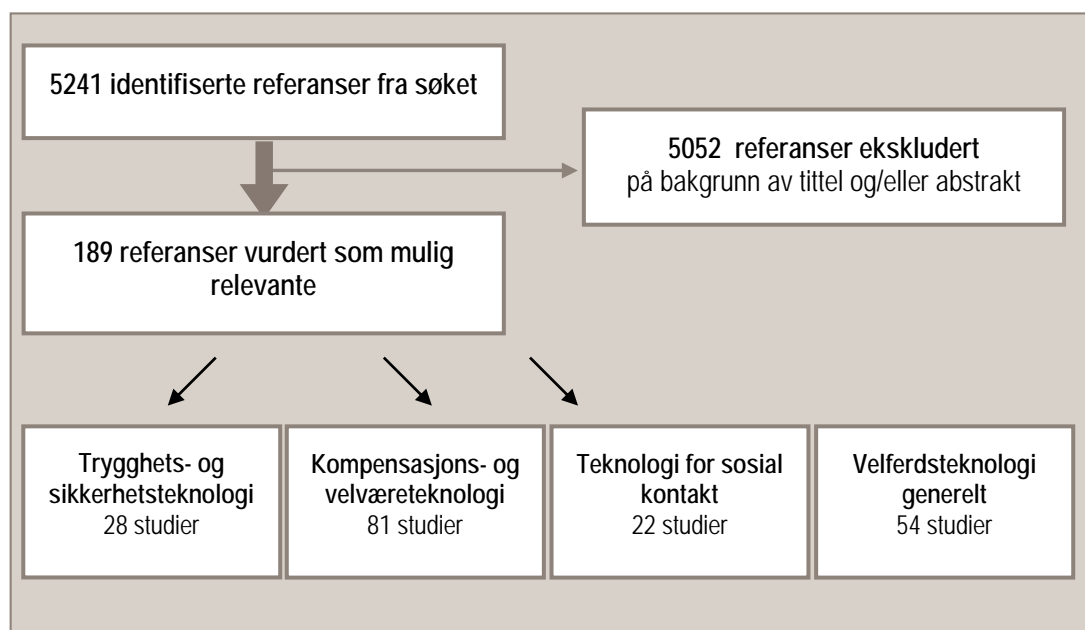
Resultat

Resultat av søk

Søket resulterte i 5241 referanser. Vi vurderte 189 av de identifiserte referansene til å være mulig relevante i henhold til inklusjonskriteriene.

Hovedårsaken til eksklusjon var at publikasjonen ikke omhandlet et relevant tiltak, eller at den omhandlet en beskrivelse eller vurdering av selve teknologien (ikke dens effekt på brukerne).

Figur 1. Flytskjema over identifisert litteratur



Resultat av sorteringen

Vi har sortert de 189 mulig relevante referansene ut fra studiedesign (se tabell 1,2), type velferdsteknologi (se tabell 3), populasjon (se tabell 4), og studieår (se tabell 5).

Vi oppgir forfattere, tittel på publikasjonen, publikasjonssted og sammendrag av artikkelen slik de fremkom i de elektroniske databasene.

Studiedesign

Vi identifiserte 19 systematiske oversikter. Disse ble publisert mellom 2000 og 2014. Elleve oversikter undersøkte velferdsteknologi generelt, fire oversikter så på trygghets- og sikkerhetsteknologi, tre undersøkte kompensasjons- og velværeteknologi, og tre undersøkte teknologi for sosial kontakt.

Tre oversikter virker særlig relevante: Brandt 2011, Martin 2008, og Reeder 2013 (se tabell 1, under «Velferdsteknologi generelt» for mer detaljer om oversiktene).

Tabell 1: Beskrivelse av identifiserte systematiske oversikter

Studie	Tittel	Sammendrag	Ref.nr. (se referanser s. 28)
Velferdsteknologi generelt			
Be- melms 2012	Socially Assis- tive Robots in Elderly Care: A Systematic Review into Effects and Effectiveness	Purpose: To provide an overview of factors influencing the acceptance of electronic technologies that support aging in place by community-dwelling older adults. Since technology acceptance factors fluctuate over time, a distinction was made between factors in the pre-implementation stage and factors in the post-implementation stage. Methods: A systematic review of mixed studies. Seven major scientific databases (including MEDLINE, Scopus and CINAHL) were searched. Inclusion criteria were as follows: (1) original and peer-reviewed research, (2) qualitative, quantitative or mixed methods research, (3) research in which participants are community-dwelling older adults aged 60 years or older, and (4) research aimed at investigating factors that influence the intention to use or the actual use of electronic technology for aging in place. Three researchers each read the articles and extracted factors. Results: Sixteen out of 2841 articles were included. Most articles investigated acceptance of technology that enhances safety or provides social interaction. The majority of data was based on qualitative research investigating factors in the pre-implementation stage. Acceptance in this stage is influenced by 27 factors, divided into six themes: concerns regarding technology (e.g., high cost, privacy implications and usability factors); expected benefits of technology (e.g., increased safety and perceived usefulness); need for technology (e.g., perceived need and subjective health status); alternatives to technology (e.g., help by family or spouse), social influence (e.g., influence of family, friends and professional caregivers); and characteristics of older adults (e.g., desire to age in place). When comparing these results to qualitative results on post-implementation acceptance, our analysis showed that some factors are persistent while new factors also emerge. Quantitative results showed that a small number of variables have a significant influence in the pre-implementation stage. Fourteen out of the sixteen included articles did not use an existing technology acceptance framework or model. Conclusions: Acceptance of technology in the pre-implementation stage is influenced by multiple factors. However, post-implementation research on technology acceptance by community-dwelling older adults is	22

		scarce and most of the factors in this review have not been tested by using quantitative methods. Further research is needed to determine if and how the factors in this review are interrelated, and how they relate to existing models of technology acceptance.	
Brandt 2011	Activity and participation, quality of life and user satisfaction outcomes of environmental control systems and smart home technology: a systematic review	<p>OBJECTIVE: To examine activity and participation, quality of life, and user satisfaction outcomes of environmental control systems (ECSs) and smart home technology (SHT) interventions for persons with impairments.</p> <p>METHOD: A systematic review. Seventeen databases, three conference proceedings, and two journals were searched without language or study design restrictions covering the period January 1993 - June 2009. Reviewers selected studies, extracted data, and assessed the methodological quality independently.</p> <p>RESULT: Of 1739 studies identified, five effect studies and six descriptive studies were included. One study was on SHT and the remainder on ECS; functionalities were overlapping. The studies varied in most aspects, and no synthesis could be drawn. However, ECS/SHT tended to increase study participants' independence, instrumental activities of daily living, socialising, and quality of life. Two studies showed high user satisfaction. The level of evidence was regarded as low, mainly due to small study sizes, lacking confounder control, and a majority of descriptive studies.</p> <p>CONCLUSION: Due to few and small studies and study diversity, it was not possible to determine whether ECS/SHT have positive outcomes for persons with impairment, even though the technologies seem to be promising. High quality outcomes studies such as randomised controlled trials, when feasible, and large longitudinal multi-centre studies are required.</p>	35
Brandt 2012	Quality of evidence of assistive technology interventions for people with disability: An overview of systematic reviews	<p>This overview summarizes the available evidence from systematic reviews of outcomes studies on various assistive technologies (AT) for persons with disabilities. Systematic reviews published between January 2000 and April 2010 were identified by comprehensive literature searches. Study selection, data extraction and methodological quality evaluation were done by two authors independently. The quality of evidence was summarized by explicit methods. Types of disabilities, settings, and AT interventions were recorded. Outcomes were mapped according to the Taxonomy of Assistive Technology Device Outcomes. Forty-four systematic reviews were included in this overview. High-quality evidence was found in single AT (positive effects of providing AT in connection with home assessment and hearing aids, no effects of hip protectors) for limited populations (older people at home, people with hearing loss, and older people in institutional care, respectively). Low-quality or unclear evidence was found for the effectiveness of the other evaluated AT interventions. Current gaps in AT outcomes research were identified. Many frequently used devices have not been systematically reviewed. Well-designed outcomes research to inform clinical decision-making is urgently needed. The systematic review methodology seems to be feasible for summarising AT outcomes research, but methodological development for grading and for primary studies is warranted.</p>	36
de Joode 2010	Efficacy and usability of assistive technology for patients with cognitive deficits: a systematic review	<p>Objective: To determine the efficacy of portable electronic aids such as personal digital assistants (PDAs), pagers or mobile phones for patients with cognitive deficits by means of a systematic review. The usability of these aids is also briefly discussed. Data sources: PubMed, CINAHL, PsychINFO, EMBASE and MEDLINE were searched up to February 2009. The references of identified and relevant articles were scanned to find additional relevant titles. Review methods: Papers referring to 'electronic aids', 'cognition' and 'brain injury' were included. The population had to be adult and have cognitive impairments as a result of acquired brain injury. Outcome</p>	52

measures were change in cognitive or occupational performance or the level of participation in daily life. The criteria of Cicerone et al. were used to evaluate the quality of the retrieved studies. Results: Twenty-eight papers presenting 25 studies were reviewed. The total number of participants was 423. Most identified papers described case reports or non-randomized clinical trials. Only one randomized controlled trial was identified, in which the NeuroPage proved effective in supporting prospective memory. Other kinds of assistive technology such as PDAs and voice recorders showed positive results in supporting retrospective and prospective memory. Conclusion: The efficacy of assistive technology in general is not yet sufficiently studied in randomized controlled trials, although promising results has been reported. Furthermore, several survey studies established that both potential users and clinicians have optimistic expectations about the usability of assistive technology.

Demiris 2008	Technologies for an aging society: a systematic review of "smart home" applications.	<p>OBJECTIVES: A "smart home" is a residence wired with technology features that monitor the well-being and activities of their residents to improve overall quality of life, increase independence and prevent emergencies. This type of informatics applications targeting older adults, people with disabilities or the general population is increasingly becoming the focus of research worldwide. The aim of this study was to provide a comprehensive review of health related smart home projects and discuss human factors and other challenges.</p> <p>METHODS: To cover not only the medical but also the social sciences and electronics literature, we conducted extensive searches across disciplines (e.g., Medline, Embase, CINAHL, PsycINFO, Electronics and Communications Abstracts, Web of Science etc.). In order to be inclusive of all new initiatives and efforts in this area given the innovativeness of the concept, we manually searched for relevant references in the retrieved articles as well as published books on smart homes and gerontechnology.</p> <p>RESULTS: A total of 114 publications (including papers, abstracts and web pages) were identified and reviewed to identify the overarching projects. Twenty one smart home projects were identified (71% of the projects include technologies for functional monitoring, 67% for safety monitoring, 47% for physiological monitoring, 43% for cognitive support or sensory aids, 19% for monitoring security and 19% to increase social interaction). Evidence for their impact on clinical outcomes is lacking.</p> <p>CONCLUSIONS: The field of smart homes is a growing informatics domain. Several challenges including not only technical but also ethical ones need to be addressed. [References: 31]</p>	57
Fischer 2014	Acceptance and use of health information technology by community-dwelling elders	<p>Objectives: With the worldwide population growing in age, information technology may help meet important needs to prepare and support patients and families for aging. We sought to explore the use and acceptance of information technology for health among the elderly by reviewing the existing literature. Methods: Review of literature using PubMed and Google Scholar, references from relevant papers, and consultation with experts. Results: Elderly people approach the Internet and health information technology differently than younger people, but have growing rates of adoption. Assistive technology, such as sensors or home monitors, may help 'aging in place', but these have not been thoroughly evaluated. Elders face many barriers in using technology for healthcare decision-making, including issues with familiarity, willingness to ask for help, trust of the technology, privacy, and design challenges. Conclusions: Barriers must be addressed for these tools to be available to this growing population. Design, education, research, and policy all play roles in addressing these barriers to acceptance and use.</p>	71

Fleming 2014	Empirical studies on the effectiveness of assistive technology in the care of people with dementia: a systematic review	<p>To evaluate the use of assistive technology in the care of people with dementia.</p> <p>MEDLINE, CINAHL, PubMed, PsycINFO, ProQuest, Web of Knowledge, IEEE and the Cochrane Library were searched for articles published from 1995 up to 2011; search terms were reported. Five journals and the reference lists of reviews and related articles were manually searched. Two gerontologists were asked to identify papers they considered to be significant.</p> <p>Studies were assessed for quality using the Forbes approach, which assessed design and allocation of intervention, inclusion, attrition, control of confounders, data collection and statistical validity. Studies that passed at least four criteria and did not fail any criteria were categorised as 'strong'. Studies that passed less than four criteria and did not fail any criteria were categorised as 'moderate'. Studies that failed one or two criteria were categorised as 'weak'. Studies that failed more than two criteria were categorised as 'poor'. Two reviewers independently assessed the studies for validity, with disagreements resolved by consensus.</p> <p>Study characteristics and results were extracted from each of the studies. The authors did not state how many reviewers undertook data extraction.</p> <p>Forty-one studies were included in the review: seven studies were considered to be strong (522 participants; range 5 to 136); ten moderate (138 participants; range 3 to 26); and 24 weak (total number of participants unclear). Studies had very small sample sizes, high drop-out rates, basic statistical analyses, lack of adjustment for multiple comparisons and poor performance of the technology. Independence, prompts and reminders: It appeared that once the evaluation moved from the laboratory, significant practical and methodological problems emerged. Generally, the reported use of the technology made little difference to practical outcomes. Safety and security: The very weak evidence showed that common problems were associated with lack of acceptance by the user, difficulties with use, and technical reliability. Careful assessment was required to discover the likely benefit of the technology to an individual; there was a strong suggestion that the window of opportunity was quite small for the successful application of technology. Telecare and telehealth: Although the literature did not seem to support the use of technology (in the form available) to enhance communication initiated by the person with dementia, it provided some promise that remote carer initiated communication could be used for assessment and simple therapeutic interventions. However, the included studies were not methodologically strong. Therapeutic interventions: There was little convincing evidence to support the use of Snoezelen technology (multi-sensory stimulation exposure) over other activities to improve the wellbeing of people with dementia. The effects of simulated presence therapy appeared modest and short lived. General use of the assistive technology available did not establish a positive difference to the lives of people with dementia. The inclusion criteria were broad, but clear. A thorough search of relevant sources was undertaken, although it was not stated whether any language restrictions were applied and limited attempts were made to identify unpublished studies, so some studies may have been missed. Not all stages of the review were undertaken in duplicate, which increased the potential for error and bias. The assessment of study quality appears to have been appropriate, but full results were not reported, so it was not possible to judge study quality. Most studies were categorised as weak, with small sample sizes and high drop-out rates amongst other problems. Study details and results were tabulated for the strong and moderate quality studies, but not the weak studies. The narrative synthesis was quite basic,</p>	73
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with a description of the individual studies for each topic area, followed by a broad summary of the evidence. This was a very broad review, which included many poor quality studies. However, the authors' conclusion is very general and appears rather negative, considering that some of the better quality studies had positive results. Practice: The authors did not state any implications for practice. Research: The authors stated that there was a great need for better designed studies with larger samples.

Martin 2008	Smart home technologies for health and social care support	<p>Background The integration of smart home technology to support health and social care is acquiring an increasing global significance. Provision is framed within the context of a rapidly changing population profile, which is impacting on the number of people requiring health and social care, workforce availability and the funding of healthcare systems. Objectives To explore the effectiveness of smart home technologies as an intervention for people with physical disability, cognitive impairment or learning disability, who are living at home, and to consider the impact on the individual's health status and on the financial resources of health care. Search strategy We searched the following databases for primary studies: (a) the Cochrane Effective Practice and Organisation of Care (EPOC) Group Register, (b) the Cochrane Central Register of Controlled Trials (CENTRAL), (The Cochrane Library, issue 1, 2007), and (c) bibliographic databases, including MEDLINE (1966 to March 2007), EMBASE (1980 toMarch 2007) and CINAHL (1982 toMarch 2007). We also searched the Database of Abstracts of Reviews of Effectiveness (DARE). We searched the electronic databases using a strategy developed by the EPOC Trials Search Co-ordinator. Selection criteria We included randomised controlled trials (RCTs), quasi-experimental studies, controlled before and after studies (CBAs) and interrupted time series analyses (ITS). Participants included adults over the age of 18, living in their home in a community setting. Participants with a physical disability, dementia or a learning disability were included. The included interventions were social alarms, electronic assistive devices, telecare social alert platforms, environmental control systems, automated home environments and 'ubiquitous homes'. Outcome measures included any objective measure that records an impact on a participant's quality of life, healthcare professional workload, economic outcomes, costs to healthcare provider or costs to participant. We included measures of service satisfaction, device satisfaction and healthcare professional attitudes or satisfaction. Data collection and analysis One review author completed the search strategy with the support of a life and health sciences librarian. Two review authors independently screened titles and abstracts of results. Main results No studies were identified which met the inclusion criteria. Authors' conclusions This review highlights the current lack of empirical evidence to support or refute the use of smart home technologies within health and social care, which is significant for practitioners and healthcare consumers.</p>	124
Peek 2014	Factors influencing acceptance of technology for aging in place: A systematic review	<p>Purpose: To provide an overview of factors influencing the acceptance of electronic technologies that support aging in place by community-dwelling older adults. Since technology acceptance factors fluctuate over time, a distinction was made between factors in the pre-implementation stage and factors in the post-implementation stage. Methods: A systematic review of mixed studies. Seven major scientific databases (including MEDLINE, Scopus and CINAHL) were searched. Inclusion criteria were as follows: (1) original and peer-reviewed research, (2) qualitative, quantitative or mixed</p>	144

methods research, (3) research in which participants are community-dwelling older adults aged 60 years or older, and (4) research aimed at investigating factors that influence the intention to use or the actual use of electronic technology for aging in place. Three researchers each read the articles and extracted factors. Results: Sixteen out of 2841 articles were included. Most articles investigated acceptance of technology that enhances safety or provides social interaction. The majority of data was based on qualitative research investigating factors in the pre-implementation stage. Acceptance in this stage is influenced by 27 factors, divided into six themes: concerns regarding technology (e.g., high cost, privacy implications and usability factors); expected benefits of technology (e.g., increased safety and perceived usefulness); need for technology (e.g., perceived need and subjective health status); alternatives to technology (e.g., help by family or spouse), social influence (e.g., influence of family, friends and professional caregivers); and characteristics of older adults (e.g., desire to age in place). When comparing these results to qualitative results on post-implementation acceptance, our analysis showed that some factors are persistent while new factors also emerge. Quantitative results showed that a small number of variables have a significant influence in the pre-implementation stage. Fourteen out of the sixteen included articles did not use an existing technology acceptance framework or model. Conclusions: Acceptance of technology in the pre-implementation stage is influenced by multiple factors. However, post-implementation research on technology acceptance by community-dwelling older adults is scarce and most of the factors in this review have not been tested by using quantitative methods. Further research is needed to determine if and how the factors in this review are interrelated, and how they relate to existing models of technology acceptance.

Reeder 2013	Framing the evidence for health smart homes and home-based consumer health technologies as a public health intervention for independent aging: A systematic review	Introduction: There is a critical need for public health interventions to support the independence of older adults as the world's population ages. Health smart homes (HSH) and home-based consumer health (HCH) technologies may play a role in these interventions. Methods: We conducted a systematic review of HSH and HCH literature from indexed repositories for health care and technology disciplines (e.g., MEDLINE, CINAHL, and IEEE Xplore) and classified included studies according to an evidence-based public health (EBPH) typology. Results: One thousand, six hundred and thirty-nine candidate articles were identified. Thirtyone studies from the years 1998-2011 were included. Twenty-one included studies were classified as emerging, 10 as promising and 3 as effective (first tier). Conclusion: The majority of included studies were published in the period beginning in the year 2005. All 3 effective (first tier) studies and 9 of 10 of promising studies were published during this period. Almost all studies included an activity sensing component and most of them used passive infrared motion sensors. The three effective (first tier) studies all used a multicomponent technology approach that included activity sensing, reminders and other technologies tailored to individual preferences. Future research should explore the use of technology for self-management of health by older adults; social support; and self-reported health measures incorporated into personal health records, electronic medical records, and community health registries. (C) 2013 Elsevier Ireland Ltd. All rights reserved.	152
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Trygghets- og sikkerhetsteknologi

Barlow 2007	A systematic review of the benefits of home telecare	We have conducted a systematic review of home telecare for frail elderly people and for patients with chronic conditions. We searched 17 electronic databases, the reference lists of identified studies, conference proceedings and Websites for studies available	20
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	for frail elderly people and those with long-term conditions	<p>in January 2006. We identified summaries of 8666 studies, which were assessed independently for relevance by two reviewers. Randomized controlled trials of any size and observational studies with 80 or more participants were eligible for inclusion if they examined the effects of using telecommunications technology to (a) monitor vital signs and security in the home, or (b) provide information and support. The review included 68 randomized controlled trials (69%) and 30 observational studies with 80 or more participants (31%). Most studies focused on people with diabetes (31%) or heart failure (29%). Almost two-thirds (64%) of the studies originated in the US; more than half (55%) had been published within the previous three years. Based on the evidence reviewed, the most effective telecare interventions appear to be automated vital signs monitoring (for reducing health service use) and telephone follow-up by nurses (for improving clinical indicators and reducing health service use). The cost-effectiveness of these interventions was less certain. There is insufficient evidence about the effects of home safety and security alert systems. It is important to note that just because there is insufficient evidence about some interventions, this does not mean that those interventions have no effect. [References: 12]</p>	
Brownsell 2011	A systematic review of lifestyle monitoring technologies	<p>The evidence base for lifestyle monitoring is relatively weak, even though there are significant numbers of commercial installations around the world. We conducted a literature review to summarize the current position with regard to lifestyle monitoring based on sensors in the home. In total, 74 papers met the inclusion criteria. Only four papers reported trials involving 20 or more subjects, with a further 21 papers reporting trials involving one or more subjects. Most papers (n = 49) were concerned with technology development. Motion detection was the most common of the technologies employed, followed by door and electrical appliance usage. The predominant monitoring strategy was that of detecting changes in activity. However, little attention has been given to determining when or how changes in the profile of activity should be used to raise a call for assistance from a health or care professional. Lifestyle monitoring remains a relatively immature research area in which there is little detailed understanding of how to provide comprehensive and effective systems.</p>	38
Chase 2012	Systematic Review of the Effect of Home Modification and Fall Prevention Programs on Falls and the Performance of Community-Dwelling Older Adults	<p>This systematic review explored the impact of fall prevention programs and home modifications on falls and the performance of community-dwelling older adults. It was conducted as part of the American Occupational Therapy Association's Evidence-Based Practice Project. Thirty-three articles were analyzed and synthesized. The strongest results were found for multifactorial programs that included home evaluations and home modifications, physical activity or exercise, education, vision and medication checks, or assistive technology to prevent falls. Positive outcomes included a decreased rate of functional decline, a decrease in fear of falling, and an increase in physical factors such as balance and strength. The strength of the evidence for physical activity and home modification programs provided individually was moderate. Implications for practice, education, and research are also discussed.</p>	47
Price 2000	Subjective barriers to prevent wandering of cognitively impaired people	<p>BACKGROUND: People with dementia often wander, at times putting themselves at risk and presenting challenges to carers and institutional staff. Traditional interventions to prevent wandering include restraint, drugs and locked doors. Cognitively impaired people may respond to environmental stimuli (sounds, images, smells) in ways distinct from healthy people. This has led to trials of visual and</p>	148

other selective barriers (such as mirrors, camouflage, grids/stripes of tape) that may reduce wandering.

OBJECTIVES: We assess the effect of subjective exit modifications on the wandering behaviour of cognitively impaired people. The second objective is to inform the direction and methods of future research.

SEARCH STRATEGY: The search strategy includes electronic searches of relevant bibliographic and trials databases, citation indices and relevant medical journals.

SELECTION CRITERIA: Randomized controlled trials and controlled trials provide the highest quality evidence, but interrupted time series are also considered as they may contribute useful information. Participants are people with dementia or cognitive impairment who wander, of any age, and in any care environment - hospital, other institution, or their own home. Interventions comprise exit modifications that aim to function as subjective barriers to prevent the wandering of cognitively impaired people. Locks, physical restraints, electronic tagging and other types of barrier are not included.

DATA COLLECTION AND ANALYSIS: The criteria for inclusion or exclusion of studies are applied independently by two reviewers. All outcomes that are meaningful to people making decisions about the care of wanderers are recorded. These include the number of exits or carer interventions, resource use, acceptability of the intervention and the effects on carer and wanderer anxiety or distress. heterogeneity of clinical area, of study design and of intervention was substantial.

MAIN RESULTS: No randomized controlled or controlled trials were found. The other experimental studies that we identified were unsatisfactory. Most were vulnerable to bias, particularly performance bias; most did not classify patients according to type or severity of dementia; in all studies, outcomes were measured only in terms of wandering frequency rather than more broadly in terms of quality of life, resource use, anxiety and distress; no studies included patients with delirium; no studies were based in patients' homes.

REVIEWER'S CONCLUSIONS: There is no evidence that subjective barriers prevent wandering in cognitively impaired people. [References: 41]

Kompensasjons- og velværeteknologi

Charters 2014	Efficacy of electronic portable assistive devices for people with acquired brain injury: A systematic review	A systematic review was conducted to evaluate the efficacy of electronic portable assistive devices (EPADs) for people with acquired brain injury. A systematic database search (OVID, CINAHL) found 541 citations published between 1989 and the end of 2012. A total of 23 reports met the inclusion/exclusion criteria, namely intervention studies (group, n-of-1) testing the efficacy of EPADs as compensatory devices for cognitive impairment for people with acquired brain injury aged 16-65 years. Study quality was rated by the PEDro (Physiotherapy Evidence Database) scale, (randomised controlled trials), the Downes and Black tool (other group intervention studies), and the Single Case Experimental Design tool (single participant studies). Levels of evidence were determined using five levels of classification based on the Spinal Cord Injury Rehabilitation Evidence table. Results found no Level 1 studies (RCTs with PEDro score ≥ 6), four Level 2 studies and 10 Level 3 studies. There was insufficient evidence to recommend any practice standards, but sufficient evidence to recommend the use of electronic reminder systems in supporting the everyday functioning of people with acquired brain injury as a practice guideline. Higher quality studies are required to support a broader range of compensatory roles that EPADs have the potential to play in neurorehabilitation and the long-term support of people with acquired brain injury.	46
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Miller 2014	Effectiveness and feasibility of virtual reality and gaming system use at home by older adults for enabling physical activity to improve health-related domains: a systematic review	<p>BACKGROUND: use of virtual reality and commercial gaming systems (VR/gaming) at home by older adults is receiving attention as a means of enabling physical activity.</p> <p>OBJECTIVE: to summarise evidence for the effectiveness and feasibility of VR/gaming system utilisation by older adults at home for enabling physical activity to improve impairments, activity limitations or participation.</p> <p>METHODS: a systematic review searching 12 electronic databases from 1 January 2000-10 July 2012 using key search terms. Two independent reviewers screened yield articles using pre-determined selection criteria, extracted data using customised forms and applied the Cochrane Collaboration Risk of Bias Tool and the Downs and Black Checklist to rate study quality.</p> <p>RESULTS: fourteen studies investigating the effects of VR/gaming system use by healthy older adults and people with neurological conditions on activity limitations, body functions and physical impairments and cognitive and emotional well-being met the selection criteria. Study quality ratings were low and, therefore, evidence was not strong enough to conclude that interventions were effective. Feasibility was inconsistently reported in studies. Where feasibility was discussed, strong retention (>70%) and adherence (>64%) was reported. Initial assistance to use the technologies, and the need for monitoring exertion, aggravation of musculoskeletal symptoms and falls risk were reported.</p> <p>CONCLUSIONS: existing evidence to support the feasibility and effectiveness VR/gaming systems use by older adults at home to enable physical activity to address impairments, activity limitations and participation is weak with a high risk of bias. The findings of this review may inform future, more rigorous research.</p>	127
Verheijden 2011	Are virtual reality applications feasible to increase physical activity in heart failure patients? A systematic review	<p>Purpose: Physical activity is an important self care behavior and is related to better prognoses in heart failure. Virtual reality applications can provide encouragement to increase the physical activity. The aims of our study were to evaluate if virtual reality applications could increase physical activity and examine if virtual reality applications are feasible to use in heart failure patients. Methods: A literature search was undertaken till December 2010 in the following databases: PsychInfo, PUBMED, Scopus, Web of Science and CINAHL. The Keywords used were Virtual reality, VR, computer games, video games, physical activity, daily activity, feasibility, usability and exergames in a number of different combinations. In the different databases a total of 757 articles were found. The abstracts were scanned for the study objective, study population, virtual reality application, the training procedure, used measurements and conclusion through two reviewers and evaluated on methodological quality using a classification system. Results: A total of 25 articles were included in this review, with 15 studies using a randomized design and the studies had no follow up data. The 25 studies had a total of 1042 participants. The mean age of the studies is relative young 31 (8-79). Nineteen studies used a commercial virtual reality application, the most common was the Nintendo Wii. All studies show an increase of physical activity in healthy participants, obese participants, elderly with disabilities and patients with stroke or cardiac diseases. The virtual reality applications also enhanced the motivation, exercise self-efficacy, positive mood, and reduced depression. No adverse effects or accidents were reported in the studies and the applications were evaluated as safe and feasible. Conclusion: Until now there are no studies published on using virtual reality in heart failure patients. However virtual reality applications are successfully used in elderly persons and in patients with stroke and cardiac disease. Virtual reality applications to increase physical activity can be a potentially useful tool for heart failure patients.</p>	177

Cheatham 2012	Effects of Internet use on well-being among adults with physical disabilities: A review	<p>Purpose: The current review provides a summarized synthesis and evaluation of studies addressing the effects of Internet use on well-being among adults (19-64 years old) with physical disabilities.</p> <p>Methods: Potential studies were identified through search of electronic bibliographic databases. Outcome studies were chosen for initial review if the study (1) involved a randomized controlled trial, a quasi-experimental, or a pre-experimental design, (2) appeared in the English language, (3) was published in a scholarly journal, and (4) was published before April, 2011. Applying these criteria, the search yielded 6762 studies, six of which were retained for review.</p> <p>Results: Current evidence with which to evaluate the effects of Internet use on well-being of adults with physical disabilities is sparse. Three of the studies found positive associations between Internet use and measures of well-being, while the remaining three studies found no statistically significant differences in well-being related to Internet use. Conclusions: Based upon the studies reviewed, conclusive statements regarding the presence or absence of these relationships are unfounded and premature. Positive relationships detected between Internet and well-being within samples of individuals with physical disabilities, however, do warrant further attention of researchers and indicate a need for studies employing heightened methodological rigor. Implications for Rehabilitation . The Internet presents a myriad of opportunities for individuals with physical disabilities to increase quality of life and well-being, including access to vital health information, social networking, education, and accessible employment. . Inconclusive findings within this review indicate that, while Internet use is associated with increased well-being within three of the six identified studies, further research is needed in effort to evaluate the clinical and social significance of Internet use as a means to improve well-being among persons with physical disabilities. Adapted from the source document.</p>	48
Health Quality 2008	Social isolation in community-dwelling seniors: an evidence-based analysis	<p>UNLABELLED: In early August 2007, the Medical Advisory Secretariat began work on the Aging in the Community project, an evidence-based review of the literature surrounding healthy aging in the community. The Health System Strategy Division at the Ministry of Health and Long-Term Care subsequently asked the secretariat to provide an evidentiary platform for the ministry's newly released Aging at Home Strategy. After a broad literature review and consultation with experts, the secretariat identified 4 key areas that strongly predict an elderly person's transition from independent community living to a long-term care home. Evidence-based analyses have been prepared for each of these 4 areas: falls and fall-related injuries, urinary incontinence, dementia, and social isolation. For the first area, falls and fall-related injuries, an economic model is described in a separate report. Please visit the Medical Advisory Secretariat Web site, http://www.health.gov.on.ca/english/providers/program/mas/mas_about.html, to review these titles within the Aging in the Community series.</p> <p>AGING IN THE COMMUNITY: Summary of Evidence-Based Analyses Prevention of Falls and Fall-Related Injuries in Community-Dwelling Seniors: An Evidence-Based Analysis Behavioural Interventions for Urinary Incontinence in Community-Dwelling Seniors: An Evidence-Based Analysis Caregiver- and Patient-Directed Interventions for Dementia: An Evidence-Based Analysis Social Isolation in Community-Dwelling Seniors: An Evidence-Based Analysis The Falls/Fractures Economic Model in Ontario Residents Aged 65 Years and Over (FEMOR)</p> <p>OBJECTIVE OF THE EVIDENCE-BASED ANALYSIS: The objective was to systematically review interventions aimed at preventing or reducing social isolation and loneliness in community-dwelling seniors, that is,</p>	88

persons > 65 years of age who are not living in long-term care institutions. The analyses focused on the following questions: Are interventions to reduce social isolation and/or loneliness effective? Do these interventions improve health, well-being, and/or quality of life? Do these interventions impact on independent community living by delaying or preventing functional decline or disability? Do the interventions impact on health care utilization, such as physician visits, emergency visits, hospitalization, or admission to long-term care?

Lindberg 2013	Using Information and Communication Technology in Home Care for Communication between Patients, Family Members, and Healthcare Professionals: A Systematic Review	Introduction. Information and communication technology (ICT) are becoming a natural part in healthcare both for delivering and giving accessibility to healthcare for people with chronic illness living at home. Aim. The aim was to review existing studies describing the use of ICT in home care for communication between patients, family members, and healthcare professionals. Methods. A review of studies was conducted that identified 1,276 studies. A selection process and quality appraisal were conducted, which finally resulted in 107 studies. Results. The general results offer an overview of characteristics of studies describing the use of ICT applications in home care and are summarized in areas including study approach, quality appraisal, publications data, terminology used for defining the technology, and disease diagnosis. The specific results describe how communication with ICT was performed in home care and the benefits and drawbacks with the use of ICT. Results were predominated by positive responses in the use of ICT. Conclusion. The use of ICT applications in home care is an expanding research area, with a variety of ICT tools used that could increase accessibility to home care. Using ICT can lead to people living with chronic illnesses gaining control of their illness that promotes self-care.	117
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I tillegg til de 21 systematiske oversiktene, identifiserte vi også 19 randomiserte kontrollerte studier, 21 eksperimentelle studier, 48 observasjonsstudier, 36 kvalitative studier, 12 studier som brukte blandete metoder og tre studier som så på kostnadseffektivitet. Studiedesign var uklart eller ikke oppgitt i 29 studier.

Studiedesign	Antall referanser: 189	Referansenr. (se referanser s. 28)
Systematiske oversikter	21	20, 22, 23, 34, 36, 38, 46, 47, 48, 52, 57, 71, 73, 88, 117, 127, 144, 148, 179,
Randomiserte kontrollerte studier	19	13, 24, 32, 63, 89, 102, 109, 110, 116, 128, 140, 159, 162, 163, 167, 170, 176, 184, 187
Eksperimentelle studier	21	49, 51, 69, 76, 86, 91, 92, 95, 96, 97, 107, 129, 146, 150, 155, 157, 158, 165, 180, 181, 189
Observasjonsstudier	48	4, 5, 6, 7, 11, 19, 26, 28, 29, 30, 33, 35, 37, 39, 44, 50, 53, 54, 60, 61, 64, 65, 66, 78, 82, 87, 90, 93, 99, 100, 101, 104, 106, 114, 115, 130, 135, 138, 143, 149, 160, 161, 166, 168, 173, 175, 177, 183

Kvalitative studier	36	10, 14, 15, 18, 31, 58, 59, 62, 67, 74, 77, 79, 80, 83, 84, 103, 111, 119, 120, 123, 125, 126, 131, 133, 136, 139, 145, 147, 152, 154, 156, 164, 169, 171, 174, 178
Studier som brukte blandete metoder	12	3, 17, 21, 40, 42, 55, 75, 105, 112, 132, 151, 172
Kostnadseffektivitet	3	1, 12, 25
Ikke oppgitt/uklart	29	2, 8, 9, 16, 27, 41, 43, 45, 56, 68, 70, 72, 81, 85, 94, 98, 108, 113, 118, 121, 122, 134, 137, 141, 142, 182, 185, 186, 188

Type velferdsteknologi

De fleste studiene undersøkte tiltak under kategorien «kompensasjons- og velværeteknologi» (81). Denne kategorien inkluderte blant annet bruk av WiiFit for å bedre balanse og fysisk form, modifiserte kjøkken, rullatorer, rullestoler og andre typer mobilitetsteknologi, og påminnelsesenheter. De resterende undersøkte tiltak knyttet til trygghets- og sikkerhetsteknologi (28) (som for eksempel GPS og sensorteknologi for nattlig overvåking av personer med demens), teknologi for sosial kontakt (for eksempel Skype, internett) (52), eller velferdsteknologi generelt (54). Fire studier spesifiserte ikke hva slags tiltak som ble undersøkt.

Videre fant vi 16 studier som undersøker eksplisitt «smart house/home» begrepet (1, 27, 35, 43, 45, 56, 57, 58, 59, 61, 123, 124, 138, 152, 155, 180). Selv om dette begrepet kan inkludere mange ulike tiltak (som diskutert tidligere), har vi inkludert dette som et separate gruppe fordi oppdragsgiveren er spesifikk interesserte i slike tiltak. Studiene som undersøke «smart house/home» er også inkludert i sortering etter hovedkategoriene (se tabell 3).

Tabell 3: Antall referanser sortert etter velferdsteknologikategori

Velferdsteknologi kategori	Antall referanser:	Referansnr.
Trygghets- og sikkerhetsteknologi	28	8, 9, 20, 25, 38, 39, 45, 47, 54, 56, 58, 59, 67, 77, 81, 100, 108, 123, 142, 147, 148, 150, 151, 155, 157, 164, 169, 171
Kompensasjons- og velværeteknologi	81	3, 4, 5, 7, 11, 12, 13, 14, 15, 17, 18, 19, 21, 27, 28, 30, 32, 35, 37, 40, 44, 46, 49, 51, 55, 60, 63, 65, 66, 68, 69, 70, 76, 79, 82, 83, 87, 90, 92, 94, 101, 102, 103, 104, 105, 106, 107, 109, 110, 111, 112, 113, 114, 115, 116, 127, 130, 132, 140, 141, 143, 145, 146, 149, 152,

		160, 161, 162, 163, 165, 166, 167, 170, 172, 174, 175, 179, 180, 182, 187, 189
Teknologi for sosial kontakt	22	26, 33, 48, 62, 75, 80, 88, 89, 91, 95, 96, 97, 117, 131, 133, 134, 135, 137, 156, 158, 173, 177
Velferdsteknologi generelt	54	2, 6, 22, 23, 29, 31, 34, 36, 41, 42, 43, 50, 52, 53, 57, 61, 64, 71, 72, 73, 74, 78, 84, 85, 86, 93, 98, 99, 118, 119, 120, 121, 122, 125, 126, 128, 129, 136, 138, 139, 144, 154, 159, 168, 176, 178, 181, 183, 184, 185, 186, 188
Ikke oppgitt	4	1, 10, 16, 24

Populasjon

De fleste studiene undersøkte tiltak rettet mot eldre (89) eller voksne med nedsatt funksjonsevne (49). De resterende undersøkte tiltak rettet mot personer med demens eller kognitiv svikt (29), voksne med kronisk sykdom (12) eller effekt på eller erfaring med tiltak blant omsorgspersoner (12). Populasjonskarakteristika var ikke oppgitt i 4 studier.

Tabell 4: Antall referanser sortert etter populasjon

Populasjon	Antall referanser: 189	Referansnr.
Eldre	89	1, 3, 5, 6, 8, 17, 18, 19, 20, 21, 22, 24, 26, 27, 28, 29, 31, 32, 33, 34, 35, 47, 50, 51, 53, 54, 56, 57, 58, 59, 63, 64, 67, 69, 70, 71, 72, 76, 77, 79, 80, 81, 82, 83, 84, 87, 88, 89, 98, 100, 101, 102, 103, 106, 107, 110, 111, 118, 119, 125, 126, 127, 131, 132, 142, 143, 144, 145, 146, 148, 149, 150, 151, 158, 159, 161, 162, 163, 164, 165, 167, 176, 177, 178, 182, 183, 187, 189
Voksne med nedsatt funksjonsevne	49	4, 11, 12, 15, 23, 30, 36, 37, 40, 44, 46, 48, 49, 55, 60, 62, 74, 75, 78, 85, 92, 93, 99, 109, 112, 113, 115, 120, 121, 122, 128, 133, 134, 135, 138, 140, 141, 152, 156, 160, 166, 168, 170, 171, 172, 173, 175, 181
Personer med demens eller kognitiv svikt	29	2, 9, 14, 16, 39, 41, 42, 43, 45, 52, 61, 73, 86, 94, 95, 96, 97, 104, 123, 129, 136, 137, 154, 169, 174, 180, 185, 186, 188

Omsorgspersoner for eldre eller voksne med nedsatte funksjonsevner	6	10, 108, 139, 147, 155, 157
Voksne med kronisk sykdom	12	7, 13, 25, 65, 66, 90, 91, 105, 116, 117, 130, 179
Ikke oppgitt	4	38, 68, 114, 184

Studieår

De fleste studiene ble publisert mellom 2010 og 2014 (112). De resterende ble publisert mellom 2000 og 2009 (72) og mellom 1995 og 1999 (4). Publikasjonsår var ikke oppgitt i én studie.

Tabell 5: Antall referanser sortert etter studieår

Studieår	Antall referanser: 187
2010-2014	112
2000-2009	72
1995-1999	4
Ikke oppgitt	1

Liste over referanser

Sortert på forfatters etternavn.

1. Aanesen M, Lotherington AT, Olsen F. Smarter elder care? A cost-effectiveness analysis of implementing technology in elder care. *Health Informatics Journal* 2011;17(3):161-172.

Whereas in most sectors, technology has taken over trivial and labour consuming tasks, this transformation has been delayed in the healthcare sector. Although appropriate technology is available, there is general resistance to substituting 'warm' hands with 'cold' technology. In the future, this may change as the number of elderly people increases relative to the people in the work force. In combination with an increasing demand for healthcare services, there are calls for efforts to increase productivity in the sector. Based on experience data from previous studies on information and communication technology efforts in the healthcare sector, we quantitatively assess the use of smart house technology and video visits in home care. Having identified healthcare providers, hospitals and relatives as the main affected groups, we show that smart house technology is cost-effective, even if only relatives gain from it. Video visits, which have higher implementation costs, demand effects on both relatives and health care providers in order to be a cost-effective tool in home care. As the analysis is purely quantitative, these results need to be complemented with qualitative effects and with more thorough discussions of the ethical, medical and legal aspects of the use of technology in home care.

2. Adlam T, Faulkner R, Orpwood R, Jones K, Macijauskiene J, Budraitiene A. The installation and support of internationally distributed equipment for people with dementia. *IEEE Transactions on Information Technology in Bio-medicine* 2004;8(3):253-257.

This paper describes the evaluation and support of assistive technology designed to increase the independence of people with dementia. Devices were evaluated by people with dementia in their own homes. Working with and supporting people with dementia requires relational skills not normally needed by installers and technical supporters.

3. Agmon M, Perry CK, Phelan E, Demiris G, Nguyen HQ. A pilot study of Wii Fit exergames to improve balance in older adults. *Journal of Geriatric Physical Therapy* 2011;34(4):161-167.

PURPOSE: To determine the safety and feasibility of using Nintendo Wii Fit exergames to improve balance in older adults.

METHODS: Seven older adults aged 84 (5) years with impaired balance (Berg Balance Scale [BBS] score < 52 points) were recruited from 4 continuing care retirement communities to participate in a single group pre- and postevaluation of Wii Fit exergames. Participants received individualized instructions (at least 5 home visits) on playing 4 exergames (basic step, soccer heading, ski slalom, and table tilt) and were asked to play these games in their homes at least 30 minutes 3 times per week for 3 months and received weekly telephone follow-up. They also completed a paper log of their exergame play and rated their enjoyment immediately after each session. Participants completed the BBS, 4-Meter Timed Walk test, and the Physical Activity Enjoyment Scale at baseline and 3 months. Semistructured interviews were conducted at the 3-month evaluation.

RESULTS: Participants safely and independently played a mean of 50 sessions, median session duration of 31 minutes. Two of the games were modified to ensure participants' safety. Participants rated high enjoyment immediately after exergame play and expressed experiencing improved balance with daily activities and desire to play exergames with their grandchildren. Berg Balance Scores increased from 49 (2.1) to 53 (1.8) points ($P = .017$). Walking speed increased from 1.04 (0.2) to 1.33 (0.84) m/s ($P = .018$).

CONCLUSIONS: Use of Wii Fit for limited supervised balance training in the home was safe and feasible for a selected sample of older adults. Further research is needed to determine clinical efficacy in a larger, diverse sample and ascertain whether Wii Fit exergames can be integrated into physical therapy practice to promote health in older adults.

4. Agree EM, Freedman VA. A comparison of assistive technology and personal care in alleviating disability and unmet need. *Gerontologist* 2003;43(3):335-344.

Purpose: The authors examine differences in reports of residual disability and unmet need by type of long-term care arrangement (assistive technology or personal care). **Design and Methods:** This study compares three specific dimensions of residual difficulty (pain, fatigue, and time intensity) and reports of unmet need across care arrangements. Samples from the U. S. 1994-1995 National Health Interview Survey Phase 2 Disability Supplements include adults with limitations in bathing, transferring, walking, and getting outside. **Results:** Even when differences in underlying disability are accounted for, assistive technology (AT) confers no additional benefit in the three dimensions of residual difficulty analyzed here. AT users equally or more often report that tasks are tiring, time consuming, or painful, even when they use assistance. Though this would appear to indicate unmet needs

for care, fewer AT users report a desire for hands-on personal care. Implications: Though disability alleviation by technology is no better on specific dimensions of difficulty, technology users report less unmet need for personal care. Designing appropriate and cost-effective home care for adults with disabilities requires a better understanding of the ways in which technology users may differ from others and the circumstances under which technology can be most effective.

5. Agree EM, Freedman VA, Cornman JC, Wolf DA, Marcotte JE. Reconsidering substitution in long-term care: When does assistive technology take the place of personal care? *Journals of Gerontology Series B-Psychological Sciences and Social Sciences* 2005;60(5):S272-S280.

Objectives. Assistive technology (AT) may improve quality of life and reduce dependence for older persons with disabilities. In this article, we examine tradeoffs between the use of AT and reliance on personal care, with attention to factors that may influence those relationships. **Methods.** We jointly modeled hours of formal and informal care with use of AT in order to address the interdependence of these outcomes in ways not taken into account in previous studies. We analyzed a national sample of older persons with difficulty in activities of daily living drawn from Phase 2 of the 1994-1995 National Health Interview Survey (NHIS) Disability Supplement. **Results.** Our findings show that the use of AT was associated with reductions in informal care hours, especially for those who were unmarried, better educated, or had better cognitive abilities, but appeared to supplement formal care services for these groups. Individuals with cognitive impairment were less likely than others to substitute AT with either type of personal care. **Discussion.** These models raise the possibility that reductions of informal care hours may be accomplished with a combination of formal care and assistive devices, rather than from either alternative alone.

6. Ahn M. Older People's Attitudes toward Residential Technology: The Role of Technology in Aging in Place. 2004. p. 2376-A.

The purpose of this study was to investigate older people's attitudes toward adopting technology as it relates to homes that could improve the quality of life and assist in aging in place. Attitudes were examined in terms of perception and acceptance of residential technology. Data for this study were gathered by an online survey. Online questionnaires were distributed to the potential sample of 9,789 e-mail addresses through the Virginia Tech alumni list serve on February 3, 2004. The response rate was 15.8% with 1,546 eligible responses returned by February 27. The majority of the sample for this study can be described as Caucasian, married men, age 55 to 64 with good or excellent health and a post graduate college education living in owned single-family detached homes. Chi-square, ANOVA, Pearson's correlations, and path analysis were employed to test hypothesized relationships. Nine hypotheses were proposed to examine the relationships of variables based on the research framework. The ANOVA revealed that there were significant differences between the degree of desire to age in place by age, the number of household members, employment status, income, tenure type, length of residence in current dwelling, and location. Other ANOVA tests showed that age, employment status, health, education, income, and length of residence in current dwelling influenced both the perceptions and acceptance of residential technology. Pearson's correlation implied that people having higher perception scores tended to have higher acceptance scores. As for the relationship between attributes of innovation and attitudes toward residential technology, the ANOVA tests showed that only two of the seven factors, ease of use and reasonable price, influenced both the perceptions and acceptance of

residential technology. Pearson's correlation tests revealed that there were negative linear relationships between the desire to age in place and both perceptions and acceptance of technology. The results of path analysis presented that many hypothesized relationships between demographic, housing, and technology factors were significant. Although, many direct effects of hypothesized relationships were supported, the relationship between the desire to age in place and attitudes toward residential technology were not strong enough to support their definite relationship as a strong motivation to adopt technology. Results from testing the proposed hypotheses presented support for eight of the nine hypotheses. Results from this study cannot be generalized to a national population because of the limitations of the sampling frame. Results, however, are significant in terms of the investigation of early computer adopters who are age 55 and older living independently. Their desire to age in place was not very different from the national population. Findings about the attitudes toward computer and Internet technology indicated that respondents had surprisingly similar attitudes. Age was revealed as an important factor for both the desire to age in place and attitudes toward residential technology as a direct effect.

7. Albores J, Marolda C, Haggerty M, Gerstenhaber B, Zuwallack R. The use of a home exercise program based on a computer system in patients with chronic obstructive pulmonary disease. *Journal of Cardiopulmonary Rehabilitation & Prevention* 2013;33(1):47-52.

PURPOSE: To test the effectiveness of a home exercise program based on a user-friendly, computer system, the Nintendo Wii Fit.

METHODS: In this longitudinal study, 25 clinically stable patients with chronic obstructive pulmonary disease began a 6-week nonintervention (baseline) period followed by 12 weeks of Wii exercise training at home. Patients were instructed to exercise 5 or more days per week. Exercise capacity, health status, and dyspnea were evaluated after home exercise training.

RESULTS: Evaluable data were available in 20 patients after home exercise training; their force expiratory volume in 1 second was 45 + 16%. Following 12 weeks of Wii exercise training, the Endurance Shuttle Walk Test increased by 131 + 183 seconds over the baseline determination ($P = .005$). Significant improvements were also noted in arm-lift and sit-to-stand repetitions, the total score, and the emotion dimension of the Chronic Respiratory Questionnaire. Men had significantly greater increases in the Endurance Shuttle Walk Test than women, although their self-reported exercise durations were similar. There were no significant adverse outcomes.

CONCLUSION: This study suggests that 12 weeks of regular, home exercise based on an interactive entertainment computer system can lead to positive short-term outcomes.

8. Alexander GL, Wilbik A, Keller JM, Musterman K. Generating sensor data summaries to communicate change in elders' health status. *Applied Clinical Informatics* 2014;5(1):73-84.

BACKGROUND: Sensor systems detect critical health changes of frail residents in the community. However, sensor systems alone may not allow users to identify data trends fast enough. Linguistic summaries of sensor data describing elder activity in their apartment provide a useful solution so clinicians can respond quicker.

OBJECTIVES: This paper describes two case studies of independent elders living with sensors in their assisted living apartment. Residents experienced declining health status and activity level over a period of approximately 24 months. Linguistic summaries were assessed iteratively by engineers and nurses working with the sensor system.

METHODS: We created summaries of activity data collected from sensors located in resident apartments during a period of health status change. Engineers distilled information from heterogeneous data sources including bedroom motion and bed restlessness sensors during the summarization process. Engineers used fuzzy measures to compare two different periods of nighttime activity. Using iterative approaches a registered nurse worked with the team to develop algorithms and short phrases that appropriately capture and describe changes in activity levels.

RESULTS: Total activity levels captured by sensors were graphed for two elderly residents experiencing health problems over a period of months. In the first case study (resident 3004), an elderly resident had knee surgery and onset of backspasms postoperatively. Graphed dissimilar measures show changes from baseline when backspasms occur. In the second case study (resident 3003), there were increased periods of bed restlessness before and after a resident had a major surgical procedure. During these periods, graphs of dissimilarity measures indicate that there were changes from usual baseline periods of restlessness postoperatively indicating the health problems were persisting. Nurse care coordination notes indicate these episodes were related to poor pain control.

CONCLUSIONS: Summaries of activity change are useful for care coordinators to detect resident health status for community dwelling residents.

9. Altus DE, Mathews RM, Xaverius PK, Engelman KK, Nolan BAD. Evaluating an electronic monitoring system for people who wander. *American Journal of Alzheimer's Disease* 2000;15(2):121-125.

Wandering away from home, or elopement, is a behavior that places persons with dementia at risk of serious injury and may lead family caregivers to place their loved ones in institutions or to severely restrict their independence. Funding from the National Institute on Aging (NIA) was used to evaluate the Mobile Locator, an electronic device designed to help caregivers quickly locate a person who has eloped. This 6-month pilot study included case studies of seven users and an opinion survey of family caregivers, professional caregivers and search and rescue workers. The survey results showed that respondents were positively impressed by the device, only identifying cost as a potential drawback. Case studies revealed that the equipment was easy to use, effective, and helpful to caregivers' peace of mind. These results suggest that the Mobile Locator is a valuable tool deserving of further study.

10. Alwin J, Persson J, Krevers B. Perception and significance of an assistive technology intervention - the perspectives of relatives of persons with dementia. *Disability and Rehabilitation* 2013;35(18):1519-1526.

Purpose: The aim of this study was to examine relatives' perception of an assistive technology intervention aimed at persons with dementia (PwDs) and their relatives, and to examine whether, and how, experiences of the intervention process differed between relatives valuing the intervention to be of high, and relatives perceiving it to be of low significance. **Method:** A total of 47 relatives of PwDs within the Swedish Technology and Dementia project were interviewed telephonically using a modified version of the Patient perspective on Care and Rehabilitation process instrument. A total of 46 participants were divided into two groups depending on whether they valued the intervention to be of great significance (GS group; N = 33) or of some/no significance (SNS group; N = 13). **Results:** Several aspects of the intervention were perceived as highly important, e.g. being shown consideration and respect, and having somewhere to turn. The results indicate that relatives in the GS group perceived certain aspects of the intervention process as highly

fulfilled to a larger extent than did relatives in the SNS group. Conclusions: This study illustrates how process evaluations can be used to increase the understanding and to identify improvement aspects of interventions.

11. Anderson WL, Wiener JM. The Impact of Assistive Technologies on Formal and Informal Home Care. *Gerontologist* 2013.

Purpose of the Study: Assistive technologies help people with disabilities compensate for their impairments. This study assessed which of 5 categories of assistive technologies-indoor/outdoor mobility, bed transfer, bathing, toileting, and telephone assistance-were substitutes or complements for human personal assistance by differentiating between total and formal personal assistance service (PAS) hours. **DESIGN AND METHODS:** The study analyzed 2004 National Long-Term Care Survey community-dwelling respondents receiving assistance with activities of daily living. Ordinary least squares (OLS) on total PAS hours was estimated on the entire sample, and logit and OLS models were estimated on the likelihood and hours of formal PAS, respectively. **RESULTS:** Assistive technology for indoor/outdoor mobility, bed transfer, and bathing was found to be substitutes for total PAS, whereas assistive technology for bed transfer and toileting was found to be complements for the use of formal PAS. Telephone assistance was not significant for either total or formal PAS hours. **IMPLICATIONS:** The use of some assistive technologies by older people with disabilities appears to reduce the amount of informal care provided, but not the amount of paid PAS. Thus, this study does not provide support for the hypothesis that the use of assistive technologies will reduce use of paid care and, therefore, spending for long-term care.

12. Andrich R, Ferrario M, Moi M. A model of cost-outcome analysis for assistive technology. *Disability and Rehabilitation* 1998;20(1):1-24.

During the CERTAIN study (research carried out in 1994-96 within the Technology Initiative for Disabled and Elderly (TIDE) programme of the European Union), a number of real life case studies of provision of assistive technology to disabled persons were investigated in order to assess the applicability of socio-economic principles, methods and techniques already available from Health Care Technology Assessment studies. A retrospective study on cost, effectiveness and utility resulting from the implementation of assistive technology was carried out over a sample of disabled persons who had adopted technical aids before the start of the project. The sample was selected in such a way to include different pathologies (steady or progressive), impairments, ages, technology and social environment. Each case was described by considering all clinical, technical and social aspects; a common structure for case reporting was developed and tested; attempts were carried out to apply and refine concept and tools derived from health technology assessment studies; on the grounds of such experience a decision support model was elaborated for the choice between different alternatives in order to maximize the client's quality of life while making efficient use of scarce resources. A computer implementation of such a model was also developed, along with a mathematical structure of cost analysis. Within a national research programme such findings were further exploited, leading to the development of a prototype cost-outcome instrument designed for use in clinical practice in the provision of assistive technology to individual cases.

13. Antypas K, Wangberg SC. E-Rehabilitation - an Internet and mobile phone based tailored intervention to enhance self-management of cardiovascular disease: study protocol for a randomized controlled trial. *BMC Cardiovascular Disorders* 2012;12:50.

Unlabelled:

BACKGROUND: Cardiac rehabilitation is very important for the recovery and the secondary prevention of cardiovascular disease, and one of its main strategies is to increase the level of physical activity. Internet and mobile phone based interventions have been successfully used to help people to achieve this. One of the components that are related to the efficacy of these interventions is tailoring of content to the individual. This trial is studying the effect of a longitudinally tailored Internet and mobile phone based intervention that is based on models of health behaviour, on the level of physical activity and the adherence to the intervention, as an extension of a face-to-face cardiac rehabilitation stay.

METHODS/DESIGN: A parallel group, cluster randomized controlled trial. The study population is adult participants of a cardiac rehabilitation programme in Norway with home Internet access and mobile phone, who in monthly clusters are randomized to the control or the intervention condition. Participants have access to a website with information regarding cardiac rehabilitation, an online discussion forum and an online activity calendar. Those randomized to the intervention condition, receive in addition tailored content based on models of health behaviour, through the website and mobile text messages. The objective is to assess the effect of the intervention on maintenance of self-management behaviours after the rehabilitation stay. Main outcome is the level of physical activity one month, three months and one year after the end of the cardiac rehabilitation programme. The randomization of clusters is based on a true random number online service, and participants, investigators and outcome assessor are blinded to the condition of the clusters.

DISCUSSION: The study suggests a theory-based intervention that combines models of health behaviour in an innovative way, in order to tailor the delivered content. The users have been actively involved in its design, and because of the use of Open-Source software, the intervention can easily and at low-cost be reproduced and expanded by others. Challenges are the recruitment in the elderly population and the possible underrepresentation of women in the study sample. Funding by Northern Norway Regional Health Authority.

TRIAL REGISTRATION: Trial registry <http://www.clinicaltrials.gov>: NCT01223170.

14. Arntzen C, Holthe T, Jentoft R. Tracing the successful incorporation of assistive technology into everyday life for younger people with dementia and family carers. *Dementia* (London) 2014.

Research shows that people with late-onset dementia and their relatives can benefit from using assistive technology (AT). Few researchers have investigated the use and utility of AT in everyday life for younger people with dementia (YPD) and their family carers. The aim of this study is to explore what characterised the implementation process when the AT was experienced as beneficial to the YPD and the family carer in their daily life. The qualitative longitudinal study followed 12 younger people (i.e. those under 65 years of age), who had recently been diagnosed with dementia and 14 of their family carers. In-depth interviews and observations during the process were conducted at the beginning, and were repeated every 3rd month for up to 12 months. The data were analysed, and the participants' experiences further discussed on the basis of embodied, social- and everyday life-situated approaches, in order to provide a deeper understanding of the interactive processes involved in the trajectory. Five elements in the process were identified as important for the experience of usefulness and successful incorporation of AT. The AT had to: (1) be valuable by addressing practical, emotional, and relational challenges; (2) fit well into, or be a better solution for, habitual practice and established strategies; (3) generate positive emotions, and become a

reliable and trustworthy tool; (4) be user-friendly, adaptable, and manageable; and (5) interest and engage the family carer. The study demonstrated the importance of understanding the use and utility of AT on the basis of embodied and social participation in daily life. The family carers played a significant role in whether or not, and in which ways, AT was absorbed into the everyday life practice of YPD.

15. Arthanat S, Nochajski SM, Lenker JA, Bauer SM, Wu YW. Measuring usability of assistive technology from a multicontextual perspective: the case of power wheelchairs. *American Journal of Occupational Therapy* 2009;63(6):751-764.

Assistive technology (AT) devices enable people with disabilities to function in multiple contexts and activities. The usability of such devices is fundamentally indicative of the user's level of participation in multiple roles and occupations. Seventy people who used power wheelchairs were interviewed using a novel tool, the Usability Scale for Assistive Technology (USAT). The USAT uses a human factors science framework to investigate the wheelchair user's perceived independence in mobility-related activities within home, workplace, community, and outdoors in accordance with the characteristics of the wheelchair, environmental factors, and abilities and skills of the user to operate the wheelchair. Descriptive analysis of the data revealed usability issues with the use of power wheelchairs in all contexts. Users confronted far more significant issues within the community and outdoor environment compared with those at home and in the workplace. These issues have been elucidated and applied to an intervention framework with relevance to a multitude of AT stakeholders.

16. Assistive Technology and Telecare to maintain Independent Living At home for people with dementia: The ATTILA Trial.
17. Auger C. Evaluation des effets de l'utilisation des aides a la mobilite motorisees chez les personnes agees de plus de 50 ans. Universite de Montreal (Canada). Tilgjengelig fra: <http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=2011033056&site=ehost-live>.

Mobility-related subsidy programs are being challenged by the aging of the population as adults aged over 50 years become the most prevalent users of power mobility devices (PMDs), such as power wheelchairs and scooters. The thesis examines the impacts of PMDs for middle-aged and older adults during the first 18 months of use. Our research question concerns the nature and magnitude of outcomes pertaining to effectiveness, social significance and subjective well-being, as well as the factors associated with outcomes.

The thesis comprises three sections: conceptual, methodological and analytical. The main results are presented in four manuscripts. The conceptual section includes a systematic review that reveals the limited coverage and low level of evidence of PMD outcomes for middle-aged and older adults. Moreover, this section supports a conceptual framework linking intention to use the PMD, mobility habits, three dimensions of outcomes (effectiveness, social significance, subjective well-being) and four categories of co-factors associated with the use of assistive technology (person, assistive device, intervention, environment).

The methodological section assembled 5 questionnaires and 18 indicators, matched to the conceptual framework, and verified their applicability for a telephone administration. Two questionnaires required transcultural validation studies with PMD users (n=45, age 50-84 years) that confirmed the test-retest reliability and the equivalence of the questionnaires with the original versions.

Finally, the analytical section examined the impact of PMDs on 3 cohorts (n=116, age 50-89 years), recruited as a function of stage of usage, and explored key factors associated with greater life-space mobility. Cohort comparisons showed significantly greater life-space mobility for initial and long term users than for the reference group waiting for the PMD. Moreover, frequency of outings was higher for PMD users in the neighbourhood and around home. Age-adjusted linear regression analyses found greater life-space mobility associated with gender, the nature of PMD activities and device type.

The thesis supports considering the environment and a combination of personal and device factors to appreciate PMD outcomes during the first months of use. The results are useful for rehabilitation services as they confirm the utility of following up PMD outcomes and identify key determinants of mobility for middle-aged and older PMD users.

Keywords. Power mobility devices, Wheelchairs, Self-help Devices, Mobility, Participation, Systematic review, Outcome Assessment (Health Care), Aged, Middle-aged, Disabled Persons/Rehabilitation.

18. August SM. Medication adherence among the elderly: A test of the effects of the Liberty 6000 technology. 2005. p. 352.

Medication adherence is a formidable challenge for the elderly who may have several prescribed medications while dealing with limited incomes and declining health. The primary purpose of this study was to evaluate the Liberty 6000, an automated capsule and tablet dispenser that provides proper medication dosages and is intended to encourage and track medication adherence. Seven focus groups were assembled; these comprised 49 men and women ages 65 to 98 years of Black, Anglo, and Hispanic descent who met the following criteria: living independently or semi-independently, had suffered one or more impairments, and were taking at least three prescription medications. Each focus group session lasted 90 minutes and was tape-recorded and transcribed verbatim, resulting in about 2,600 lines of text. Each question was designed to be open-ended to avoid introducing any bias that might influence the response. The Health Belief Model conceptually guided the study that addressed perceptions of illness susceptibility and severity, barriers, benefits, and cues to action associated with medication adherence. Main benefits of taking medications included avoiding inherited illnesses (or tendencies for illnesses), and reducing illness symptoms. Barriers to taking medications included forgetting, dexterity problems, and high cost. Benefits of the proposed intervention included reminding, caregiver notification, and providing a printed log of medications taken and missed. Barriers associated with the when loading the device, and its perceived cost. Using an adoption prediction model proposed a way to overcome barriers and encourage acceptance as well as a strategy to maintain acceptance over time. The model also can be used to evaluate a wide variety of medical devices for elderly people. This study identified the advantages and disadvantages of the Liberty 6000. Findings also suggest areas for further investigation by the nursing community and healthcare policy makers in finding solutions to the myriad problems faced by older people in medication adherence.

19. Bainbridge E, Bevans S, Keeley B, Oriol K. The Effects of the Nintendo Wii Fit on Community-Dwelling Older Adults with Perceived Balance Deficits: A Pilot Study. *Physical & Occupational Therapy in Geriatrics* 2011;29(2):126-135.

The purpose of this study was to determine if a 6-week intervention program using the Nintendo Wii Fit Balance Board would lead to improvements in

balance in community-dwelling older adults over the age of 65 with a perceived balance deficit. Balance, balance confidence, and limits of stability were measured at preintervention and postintervention using the Berg Balance Scale (BBS), Activities-specific Balance Confidence Scale, and the Multi-Directional Reach Test, respectively. The center of pressure excursion was calculated by the Wii Balance Board. The intervention consisted of 30-min sessions, 2×/week using the Balance Board. No statistically significant changes were found for any outcome measure, although 4 of the 6 participants demonstrated clinically significant improvements on the BBS, using established clinical guidelines. These findings suggest that an intervention program including the Wii fit may be an effective rehabilitation option for older adults with perceived balance deficits.

20. Barlow J, Singh D, Bayer S, Curry R. A systematic review of the benefits of home telecare for frail elderly people and those with long-term conditions. *Journal of Telemedicine & Telecare* 2007;13(4):172-179.

We have conducted a systematic review of home telecare for frail elderly people and for patients with chronic conditions. We searched 17 electronic databases, the reference lists of identified studies, conference proceedings and Websites for studies available in January 2006. We identified summaries of 8666 studies, which were assessed independently for relevance by two reviewers. Randomized controlled trials of any size and observational studies with 80 or more participants were eligible for inclusion if they examined the effects of using telecommunications technology to (a) monitor vital signs or safety and security in the home, or (b) provide information and support. The review included 68 randomized controlled trials (69%) and 30 observational studies with 80 or more participants (31%). Most studies focused on people with diabetes (31%) or heart failure (29%). Almost two-thirds (64%) of the studies originated in the US; more than half (55%) had been published within the previous three years. Based on the evidence reviewed, the most effective telecare interventions appear to be automated vital signs monitoring (for reducing health service use) and telephone follow-up by nurses (for improving clinical indicators and reducing health service use). The cost-effectiveness of these interventions was less certain. There is insufficient evidence about the effects of home safety and security alert systems. It is important to note that just because there is insufficient evidence about some interventions, this does not mean that those interventions have no effect. [References: 12]

21. Bell CS, Fain E, Daub J, Warren SH, Howell SH, Southard KS, et al. Effects of Nintendo Wii on Quality of Life, Social Relationships, and Confidence to Prevent Falls. *Physical & Occupational Therapy in Geriatrics* 2011;29(3):213-221.

Our society is aging and is the fastest growing sector of the population. The increased longevity of the population over 65 is also associated with declining health, impaired mobility, feelings of isolation, and loneliness (Drewnowski & Evans, 2001). Since the elderly population is steadily increasing, occupational therapy needs to focus attention on resources that promote independence and improve quality of life. Additional qualitative and quantitative research investigating the utilization of the Nintendo Wii on the geriatric population will benefit evidence-based practice. Purpose of study: This pilot study investigated the effects of the Nintendo Wii on quality of life, social relationships, and the confidence in the ability to prevent falls. Setting: This study was conducted at three assisted living facilities in the piedmont/triad area of North Carolina. Participants: Total sample size was 21 participants 60 years and older. Design: This study was a repeated measures

design collecting both quantitative and qualitative data. Instruments utilized were the Control, Autonomy, Self-realization, Pleasure-19 (CASP-19), the Social Provisions Scale (SPA), and the Modified Falls Efficacy Scale (M-FES). The interventions for the study included warm-up exercises, Nintendo Wii bowling, and fall prevention education. Results: Minimal significant items were noted across the three groups in the quantitative data for this pilot study, and results were scattered and no valid conclusions could be drawn. However, the qualitative data captured variations of participant views of overall satisfaction, fall awareness, and increased participation that support findings reported in the literature, and results were scattered and no conclusions could be drawn. Discussion: Owing to increase interest and use of the Nintendo Wii in assisted living facilities, further studies investigating the social benefits, fall prevention benefits, and quality of life would be valuable and could contribute to more regular and structured usage within facilities for this population.

22. Bemelmans R, Gelderblom GJ, Jonker P, de Witte L. Socially Assistive Robots in Elderly Care: A Systematic Review into Effects and Effectiveness. *Journal of the American Medical Directors Association* 2012;13(2):114-U142.

The ongoing development of robotics on the one hand and, on the other hand, the foreseen relative growth in number of elderly individuals suffering from dementia, raises the question of which contribution robotics could have to rationalize and maintain, or even improve the quality of care. The objective of this review was to assess the published effects and effectiveness of robot interventions aiming at social assistance in elderly care. We searched, using Medical Subject Headings terms and free words, in the CINAHL, MEDLINE, Cochrane, BIOMED, PUBMED, PsycINFO, and EMBASE databases. Also the IEEE Digital Library was searched. No limitations were applied for the date of publication. Only articles written in English were taken into account. Collected publications went through a selection process. In the first step, publications were collected from major databases using a search query. In the second step, 3 reviewers independently selected publications on their title, using predefined selection criteria. In the third step, publications were judged based on their abstracts by the same reviewers, using the same selection criteria. In the fourth step, one reviewer made the final selection of publications based on complete content. Finally, 41 publications were included in the review, describing 17 studies involving 4 robot systems. Most studies reported positive effects of companion-type robots on (socio) psychological (eg, mood, loneliness, and social connections and communication) and physiological (eg, stress reduction) parameters. The methodological quality of the studies was, mostly, low. Although positive effects were reported, the scientific value of the evidence was limited. The positive results described, however, prompt further effectiveness research in this field. Copyright (C) 2012 - American Medical Directors Association, Inc.

23. Ben Mortenson W, Demers L, Fuhrer MJ, Jutai JW, Lenker J, DeRuyter F. How Assistive Technology Use by Individuals with Disabilities Impacts Their Caregivers A Systematic Review of the Research Evidence. *American Journal of Physical Medicine & Rehabilitation* 2012;91(11):984-998.

Mortenson WB, Demers L, Fuhrer MJ, Jutai JW, Lenker J, DeRuyter F: How assistive technology use by individuals with disabilities impacts their caregivers: a systematic review of the research evidence. *Am J Phys Med Rehabil* 2012;91:984-998. Informal caregivers are a critical yet frequently unacknowledged part of the healthcare system. It is commonly presumed that providing assistive technology will decrease the burden of their care pro-

vision; however, no review has evaluated the evidence behind this assumption. Therefore, a systematic review was undertaken to evaluate evidence of the impact of assistive technology use by care recipients on their informal caregivers. Data sources included EMBASE, MEDLINE, Cumulative Index to Nursing and Allied Health Literature, Web of Science, PsychINFO, PubMed, and active researchers in this area. Twenty-two studies met the specified inclusion criteria. Collectively, the findings suggest that assistive technology use helps caregivers by diminishing some of the physical and emotional effort entailed in supporting individuals with disability. However, confidence in this causal connection is limited because of the study designs that were used. This undermines the understanding of the impacts of assistive technology use on the users' informal caregivers.

24. Ben Mortenson W, Demers L, Fuhrer MJ, Jutai JW, Lenker J, DeRuyter F. Effects of an Assistive Technology Intervention on Older Adults with Disabilities and Their Informal Caregivers An Exploratory Randomized Controlled Trial. *American Journal of Physical Medicine & Rehabilitation* 2013;92(4):297-306.

Mortenson WB, Demers L, Fuhrer MJ, Jutai JW, Lenker J, DeRuyter F: Effects of an assistive technology intervention on older adults with disabilities and their informal caregivers: An exploratory randomized controlled trial. *Am J Phys Med Rehabil* 2013;92:297-306. Objective: The aim of this study was to demonstrate experimentally that an assistive technology (AT) intervention improves older AT users' activity performance and satisfaction with activity performance and decreases their caregivers' sense of burden. Design: This study was a delayed intervention, randomized control trial. Baseline data were collected on 44 community-dwelling AT user-caregiver dyads in Vancouver, British Columbia, and Montreal, Quebec. The primary outcome measures for AT users were the satisfaction and accomplishment scales from the Assessment of Life Habits. The primary outcome measure for caregivers was the Caregiver Assistive Technology Outcome Measure, which assessed burden associated with dyad-identified problematic activities. Results: After the intervention, assistance users in the immediate intervention group reported significantly increased satisfaction with activity performance ($P < 0.001$) and improved accomplishment scores ($P = 0.014$). Informal caregivers in the immediate intervention group experienced significantly decreased burden with the dyad-identified problematic activity ($P = 0.013$). Participants in the delayed intervention group experienced similar benefits after the intervention. Improvements for both groups were mostly maintained 4 mos after the conclusion of the intervention. Conclusions: This is the first experimental study to demonstrate that the provision of AT decreases caregiver burden. If confirmed and extended by subsequent research, the findings have significant policy and practice implications and may enable health care providers to advocate for improved access to AT provision and the related follow-up services.

25. Bendixen RM, Levy CE, Olive ES, Kobb RF, Mann WC. Cost effectiveness of a telerehabilitation program to support chronically ill and disabled elders in their homes. *Telemedicine Journal & E-Health* 2009;15(1):31-38.

Chronic illnesses account for approximately 75% of all healthcare costs in the United States today, resulting in functional limitations and loss of independence, as well as increased medical expenditures. The elderly population is at a higher risk for developing chronic conditions, increasing their risk for disabilities. Given the rapid growth of the aging population, and the chronic illnesses, disabilities, and loss of functional independence endemic to elders, novel methods of rehabilitation and care management are urgently needed.

Telehealth models that combine care coordination with communications technology offer a means for managing chronic illnesses, thereby decreasing healthcare costs. We examined the effects of a Veterans Administration (VA) telerehabilitation program (Low Activities of Daily Living [ADL] Monitoring Program-LAMP) on healthcare costs. LAMP is based on a rehabilitative model of care. LAMP patients received adaptive equipment and environmental modifications, which focused on self-care and safety within the home. LAMP Care Coordinators remotely monitored their patient's vital signs and provided education and self-management strategies for decreasing the effects of chronic illnesses and functional decline. The matched comparison group (MCG) received standard VA care. Healthcare costs 12 months pre-enrollment and 12 months post-enrollment were examined through a difference-in-differences multivariable model. Using actual costs totaled for these analyses, no significant differences were detected in post-enrollment costs between LAMP and the MCG. For LAMP patients, the provision of adaptive equipment and environmental modifications, plus intensive in-home monitoring of patients, led to increases in clinic visits post-intervention with decreases in hospital and nursing home stays.

26. Berkman P, Heinik J, Rosenthal M, Burke M. Supportive telephone outreach as an interventional strategy for elderly patients in a period of crisis. *Social Work in Health Care* 1999;28(4):63-76.

During the Gulf War in 1991 a telephone-based support system was established for elderly patients living at home in Israel. The study population involved 93 elderly patients (mean age 74), who had recently been discharged from hospital and were chosen for supervision by the Home-Care Unit of the Tel Aviv Sourasky Medical Center, Israel. Two different teams were involved with the telephone support calls: secretarial staff (nonprofessional team) and social workers (professional team). The research examined the characteristics of the study population and also included a comparison between the two groups of patients receiving the psycho-social support. The latter indicated that better results of outcome indices were achieved by the professional team. Further, this study demonstrated the feasibility of telephone-support outreach as an interventional strategy for psycho-social support for elderly patients at a time of crisis.

27. Blasco R, Marco A, Casas R, Cirujano D, Picking R. A smart kitchen for ambient assisted living. *Sensors* 2013;14(1):1629-1653.

The kitchen environment is one of the scenarios in the home where users can benefit from Ambient Assisted Living (AAL) applications. Moreover, it is the place where old people suffer from most domestic injuries. This paper presents a novel design, implementation and assessment of a Smart Kitchen which provides Ambient Assisted Living services; a smart environment that increases elderly and disabled people's autonomy in their kitchen-related activities through context and user awareness, appropriate user interaction and artificial intelligence. It is based on a modular architecture which integrates a wide variety of home technology (household appliances, sensors, user interfaces, etc.) and associated communication standards and media (power line, radio frequency, infrared and cabled). Its software architecture is based on the Open Services Gateway initiative (OSGi), which allows building a complex system composed of small modules, each one providing the specific functionalities required, and can be easily scaled to meet our needs. The system has been evaluated by a large number of real users (63) and carers (31) in two living labs in Spain and UK. Results show a large potential of system functionalities combined with good usability and physical, sensory and cognitive accessibility.

28. Boersma D, Thembani E, Mohtasahm Z, Demontiero O, Suriyaarachchi P, Suarez H, et al. Use of virtual reality for balance training in unsteady community-dwelling elderly fallers. *Journal of the American Geriatrics Society* 2010;58:S99-S100.

Introduction: Unsteadiness is considered an important risk factor for falls in elderly subjects. Despite its high prevalence, the therapeutic options for unsteadiness in elderly subjects are limited. **Objective:** To evaluate the effect of balance training using a virtual reality system reproducing environmental stimulation in unsteady community-dwelling elderly fallers. **Methods:** Twenty-two community-dwelling unsteady elderly subjects (mean age = 82 years) were treated for 6 weeks (2 sessions a week/30 minutes per session) at our Falls and Fractures Clinic using a balance rehabilitation unit, which is based on a virtual-reality system that changes sensory information/input (visual, vestibular, and somatosensory) to the patient. We assessed postural responses by posturography before and after 6 weeks in the vestibular rehabilitation program under two conditions: (1) standing, eyes open, static visual field and (2) standing, eyes open, dynamic visual field through virtual-reality goggles, generating horizontal optokinetic stimulation (70 degrees per second angular velocity). We recorded postural responses with a platform measuring the confidential ellipse of the center-of-pressure distribution area and sway velocity. Changes in gait parameters were assessed using a GaitRite walkway system. **Results:** After 6 weeks of treatment, postural response, confidential ellipse and sway velocity values were significantly lower (~ - 30%, $p < 0.05$) whereas limits of stability were significantly higher (~ 37%, $p < 0.01$) as compared with the initial assessment. These changes indicate a significant improvement in balance parameters. Additionally, gait velocity was significantly improved (50%, $p < 0.05$) after 6 weeks of balance retraining using our virtual reality system. **Conclusion:** Our data demonstrates the positive effect of a virtual reality system on markers of unsteadiness in elderly fallers. This study supports the possibility of treating elderly fallers with balance disorders using virtual-reality environmental stimulation. The effect of this intervention on falls prevention and the lasting effect in the long term are subjects of future studies.

29. Boons CC, van de Kamp K, Deeg DJ. Assistive technology and self-rated health in comparison with age peers: a longitudinal study in 55-64-year-olds. *Disabil Rehabil Assist Technol* 2014:1-7.

Abstract Purpose: To determine changes in self-rated health in comparison with age peers (SRH-AP) among 55-64-year-olds, as affected by (1) initiating, (2) ceasing, and (3) prolonging the use of assistive technology (AT). **Methods:** Data included two national cohorts of 55-64-year-olds from the Longitudinal Aging Study Amsterdam (total N = 1968), with baseline cycles in 1992-93 and 2002-03 and 3-year follow-ups. The effect of AT use on SRH-AP was studied in analyses of variance for repeated measurements, adjusting for age and self-reported disability. **Results:** Respondents using AT reported poorer SRH-AP than respondents not using AT. Over time disability increased for respondents prolonging and initiating AT use and decreased for respondents ceasing AT use. No major changes were seen in SRH-AP over time, except for a small improvement for respondents prolonging AT use. **Conclusions:** AT use had a negative influence on SRH-AP, but this influence subsided over time for prolonged AT use. Despite longitudinal changes in disability, there was a marked stability of SRH-AP over time which may be attributed to AT use. **Implications for Rehabilitation** Both the proportion of 55-64-year-olds using AT and the proportion reporting disability was significantly higher in the recent cohort as compared to the early cohort. 55-64-

Year-olds not using AT rated their health compared with age peers (SRH-AP) better than those using AT. 55-64-Year-olds who prolonged the use of AT reported the poorest ratings of SRH-AP, but also showed the clearest improvement in SRH-AP, suggesting that the initial negative influence of AT use on SRH-AP may subside over time.

30. Borg J, Larsson S, Ostergren P-O, Rahman ASMA, Bari N, Khan AHMN. User involvement in service delivery predicts outcomes of assistive technology use: A cross-sectional study in Bangladesh. *Bmc Health Services Research* 2012;12.

Background: Knowledge about the relation between user involvement in the provision of assistive technology and outcomes of assistive technology use is a prerequisite for the development of efficient service delivery strategies. However, current knowledge is limited, particularly from low-income countries where affordability is an issue. The objective was therefore to explore the relation between outcomes of assistive technology use and user involvement in the service delivery process in Bangladesh. **Methods:** Using structured interviews, data from 136 users of hearing aids and 149 users of manual wheelchairs were collected. Outcomes were measured using the International Outcome Inventory for Hearing Aids (IOI-HA), which was adapted for wheelchair users. Predictors of user involvement included preference, measurement and training. **Results:** Users reported outcomes comparable to those found in other high- and low-income countries. User involvement increased the likelihood for reporting better outcomes except for measurement among hearing aid users. **Conclusions:** The findings support the provision of assistive technology as a strategy to improve the participation of people with disabilities in society. They also support current policies and guidelines for user-involvement in the service delivery process. Simplified strategies for provision of hearing aids may be explored.

31. Bostrom M, Kjellstrom S, Bjorklund A. Older persons have ambivalent feelings about the use of monitoring technologies. *Technology and Disability* 2013;25(2):117-125.

BACKGROUND: As they age, older persons prefer to continue to live in their own homes. Sensors in the environment and/or bodily worn systems that monitor people might contribute to an increased sense of safety and security at home, but also raise concerns about the loss of privacy by surveillance. Little is known about how older persons, living at home independently and stating good health, perceive monitoring technology in terms of personal privacy. **OBJECTIVE:** to identify and describe how older persons, perceive monitoring technology in terms of personal privacy. **METHOD:** A qualitative study based on five focus group interviews was used. Concepts of freedom and surveillance were used as content areas in the data analysis. **RESULTS:** The results comprised three categories of ambivalence; independence vs. security, privacy vs. intrusion, and in the best interest of me vs. in the best interest of others. These three categories merged into the overarching theme maintaining a sense of self which illustrates a desire to maintain control of one's life as long as possible. **CONCLUSIONS:** Older persons generally have positive feelings and attitudes toward technology and strive to maintaining a sense of self as long as possible, by having control. They stated high value to privacy, but valued being watched over if it ensured security. To feel good and bad about monitoring technologies, rather than good or does not necessarily lead to feelings of conflict. 2013 - IOS Press and the authors. All rights reserved.

32. Bozoki A, Radovanovic M, Winn B, Heeter C, Anthony JC. Effects of a computer-based cognitive exercise program on age-related cognitive decline. *Archives of Gerontology & Geriatrics* 2013;57(1):1-7.

We developed a 'senior friendly' suite of online 'games for learning' with interactive calibration for increasing difficulty, and evaluated the feasibility of a randomized clinical trial to test the hypothesis that seniors aged 60-80 can improve key aspects of cognitive ability with the aid of such games. Sixty community-dwelling senior volunteers were randomized to either an online game suite designed to train multiple cognitive abilities, or to a control arm with online activities that simulated the look and feel of the games but with low level interactivity and no calibration of difficulty. Study assessment included measures of recruitment, retention and play-time. Cognitive change was measured with a computerized assessment battery administered just before and within two weeks after completion of the six-week intervention. Impediments to feasibility included: limited access to in-home high-speed internet, large variations in the amount of time devoted to game play, and a reluctance to pursue more challenging levels. Overall analysis was negative for assessed performance (transference effects) even though subjects improved on the games themselves. Post hoc analyses suggest that some types of games may have more value than others, but these effects would need to be replicated in a study designed for that purpose. We conclude that a six-week, moderate-intensity computer game-based cognitive intervention can be implemented with high-functioning seniors, but the effect size is relatively small. Our findings are consistent with Owen et al. (2010), but there are open questions about whether more structured, longer duration or more intensive 'games for learning' interventions might yield more substantial cognitive improvement in seniors. Copyright 2013 Elsevier Ireland Ltd. All rights reserved.

33. Bradley N, Poppen W. Assistive technology, computers and internet may decrease sense of isolation for homebound elderly and disabled persons. *Technology and Disability* 2003;15(1):19-25.

In an interesting twist to the initial fear that the access to internet would result in a more isolative community, the CHIPs program (Computers for Homebound and Isolated Persons) inspired an online community for individuals who were homebound. The subjects began to get to know one another through the Internet, thereby making virtual friends with others in similar circumstances. Elderly citizens, disabled individuals and caregivers found themselves with a new sense of camaraderie and friendship. A one-year follow up to a questionnaire indicates that the subjects' level of satisfaction in the amount of contact with others increased significantly. These results suggest that the intervention may cause significant changes in the lives of isolated individuals, a change worthy of more formalized research.

34. Brandt A, Iwarsson S, Stahle A. Older people's use of powered wheelchairs for activity and participation. *Journal of Rehabilitation Medicine* 2004;36(2):70-77.

Objective: The aims of this study were to investigate outcomes of older people's use of powered wheelchairs and risk factors for negative outcomes. Design: The study was a cross-sectional interview-study including 111 powered wheelchair users over 65 years of age. Results: All participants used their powered wheelchair in the summer; nearly all users regarded it as important and found that it gave them independence. The wheelchair made activity and participation possible for the users. The most frequent activity in the summer was going for a ride, and in the winter it was shopping. However, some

could not use the wheelchair for visits, and supplementary travel modes are called for. Users who could not walk at all or who could not transfer without assistance were more likely not to be able to carry out prioritized activities. Furthermore, other risk factors for negative outcomes and need for further research were identified. Conclusion: The use of powered wheelchairs is a relevant societal intervention in relation to older people with limited walking ability in order to make activity and participation possible. It is likely that a larger proportion of older people could benefit from this intervention, in particular if current practices are improved taking activity and participation outcomes into consideration.

35. Brandt A, Samuelsson K, Toytari O, Salminen AL. Activity and participation, quality of life and user satisfaction outcomes of environmental control systems and smart home technology: a systematic review. *Disability & Rehabilitation Assistive Technology* 2011;6(3):189-206.

OBJECTIVE: To examine activity and participation, quality of life, and user satisfaction outcomes of environmental control systems (ECSs) and smart home technology (SHT) interventions for persons with impairments.

METHOD: A systematic review. Seventeen databases, three conference proceedings, and two journals were searched without language or study design restrictions covering the period January 1993 - June 2009. Reviewers selected studies, extracted data, and assessed the methodological quality independently.

RESULT: Of 1739 studies identified, five effect studies and six descriptive studies were included. One study was on SHT and the remainder on ECS; functionalities were overlapping. The studies varied in most aspects, and no synthesis could be drawn. However, ECS/SHT tended to increase study participants' independence, instrumental activities of daily living, socialising, and quality of life. Two studies showed high user satisfaction. The level of evidence was regarded as low, mainly due to small study sizes, lacking confounder control, and a majority of descriptive studies.

CONCLUSION: Due to few and small studies and study diversity, it was not possible to determine whether ECS/SHT have positive outcomes for persons with impairment, even though the technologies seem to be promising. High quality outcomes studies such as randomised controlled trials, when feasible, and large longitudinal multi-centre studies are required.

36. Brandt Å, Alwin J, Anttila H, Samuelsson K, Salminen A-L. Quality of evidence of assistive technology interventions for people with disability: An overview of systematic reviews. *Technology & Disability* 2012;24(1):9-48.

This overview summarizes the available evidence from systematic reviews of outcomes studies on various assistive technologies (AT) for persons with disabilities. Systematic reviews published between January 2000 and April 2010 were identified by comprehensive literature searches. Study selection, data extraction and methodological quality evaluation were done by two authors independently. The quality of evidence was summarized by explicit methods. Types of disabilities, settings, and AT interventions were recorded. Outcomes were mapped according to the Taxonomy of Assistive Technology Device Outcomes. Forty-four systematic reviews were included in this overview. High-quality evidence was found in single AT (positive effects of providing AT in connection with home assessment and hearing aids, no effects of hip protectors) for limited populations (older people at home, people with hearing loss, and older people in institutional care, respectively). Low-quality or unclear evidence was found for the effectiveness of the other evaluated AT interventions. Current gaps in AT outcomes research were identified. Many frequently used devices have not been systematically reviewed. Well-

designed outcomes research to inform clinical decision-making is urgently needed. The systematic review methodology seems to be feasible for summarising AT outcomes research, but methodological development for grading and for primary studies is warranted.

37. Brown SH, Lewis CA, McCarthy JM, Doyle ST, Hurvitz EA. The effects of Internet-based home training on upper limb function in adults with cerebral palsy. *Neurorehabilitation & Neural Repair* 2010;24(6):575-583.

BACKGROUND: While adults with hemiplegic cerebral palsy (CP) can have significant upper limb dysfunction, the effects of movement-based training has not been investigated.

OBJECTIVE: This uncontrolled trial assessed the effects of a home and internet-based upper limb intervention program targeting motor and sensory function.

METHODS: Twelve adults, aged 21 to 57 yrs, GMFCS levels I-III with asymmetric upper limb involvement participated in the Upper Limb Training and Assessment (ULTrA) program. Clinical and functional measures included the Motor Activity Log (MAL), the Nine-Hole Peg test, and grip strength. An upper limb training system consisting of a laptop, webcam, target light board, and hand manipulation/ discrimination devices was installed in each participant's home. Training occurred 40 min/day, 5 days/wk for 8 wks and included both unilateral and bilateral reach movements as well as a series of hand sensorimotor tasks such as card turning, stereognosis, and tactile discrimination. Data generated during each session were transmitted to the laboratory via the Internet.

MAIN OUTCOME MEASURES: were movement time, interlimb delay time, and performance on hand sensorimotor tasks.

RESULTS: Following training, affected limb reach movement time decreased significantly for unilateral and bilateral tasks. Interlimb delay during sequential reaching also decreased. Significant improvement in hand manipulation tasks was also seen. Compliance was excellent and there were no adverse effects.

CONCLUSION: The ULTrA program had beneficial effects for adults with CP and is safe and convenient to use. This system contrasts sharply with programs with similar intent that require participant travel and hours of therapist-based intervention.

38. Brownsell S, Bradley D, Blackburn S, Cardinaux F, Hawley MS. A systematic review of lifestyle monitoring technologies. *Journal of Telemedicine & Telecare* 2011;17(4):185-189.

The evidence base for lifestyle monitoring is relatively weak, even though there are significant numbers of commercial installations around the world. We conducted a literature review to summarize the current position with regard to lifestyle monitoring based on sensors in the home. In total, 74 papers met the inclusion criteria. Only four papers reported trials involving 20 or more subjects, with a further 21 papers reporting trials involving one or more subjects. Most papers (n = 49) were concerned with technology development. Motion detection was the most common of the technologies employed, followed by door and electrical appliance usage. The predominant monitoring strategy was that of detecting changes in activity. However, little attention has been given to determining when or how changes in the profile of activity should be used to raise a call for assistance from a health or care professional. Lifestyle monitoring remains a relatively immature research area in which there is little detailed understanding of how to provide comprehensive and effective systems.

39. Bulat T, Rowe M, McKenzie B. Safe home: Technologies to support extended home care of veterans with dementia. *Journal of the American Geriatrics Society* 2013;61:S113.

Background: Individuals with dementia are at risk of getting lost or missing. Missing incidents are associated with high risk of injury or death, and nursing home (NH) placement due to increased caregiver burden/burnout. The purpose of this project was to support extended living at home for individuals with dementia by using technologies to improve safety/decrease caregiver burden. **Methods:** We identified technologies to improve home safety, evaluated installation challenges, developed algorithms for providers to identify targeted technologies and tested and modified them based on feedback. Participants were referred for evaluation by their primary providers (HBPC or PACT team). The SafeHome assessment was done and technologies installed a week later. Follow-up visits were done at 1 and 3 months. The caregivers (CG) completed questionnaires at each visit (CG vigilance and peace of mind). **Results:** We developed a set of algorithms for healthcare providers that address risks due to missing incidents, unsafe firearms, fire/CO poisoning, medication complexity, and unsupervised time. We enrolled 273 patient/CG pairs, conducted SafeHome assessment and provided technologies (bed occupancy sensors, bedside mats, in-bed pads, motion sensors (bedroom and driveway), cameras, enrollment in MedicAlert/Safe Return program, Project Lifesaver, medication pill boxes, smoke and CO alarms). There were no missing events during follow-up. We found a 37.5% relative risk reduction in NH placement (unadjusted) for veterans that were enrolled, when compared to historical control. On caregiver survey, we found improvement in all domains except sense of harmony. **Conclusion:** Our program improved the safety of individuals with dementia living in the community, improved caregiver peace of mind and decreased caregiver stress.

40. Burton M, Nieuwenhuijsen ER, Epstein MJ. Computer-related assistive technology: Satisfaction and experiences among users with disabilities. *Assistive Technology* 2008;20(2):99-106.

Many people with disabilities use assistive technology devices (ATDs) for computer access. The specific focus of this exploratory study was (a) to assess the experiences, opinions, and satisfaction levels of 24 individuals with disabilities using computer-related ATDs; (b) to investigate their awareness of health risk factors related to computer usage; and (c) to examine the psychosocial impact of computer-related ATDs on users. Data were collected via telephone interviews with 24 individuals with physical disabilities who had experience using one or more ATDs. The Quebec User Evaluation with Assistive Technology instrument was used to evaluate users' satisfaction with ATDs in a number of dimensions, including their physical attributes. The Psychosocial Impact of Assistive Devices Scale measured the psychosocial impact (i.e., independence, competence, and adequacy) of an ATD on users. Additional questions were posed to gather information about user's opinions and experiences. Training appeared to be an important component for ATD users, many of whom preferred a setting to try out devices rather than group or individual training. Respondents with visual impairments revealed a higher level of adaptability versus those without visual impairments ($p = .001$). Additional research is needed to develop specific survey items focused on users of computer-related ATDs and the evaluation of the psychosocial impact of ATDs on computer users.

41. Cahill S, Begley E, Faulkner JP, Hagen I. "It gives me a sense of independence" - Findings from Ireland on the use and usefulness of assistive technology for people with dementia. *Technology and Disability* 2007;19(2-3):133-142.

This work reports Irish data emerging from the ENABLE study which trialled assistive technologies in the homes of people with dementia across five European countries and assessed their use and usefulness. The aim of this paper is to report findings on i) whether new prototype technologies could be used and were considered useful by people with dementia and their primary caregivers, ii) whether any technical difficulties were experienced by families while trialling these products, iii) whether these technologies could be better refined, and (iv) whether these products would be financially viable on the open market. Findings showed that in general, most devices trialled were used and were considered useful by people with dementia. Apart from the night lamp, each of the other devices trialled was also used and considered useful by most primary caregivers. With the exception of the night lamp which was an entirely passive device, other devices often needed a carer present to remind the person with dementia to use the product. This occurred in about 50% of cases trialling the calendar, 33% trialling the telephone, and 80% trialling the locator. Caregivers were willing to pay most for devices which they considered useful and which required active participation, such as the picture telephone and the item locator. 2007 IOS Press. All rights reserved.

42. Cahill S, Begley E, Topo P, Saarikalle K, Macijauskiene J, Budraitiene A, et al. 'I know where this is going and I know it won't go back': hearing the individual's voice in dementia quality of life assessments. *Dementia* (14713012) 2004;3(3):313-330.

While it is generally agreed that any appraisal of quality of life should as far as possible rely on the individual's own perspective, having people with dementia evaluate their own quality of life remains a much-debated issue. This article reports findings from a longitudinal study (ENABLE) designed to examine the impact of assistive technology on persons with dementia and their family caregivers. The study's methodology sought to empower people with dementia by engaging them in the research process. Both quantitative and qualitative data on quality of life were collected from a sample of 92 persons with dementia before and after assistive technologies were introduced into their homes. This article presents preliminary baseline data on quality of life prior to when the home interventions (technologies) were introduced. Results demonstrate that people with dementia can competently participate in research on dementia and have more positive appraisals of their lives, roles and relationships than might be expected.

43. Calder C, McSherry D. Dementia technology initiative: preliminary evaluation report. Hamilton: South Lanarkshire Council; 2004.

Telecare has been defined as the 'use of information and communication technology (ICT) to help deliver health and social care directly to people in their own homes.' The purpose of telecare for people with dementia is to enable them to remain at home for as long as possible; managing risks, informing the care process, empowering independence. A range of devices and technologies are now commercially available which can make a difference to the life of people with dementia, and their carers. For example fall detectors, flood detectors and 'wandering' detectors can be used as single devices to reduce the risks of particular problems as these become apparent. This report

presents the findings of the preliminary evaluation of SMART Technology installed in the homes of 10 older people with dementia, living in South Lanarkshire.

44. Caligari M, Godi M, Guglielmetti S, Franchignoni F, Nardone A. Eye tracking communication devices in amyotrophic lateral sclerosis: Impact on disability and quality of life. *Amyotrophic Lateral Sclerosis and Frontotemporal Degeneration* 2013;14(7-8):546-552.

People with amyotrophic lateral sclerosis (PwALS) show progressive loss of voluntary muscle strength. In advanced disease, motor and phonatory impairments seriously hinder the patient's interpersonal communication. High-tech devices such as eye tracking communication devices (ETCDs) are used to aid communication in the later stages of ALS. We sought to evaluate the effect of ETCDs on patient disability, quality of life (QoL), and user satisfaction, in a group of 35 regular ETCD users in late-stage ALS with tetraplegia and anarthria. The following scales were administered: 1) the Individually Prioritized Problem Assessment (IPPA) scale, in three conditions: without device, with ETCD and, when applicable, with an Eye Transfer (ETRAN) board; 2) the Psychosocial Impact of Assistive Devices Scale (PIADS); and 3) the Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0). With ETRAN, IPPA showed an increase in communicative abilities with respect to the condition without device, but ETCD produced a further significant increase. PIADS evidenced a large increase of QoL, and QUEST 2.0 showed high user satisfaction with ETCD use. In conclusion, ETCDs should be considered in late-stage ALS with tetraplegia and anarthria, since in these patients they can reduce communication disability and improve QoL.

45. Cavallo F, Aquilano M, Arvati M, Odetti L, Carrozza MC. Toward a smart home solution for domiciliary assistance in Alzheimer's diseases. *Alzheimer's and Dementia* 2009;1:141.

Background: The number of people with Alzheimer in the European Union is estimated to be 5.8 million and is expected to double or treble by 2050. Alzheimer's patients should be constantly assisted or at home by caregivers or in nursing home by skilled workers. Some studies showed that a specific domiciliary care of Alzheimer's patients in initial stages of the syndrome can slow down the course of the illness. However, because of the complexity of this disease, these persons are early institutionalized in nursing home with negative consequences for patients themselves and welfare costs (nursing home costs three time the domiciliary one). In order to increase quality and time of domiciliary cares, innovative technologies, integrated in patients' domestic environments, and assistance to caregivers are crucial to perform a sterling service. The present study shows a smart domestic sensors network to help caregivers in patient monitoring and avoiding unsafe events. **Methods:** A multidisciplinary work-team consisting of clinicians, psychologists, therapists and engineers identified the potential patients to involve in the experimentation. Patients and their caregivers were interviewed to point out their life styles, habits, needs and features of their houses. The interventions and the technological solutions to be provided to subjects were defined and then developed and evaluated with a custom protocol to highlight their usability and acceptability by patients and caregivers. **Results:** A smart domestic system was produced with a ZigBee wireless sensor network (ZWSN), assistive devices and software tools. The ZWSN is composed of a coordinator to process data sensors, identify patient's activities and send warning to caregiver if request, and of sensor nodes (beds/chairs, posture, location) and out-

door/indoor alert systems (microGSM, buzzer). A drug dispenser, an advanced phone and a fingerprint recognition sensor for cabinets and water/gas valves security were also included. Software tools were developed for cognitive stimulation and for outdoor localization through GPS technology and GoogleMaps website to pick patient up when he/she gets lost. Conclusions: The preliminary experiments showed that the system is suitable and reliable for patients' assistance and caregivers' workload reduction and highlights that it is also particularly appropriate for assistance in nursing home.

46. Charters E, Gillett L, Simpson GK. Efficacy of electronic portable assistive devices for people with acquired brain injury: A systematic review. *Neuropsychol Rehabil* 2014;1-40.

A systematic review was conducted to evaluate the efficacy of electronic portable assistive devices (EPADs) for people with acquired brain injury. A systematic database search (OVID, CINAHL) found 541 citations published between 1989 and the end of 2012. A total of 23 reports met the inclusion/exclusion criteria, namely intervention studies (group, n-of-1) testing the efficacy of EPADs as compensatory devices for cognitive impairment for people with acquired brain injury aged 16-65 years. Study quality was rated by the PEDro (Physiotherapy Evidence Database) scale, (randomised controlled trials), the Downes and Black tool (other group intervention studies), and the Single Case Experimental Design tool (single participant studies). Levels of evidence were determined using five levels of classification based on the Spinal Cord Injury Rehabilitation Evidence table. Results found no Level 1 studies (RCTs with PEDro score ≥ 6), four Level 2 studies and 10 Level 3 studies. There was insufficient evidence to recommend any practice standards, but sufficient evidence to recommend the use of electronic reminder systems in supporting the everyday functioning of people with acquired brain injury as a practice guideline. Higher quality studies are required to support a broader range of compensatory roles that EPADs have the potential to play in neurorehabilitation and the long-term support of people with acquired brain injury.

47. Chase CA, Mann K, Wasek S, Arbesman M. Systematic Review of the Effect of Home Modification and Fall Prevention Programs on Falls and the Performance of Community-Dwelling Older Adults. *American Journal of Occupational Therapy* 2012;66(3):284-291.

This systematic review explored the impact of fall prevention programs and home modifications on falls and the performance of community-dwelling older adults. It was conducted as part of the American Occupational Therapy Association's Evidence-Based Practice Project. Thirty-three articles were analyzed and synthesized. The strongest results were found for multifactorial programs that included home evaluations and home modifications, physical activity or exercise, education, vision and medication checks, or assistive technology to prevent falls. Positive outcomes included a decreased rate of functional decline, a decrease in fear of falling, and an increase in physical factors such as balance and strength. The strength of the evidence for physical activity and home modification programs provided individually was moderate. Implications for practice, education, and research are also discussed.

48. Cheatham LP. Effects of Internet use on well-being among adults with physical disabilities: A review. *Disability and Rehabilitation: Assistive Technology* 2012;7(3):181-188.

Purpose: The current review provides a summarized synthesis and evaluation of studies addressing the effects of Internet use on well-being among adults (19-64 years old) with physical disabilities. **Methods:** Potential studies were identified through search of electronic bibliographic databases. Outcome studies were chosen for initial review if the study (1) involved a randomized controlled trial, a quasi-experimental, or a pre-experimental design, (2) appeared in the English language, (3) was published in a scholarly journal, and (4) was published before April, 2011. Applying these criteria, the search yielded 6762 studies, six of which were retained for review. **Results:** Current evidence with which to evaluate the effects of Internet use on well-being of adults with physical disabilities is sparse. Three of the studies found positive associations between Internet use and measures of well-being, while the remaining three studies found no statistically significant differences in well-being related to Internet use. **Conclusions:** Based upon the studies reviewed, conclusive statements regarding the presence or absence of these relationships are unfounded and premature. Positive relationships detected between Internet and well-being within samples of individuals with physical disabilities, however, do warrant further attention of researchers and indicate a need for studies employing heightened methodological rigor. **Implications for Rehabilitation .** The Internet presents a myriad of opportunities for individuals with physical disabilities to increase quality of life and well-being, including access to vital health information, social networking, education, and accessible employment. . Inconclusive findings within this review indicate that, while Internet use is associated with increased well-being within three of the six identified studies, further research is needed in effort to evaluate the clinical and social significance of Internet use as a means to improve well-being among persons with physical disabilities. Adapted from the source document.

49. Chen WL, Liou AH, Chen SC, Chung CM, Chen YL, Shih YY. A novel home appliance control system for people with disabilities. *Disability & Rehabilitation Assistive Technology* 2007;2(4):201-206.

PURPOSE: This research proposed an eyeglass-type infrared-based home appliance control system for spinal cord injured (SCI) with tetraplegia.

METHOD: This system is composed of four major components: A headset, an infrared transmitting module, an infrared receiving/signal-processing module, and a main controller, the Intel-8951 microprocessor. This design concept was based on the use of an infrared remote module fastened to the eyeglasses that could allow the convenient control of the input motion on the keys of a remote controller of a home appliance which are all modified with infrared receiving/signal-processing modules. For system evaluation, 12 subjects (4 male, 8 female, 26- 47-years-old were recruited. Six persons without disabilities were in the control group and 6 with SCI with tetraplegia formed the experimental group.

RESULTS: The average accuracy of the control group and the experimental group are 88.8 +/- 10.6% and 85.9 +/- 14.3%, respectively. The average time cost of the control group and the experimental group are 57.2 +/- 8.1 sec and 66.6 +/- 12.3 sec, respectively. An independent t-test revealed that the differences in the average accuracy and the average time cost of the control group and the experimental group are not significant ($p > 0.05$).

CONCLUSIONS: Using the novel home appliance control system not only provided the advantages of convenience, accuracy and sanitation for people with disabilities but it also helped them to live more independently.

50. Damant J, et al. The impact of ICT services on perceptions of the quality of life of older people. *Journal of Assistive Technologies* 2013;7(1).

This article reports the results of the impact of the information and communication technology (ICT) platform and telecare services developed by the MonAMI consortium on the quality of life (QOL) of older people in three European communities. The technology consisted of alarms, home monitoring and control, reminder services and entertainment services. In a three-month trial, the MonAMI technology was installed in the homes of older people with various needs, in the cities of Stockholm, Sweden; Zaragoza, Spain; and Kosice, Slovakia. Evaluation criteria and instrumentation were developed to assess the effects of the services on users' perceived QOL in the domains of independence, physical health, psychological wellbeing, social networking, and physical environment. A total of 62 users, with a mean age of 79 years, participated in the trial. Results demonstrate that the MonAMI services had some positive, significant effects on users' QOL. For instance, users with a higher number of disabilities at baseline reported greater confidence in keeping intruders from entering their home compared to users with fewer disabilities. However, overall findings show that healthier, more independent users perceived more benefits from the services compared to users who report more health problems and are less independent. The paper highlights some of the methodological challenges of evaluating ICT-based care services in a community setting. Limitations of the research are identified as size of the sample group, which was the small, heterogeneous sample of users and the fact that they were observed over a short time span.

51. Daniel K. Wii-hab for pre-frail older adults. *Rehabilitation Nursing Journal* 2012;37(4):195-201.

PURPOSE: To examine the effectiveness of a novel intervention aimed at decreasing indices related to frailty through systematic, Progressive Functional Rehabilitation (PFR).

METHODS: Pre-frail volunteers were recruited to participate in a 15 week exercise intervention or control group. Those who met study criteria and consented were randomized into one of three groups: control, seated exercise, or Wii() -fit. Test measures were completed before and after the 15 week intervention period on all participants. Measures included: Senior Fitness Test, Body Weight, Balance Efficacy Scale, CHAMPS, Late-Life Function and Disability Index, MOS SF-36. Attendance was also recorded.

RESULTS: There were improvements on several of the measures included in the Senior Fitness Test including chair stands, arm curls, step 2, six minute walk, sit and reach, and the timed up and go. A few participants did lose weight. All of the differences reflected improved physical functional status in the seated exercise or Wii-fit groups compared with the control group.

DISCUSSION: Increased physical activity was beneficial for all who participated. There were improvements in physical performance scores on several of the measures on the senior fitness test in both the seated exercise and Wii-fit groups. Participants in the Wii-fit group also showed improvement in their reported caloric expenditure and balance confidence.

CONCLUSION: This pilot study suggests a rehabilitation effect that was similar to the effect of community based senior fitness classes. A home video game console system with weight vest could be an effective alternative for pre-frail senior adults to group exercise classes. 2012 Association of Rehabilitation Nurses.

52. de Joode E, van Heugten C, Verhey F, van Boxtel M. Efficacy and usability of assistive technology for patients with cognitive deficits: a systematic review. *Clinical Rehabilitation* 2010;24(8):701-714.

Objective: To determine the efficacy of portable electronic aids such as personal digital assistants (PDAs), pagers or mobile phones for patients with

cognitive deficits by means of a systematic review. The usability of these aids is also briefly discussed. Data sources: PubMed, CINAHL, PsychINFO, EMBASE and MEDLINE were searched up to February 2009. The references of identified and relevant articles were scanned to find additional relevant titles. Review methods: Papers referring to 'electronic aids', 'cognition' and 'brain injury' were included. The population had to be adult and have cognitive impairments as a result of acquired brain injury. Outcome measures were change in cognitive or occupational performance or the level of participation in daily life. The criteria of Cicerone et al. were used to evaluate the quality of the retrieved studies. Results: Twenty-eight papers presenting 25 studies were reviewed. The total number of participants was 423. Most identified papers described case reports or non-randomized clinical trials. Only one randomized controlled trial was identified, in which the NeuroPage proved effective in supporting prospective memory. Other kinds of assistive technology such as PDAs and voice recorders showed positive results in supporting retrospective and prospective memory. Conclusion: The efficacy of assistive technology in general is not yet sufficiently studied in randomized controlled trials, although promising results has been reported. Furthermore, several survey studies established that both potential users and clinicians have optimistic expectations about the usability of assistive technology.

53. de Klerk MM, Huijsman R. [Effects of technical aids on the utilization of professional care. A study among single 75-year olds]. *Tijdschrift voor Gerontologie en Geriatrie* 1996;27(3):105-114.

In this paper we describe the results of a project, in which occupational therapists visited 83 independently living, single, elderly people (clients of organisations providing care) and advised them about technical aids. Subsequently some technical aids were provided. The intervention group received, on average, three out of five advised technical aids. The effect of this intervention was an increase in the use of technical aids (people used, on average, two technical aids more at the end of the project), which means that the provided technical aids were being used. This effect was stronger in the group of the 75-84 old persons than in the above 85 year old ones. This effect led to a change in people's attitudes towards technical aids: at the beginning of the project 80% of the elderly believed technical aids could help them to remain independent and at the end this percentage was 90%. There was a slight, non-significant, decrease in the number of hours home help (from 5,4 to 4,7 hours per week). However, we were unable to ascertain an effect on the percentage of elderly using community care or waiting for institutional care. This may have been due to the heterogeneity of the intervention, the small research population and the relatively short intervention period. Elderly should be assessed as being in need of technical aids at an earlier stage.

54. De Leo D, Carollo G, Dello Buono M. Lower suicide rates associated with a Tele-Help/Tele-Check service for the elderly at home. *American Journal of Psychiatry* 1995;152(4):632-634.

OBJECTIVE: The authors' goal was to determine the impact on suicidal behavior of Tele-Help/Tele-Check, a telephone service designed to provide elderly people with home assistance. Tele-Help is an alarm system that the client can activate to call for help; in Tele-Check the client is contacted about twice a week for assessment of needs and for emotional support.

METHOD: The authors determined the number of suicides among 12,135 elderly subjects who were connected to the Tele-Help/Tele-Check service in the Veneto region of Italy from Jan. 1, 1988, to Dec. 31, 1991, and compared it with the suicide rate for the general population in the Veneto region.

RESULTS: Only one death by suicide was found in the elderly subjects connected to Tele-Help/Tele-Check, compared with the expected number of 7.44 for the general population (standardized mortality ratio = 13.44%).

CONCLUSIONS: Since many of the traditional risk factors for suicide were concentrated in the elderly subjects studied, the Tele-Help/Tele-Check service appears to provide support of great interest for the prevention of suicide in the elderly.

55. Demers L, Fuhrer MJ, Jutai JW, Scherer MJ, Pervieux I, DeRuyter F. Tracking mobility-related assistive technology in an outcomes study. *Assistive Technology* 2008;20(2):73-83.

The objective of this follow-up study was to describe changes in the mobility-related assistive technology devices (ATDs) that are used from shortly after discharge from a hospital setting until 5-6 months later. One hundred and thirty-nine participants who had one or more mobility ATDs (canes, crutches, walkers, and wheelchairs) that had been recommended during hospitalization were interviewed an average of 5.5 weeks after discharge and an average of 23.2 weeks later. Information about mobility ATD usage was obtained by questionnaire during face-to-face interviews. The SF-36 was used to assess perceived health status, both physical and mental, as an additional outcome. Results show that at follow-up, only 23.3% of participants were using the ATD provided at baseline as their primary aid. Seven distinct groups of participants were noted based on individual experience with ATD use from the time of discharge to follow-up. Those groups varied according to continued versus discontinued use of an ATD, single versus multiple ATD use across time, and primary versus secondary importance attributed to the ATD. The groups also differed in terms of their differential association with rehabilitation diagnosis, age, as well as physical and mental perceived health status. The findings have implications for designing ATD outcome studies and for interpreting the relationship of ATD outcomes to other variables. The information about changes in mobility-related ATDs can also help rehabilitation specialists at the point of device referral target their patients for interventions that will either increase their adherence to device prescriptions or support nondevice strategies for managing disabilities.

56. Demiris G. Privacy and social implications of distinct sensing approaches to implementing smart homes for older adults. *Conference Proceedings: Annual International Conference of the IEEE Engineering in Medicine & Biology Society* 2009;2009:4311-4314.

Two distinct approaches to smart home design, namely Distributed Direct Sensing (DDS) and Infrastructure Mediated Sensing (IMS), have distinguishing features and implications resulting from their implementation. These two distinct smart home approaches have not been directly compared pertaining to their technical performance or their acceptance by the end users. It is also unclear what the perceived privacy and obtrusiveness concerns are when it comes to the implementation of these two different approaches in homes. The study presented here aimed to evaluate acceptance of these two sensing approaches by older adults and assess the perceived privacy and obtrusiveness concerns and ultimately define their social implications.

57. Demiris G, Hensel BK. Technologies for an aging society: a systematic review of "smart home" applications. *Yearbook of Medical Informatics* 2008:33-40.

OBJECTIVES: A "smart home" is a residence wired with technology features that monitor the well-being and activities of their residents to improve overall quality of life, increase independence and prevent emergencies. This type

of informatics applications targeting older adults, people with disabilities or the general population is increasingly becoming the focus of research worldwide. The aim of this study was to provide a comprehensive review of health related smart home projects and discuss human factors and other challenges.

METHODS: To cover not only the medical but also the social sciences and electronics literature, we conducted extensive searches across disciplines (e.g., Medline, Embase, CINAHL, PsycINFO, Electronics and Communications Abstracts, Web of Science etc.). In order to be inclusive of all new initiatives and efforts in this area given the innovativeness of the concept, we manually searched for relevant references in the retrieved articles as well as published books on smart homes and gerontechnology.

RESULTS: A total of 114 publications (including papers, abstracts and web pages) were identified and reviewed to identify the overarching projects. Twenty one smart home projects were identified (71% of the projects include technologies for functional monitoring, 67% for safety monitoring, 47% for physiological monitoring, 43% for cognitive support or sensory aids, 19% for monitoring security and 19% to increase social interaction). Evidence for their impact on clinical outcomes is lacking.

CONCLUSIONS: The field of smart homes is a growing informatics domain. Several challenges including not only technical but also ethical ones need to be addressed. [References: 31]

58. Demiris G, Hensel BK, Skubic M, Rantz M. Senior residents' perceived need of and preferences for "smart home" sensor technologies. *International Journal of Technology Assessment in Health Care* 2008;24(1):120-124.

Objectives: The goal of meeting the desire of older adults to remain independent in their home setting while controlling healthcare costs has led to the conceptualization of "smart homes." A smart home is a residence equipped with technology that enhances safety of residents and monitors their health conditions. The study aim is to assess older adults' perceptions of specific smart home technologies (i.e., a bed sensor, gait monitor, stove sensor, motion sensor, and video sensor). **Methods:** The study setting is TigerPlace, a retirement community designed according to the Aging in Place model. Focus group sessions with fourteen residents were conducted to assess perceived advantages and concerns associated with specific applications, and preferences for recipients of sensor-generated information pertaining to residents' activity levels, sleep patterns and potential emergencies. Sessions were audio-taped; tapes were transcribed, and a content analysis was performed. **Results:** A total of fourteen older adults over the age of 65 participated in three focus group sessions. Most applications were perceived as useful, and participants would agree to their installation in their own home. Preference for specific sensors related to sensors' appearance and residents' own level of frailty and perceived need. Specific concerns about privacy were raised. **Conclusions:** The findings indicate an overall positive attitude toward sensor technologies for nonobtrusive monitoring. Researchers and practitioners are called upon to address ethical and technical challenges in this emerging domain.

59. Demiris G, Oliver DP, Dickey G, Skubic M, Rantz M. Findings from a participatory evaluation of a smart home application for older adults. *Technology & Health Care* 2008;16(2):111-118.

The aim of this paper is to present a participatory evaluation of an actual "smart home" project implemented in an independent retirement facility. Using the participatory evaluation process, residents guided the research team through development and implementation of the initial phase of a

smart home project designed to assist residents to remain functionally independent and age in place. We recruited nine residents who provided permission to install the technology in their apartments. We conducted a total of 75 interviews and three observational sessions. Residents expressed overall positive perceptions of the sensor technologies and did not feel that these interfered with their daily activities. The process of adoption and acceptance of the sensors included three phases, familiarization, adjustment and curiosity, and full integration. Residents did not express privacy concerns. They provided detailed feedback and suggestions that were integrated into the redesign of the system. They also reported a sense of control resulting from their active involvement in the evaluation process. Observational sessions confirmed that the sensors were not noticeable and residents did not change their routines. The participatory evaluation approach not only empowers end-users but it also allows for the implementation of smart home systems that address residents' needs.

60. Dicianno BE, Gaines A, Collins DM, Lee S. Mobility, Assistive Technology Use, and Social Integration Among Adults with Spina Bifida. *American Journal of Physical Medicine & Rehabilitation* 2009;88(7):533-541.

Objective: Many individuals with spina bifida have impairments that limit mobility and functional independence. Sedentary lifestyles and social isolation are very prevalent. This study evaluated the association between the use of mobility devices and degree of socialization. **Design:** A retrospective chart review was performed on 208 adults with spina bifida attending a university-based clinic. Data collected included the Craig Handicap Assessment Reporting Technique-Short Form, Beck Depression Inventory, and data on wheelchair and other assistive technology use. We hypothesized that community and home mobility and social integration, as measured by the Craig Handicap Assessment Reporting Technique-Short Form, would be lower for manual and power wheelchair users than for ambulators, regardless of depression scores or shunt history. **Results:** We found that individuals with spina bifida who used both manual and power wheelchairs do have lower daily home and community activity levels compared with ambulators, but that most individuals with spina bifida have low social integration and economic self-sufficiency scores, regardless of whether they can ambulate or use wheelchairs. These findings were not explained by wheelchair quality because most were prescribed high-quality devices. A high prevalence of depression was also found. **Conclusions:** Special considerations for wheelchair provision are discussed. Additional research is needed to identify other barriers to social integration.

61. Dillahunt-Aspillaga C, Rugs D, Martinez K. Department of veterans affairs smart home 2: Extending smart home technology for cognitively impaired veterans to delay institutionalization. *Brain Injury* 2014;28 (5-6):552.

Objectives: The Smart Home (SH) technology developed at the Tampa James A. Haley Veteran's Hospital's Polytrauma Transitional Rehabilitation Programme (PTRP) uses a precise indoor tracking technology to monitor Veterans' activities. SH technology provides time- and location-dependent Activities of Daily Living (ADL) prompting [1]. The use of SH technology has been expanded to individual Veterans' homes in the Tampa Bay area to support ADL's, maintain independence and reduce caregiver burden and the likelihood of institutionalization. **Methods:** Veteran participants with mild-to-moderate cognitive impairments were selected based upon eligibility criteria. Systematic home and Veteran assessments were conducted to determine technology needs of Veterans and their caregivers. Based on the assessments,

in-home technologies were installed to maximize freedom, promote independence and increase safety for Veterans. The Ultra Wide Band (UWB) Real-time Location System (RTLS) assigned a unique identifier to each Veteran and caregiver. The technology continuously and objectively monitored and documented Veterans' behaviours in their environments. Results: Outcome measures collected by the in-home SH technology include: (a) frequency and context of memory cuing, navigational assistance and environmental safety cues, (b) frequency, location and duration of caregiver and therapeutic interactions, (c) frequency of safety risk encounters and (d) progress in achieving individual rehabilitation goals. Data reports were generated for Veterans and caregivers to assist them in recognizing achievements and identifying goals for further improvement. Clinician reports provided documentation for assessing and charting progress of the Veteran. Changes in caregiver burden were measured using the Perceived Change Index tool. Caregiver and Veteran satisfaction with Technology was measured through a modified Technology Acceptance Model (TAMs) instrument. Conclusions: Smart Home technology is an integral tool for supporting the transition of Veterans with cognitive impairments to their homes and into the community. Extending the successful PTRP SH to a home-based population, where a current gap in services exists, aligns with the goals of (Patient Aligned Care Teams) PACT model of team-based, patient-centred care for enhanced access to care, through cutting-edge technology. Immediate integration of SH technology will reinforce the use of compensatory strategies early in recovery, aiding in the success of the rehabilitation process. The material presented herein is based upon work supported by the Department of Veterans Affairs, Veterans Health Administration, Office of Patient Centred Care and Cultural Transformation T-21 Innovation grant awarded to Steven Scott and Jan Jasiewicz in 2010 and the Office of Geriatric and Extended Care Non-Institutional Long Term Care (NILTC) T-21 grant awarded to Jan M. Jasiewicz in 2011-2013.

62. Dorey B, Reid D, Chiu T. Stroke survivors' experiences of computer use at home. *Technology and Disability* 2007;19(4):179-188.

Using computers can lead to increased independence and an improved social network for stroke survivors. However, little is known about how and why stroke survivors are using computers at home and the barriers they encounter. The objective of this study was to gain an understanding about the experiences of stroke survivors using home computers, including the reasons stroke survivors use the computer, how patterns of computer use have changed post-stroke and any barriers or enablers to computer use. A modified grounded theory approach was utilized. In-depth interviews and observations with six stroke survivors were conducted. The constant comparison method was used to analyze the data. Two main themes emerged from the data: connected through doing and occupational tensions and strategies. The first theme refers to the reasons why and what purposes the computer was used for, and the meaning of computer use, while the second theme highlights barriers to access to computer use and the attempts to overcome difficulties. The results of this preliminary study shed light on stroke survivors' use of computers at home, which may help guide occupational therapists working with this population. 2007 IOS Press. All rights reserved.

63. Duque G, Boersma D, Loza-Diaz G, Hassan S, Suarez H, Geisinger D, et al. Effects of balance training using a virtual-reality system in older fallers. *Clinical Interventions In Aging* 2013;8:257-263.

Poor balance is considered a challenging risk factor for falls in older adults. Therefore, innovative interventions for balance improvement in this population are greatly needed. The aim of this study was to evaluate the effect of a new virtual-reality system (the Balance Rehabilitation Unit [BRU]) on balance, falls, and fear of falling in a population of community-dwelling older subjects with a known history of falls. In this study, 60 community-dwelling older subjects were recruited after being diagnosed with poor balance at the Falls and Fractures Clinic, Nepean Hospital (Penrith, NSW, Australia). Subjects were randomly assigned to either the BRU-training or control groups. Both groups received the usual falls prevention care. The BRU-training group attended balance training (two sessions/week for 6 weeks) using an established protocol. Change in balance parameters was assessed in the BRU-training group at the end of their 6-week training program. Both groups were assessed 9 months after their initial assessment (month 0). Adherence to the BRU-training program was 97%. Balance parameters were significantly improved in the BRU-training group ($P < 0.01$). This effect was also associated with a significant reduction in falls and lower levels of fear of falling ($P < 0.01$). Some components of balance that were improved by BRU training showed a decline after 9 months post-training. In conclusion, BRU training is an effective and well-accepted intervention to improve balance, increase confidence, and prevent falls in the elderly.

64. Elliot AJ, Mooney CJ, Douthit KZ, Lynch MF. Predictors of Older Adults' Technology Use and Its Relationship to Depressive Symptoms and Well-being. *Journals of Gerontology Series B-Psychological Sciences & Social Sciences* 2014;69(5):667-677.

OBJECTIVE: To extend the empirical evidence regarding the predictors of older adults' use of information and communications technology (ICT) and to further examine its relationship to depressive symptoms and well-being. **METHOD:** This cross-sectional study utilized a sample of community-dwelling older adults from the National Health and Aging Trends Study ($N = 6,443$). Structural equation modeling was used to estimate the effects of predictor variables on ICT use and the effects of use on depressive symptoms and well-being. Tests of moderation by demographic characteristics and level of ICT use were also performed.

RESULTS: Socioeconomic status (SES), age, and cognitive function accounted for approximately 60% of the variance in ICT use. SES was a stronger predictor for Blacks/African Americans, whereas cognitive function was a stronger predictor for Whites. ICT use was unrelated to depressive symptoms or well-being. However, it acted as a moderator, such that limitations in activities of daily living (ADLs) was a stronger predictor of depressive symptoms for high ICT users, whereas ill-health was a stronger predictor for non/limited users.

DISCUSSION: Findings do not support the claim that ICT use directly enhances mental health or well-being among older adults although it may protect against depressive symptoms for individuals coping with health conditions other than ADL impairments. The Author 2013. Published by Oxford University Press on behalf of The Gerontological Society of America. All rights reserved. For permissions, please e-mail: journals.permissions@oup.com.

65. Esculier JF, Vaudrin J, Beriault P, Gagnon K, Tremblay LE. Home-based balance training program using the Wii and the Wii Fit for Parkinson's disease. *Movement Disorders* 2011;26:S125-S126.

Objective: To create and evaluate the effectiveness of a home-based balance exercise program using the Wii console and Wii Fit balance board with medicated moderate PD subjects. **Background:** PD increases risks of falling by impairing balance. While dopa therapy has no positive effect on balance, several studies have shown that an exercise program, (conventional and visual feedback enhanced program) help to increase balance and prevent falls in PD individuals. The Wii console and Wii Fit game using the balance board are new generation's tools promoting pleasant and low cost home-based training environment and encouraging sustained participation. **Methods:** 21 subjects, (11 PD, (61.9611yrs) and 9 healthy elderly, (HS) (63.56 12 yrs)) participated in this study. Data from three evaluations sessions, (pre, 3 and 6 wks) measured static and dynamic balance, (Tinetti's performance oriented mobility assessment, (POMA), Community balance and mobility scale, (CBM), unipodal stance duration, displacement of center of pressure with a force platform, (COP) and Activities-specific balance confidence scale, (ABC)), limits of stability, (forward and lateral reach test, (FRT and LRT)) and functional performance, (Time up and Go test, (TUG), Sit-to-stand test, (STST) and 10-meters walking test). The balance training consisted of a 6 weeks home-based specific training, (8 activities) using the Wii and Wii Fit game for 45 minutes at 3 days per week for both groups. **Results:** PD subjects significantly improved their results to several tests: POMA by 12%, CBM by 23.4%, unipodal stance by 64.5%, COP by 25%, ABC by 7.5%, FRT by 10%, LRT by 15.6%, TUG by 19%, STST by 41.1% and 10-meters waking test by 19%. HS also improved in a lesser extent: POMA by 3%, (ns), CBM by 9.5%, unipodal by 79.2%, COP by 5.5%, (ns), ABC -2.6%, (ns), FRT by 11% (ns), LRT by -6%, (ns), TUG by 17%, STST by 26.5% and 10-meters walking test by 5.5%. **Conclusions:** These results show that a home-based balance exercise program for PD could be beneficial and probably reduce risks of falling by improving balance, limits of stability and functional performance. This experimental setting provides an excellent visual feedback cueing and fitness solicitation by a form of virtual reality. The Wii and Wii Fit could represent good tools to supplement neuro-rehabilitation programs for PD by training at home.

66. Esculier JF, Vaudrin J, Beriault P, Gagnon K, Tremblay LE. Home-based balance training programme using Wii Fit with balance board for Parkinson's disease: a pilot study. *Journal of Rehabilitation Medicine* 2012;44(2):144-150.

OBJECTIVES: To evaluate the effects of a home-based balance training programme using visual feedback (Nintendo Wii Fit game with balance board) on balance and functional abilities in subjects with Parkinson's disease, and to compare the effects with a group of paired healthy subjects.

SUBJECTS: Ten subjects with moderate Parkinson's disease and 8 healthy elderly subjects.

METHODS: Subjects participated in a 6-week home-based balance training programme using Nintendo Wii Fit and balance board. Baseline measures were taken before training for the Sit-to-Stand test (STST), Timed-Up-and-Go (TUG), Tinetti Performance Oriented Mobility Assessment (POMA), 10-m walk test, Community Balance and Mobility assessment (CBM), Activities-specific Balance and Confidence scale (ABC), unipodal stance duration, and a force platform. All measurements were taken again after 3 and 6 weeks of training.

RESULTS: The Parkinson's disease group significantly improved their results in TUG, STST, unipodal stance, 10-m walk test, CBM, POMA and force platform at the end of the 6-week training programme. The healthy subjects group significantly improved in TUG, STST, unipodal stance and CBM.

CONCLUSION: This pilot study suggests that a home-based balance programme using Wii Fit with balance board could improve static and dynamic

balance, mobility and functional abilities of people affected by Parkinson's disease.

67. Essen A. The two facets of electronic care surveillance: an exploration of the views of older people who live with monitoring devices. *Social Science & Medicine* 2008;67(1):128-136.

Scholars are increasingly questioning the notion that electronic surveillance merely constrains individuals' liberty and privacy. However, illustrations of alternative perspectives are few and there is a need for empirical research exploring the actual experience of surveilled subjects. This study, carried out in Sweden, seeks to offer a nuanced account of how senior citizens experience electronic care surveillance in relation to their privacy. It is based on in-depth interviews with 17 seniors who have participated in a telemonitoring project and who have experience of being continuously activity monitored in their own homes. The findings suggest that senior citizens can perceive electronic care surveillance as freeing and as protecting their privacy, as it enables them to continue living in their own home rather than moving to a nursing home. One individual, however, experienced a privacy violation and the surveillance service was interrupted at her request. This illustrates the importance of built-in possibilities for subjects to exit such services. In general, the study highlights that e-surveillance can be not only constraining but also enabling. Hence, it supports the view of the dual nature of surveillance. The study also illustrates the agency of the surveilled subject, extending the argument that various agents actually participate in the construction of surveillance practices. It analyzes the indirect role and responsibility of the surveilled subject, and thereby questions the traditional roles ascribed to the agents and targets of surveillance.

68. Evans N, Hillman M, Orpwood R. The role of user evaluation in designing robotics. *British Journal of Therapy & Rehabilitation* 2002;9(12):485-489.

Robotic technology is now being developed as a tool for assisting everyday activity. The Weston robot is a prototype robotic arm developed by the Bath Institute of Medical Engineering. This article describes how volunteers evaluated the robotic arm in their own homes and how their practical experiences and views are refining and guiding this project.

69. Fachko MJ. Cardiovascular effects and enjoyment of exer-gaming in older adults. University of Pennsylvania. Tilgjengelig fra: <http://search.ebsco-host.com/login.aspx?direct=true&db=cin20&AN=2012240301&site=ehost-live>.

Background. A physically active lifestyle provides a variety of health benefits. However, physical activity may decline with age. Currently, there are 40 million older adults, representing 13.1% of the population in the United States. National surveys report that only 30% of older adults perform adequate amounts of physical activity. The lack of daily physical activity (PA) can lead to an increased risk of chronic disease. Exer-gaming (EG) has been successful in increasing PA in children and young adults in a fun and enjoyable manner, but the use of EG with older adults has not been well studied.

Purpose. To quantify the cardiovascular responses, the enjoyment, and the untoward physical discomforts to a 15 minute trial of EG (Nintendo Wii Tennis) in healthy, older adults.

Methods. A quasi-experimental design using a convenience sample of 34 self-reported healthy older adults from an independent living retirement community in Southeastern Pennsylvania completed the study. Serial measurements of heart rate, blood pressures (systolic, diastolic, and mean), rate-pressure

product, and perceived exertion were taken at 5 minute intervals beginning at rest, standing, playing Wii tennis and post play recovery. Enjoyment was measured post Wii play and a 48 hour post questionnaire was provided. Analysis of the data included the use of descriptive statistics and general linear modeling of repeated measures.

Results. 15 minutes of exercise gaming (Nintendo Wii Tennis), moderately increased heart rate ($p < 0.001$), blood pressures ($p < 0.001$) and perceived exertion ($p < 0.0001$) compared to rest. This level of activity corresponded to an age predicted maximum heart rate range of 64%. No differences in cardiovascular variables occurred between genders. Beta-blockade suppressed the heart rate and rate pressure product. All subjects completed EG tennis without reporting fatigue with 86% enjoying the experience with few physical discomforts and arrhythmias.

Conclusions. Nintendo Wii EG technology (tennis) induces a moderate intensity cardiovascular stress in an overall enjoyable manner among health, older adults.

70. Ficocelli M, Nejat G. The design of an interactive assistive kitchen system. *Assistive Technology* 2012;24(4):246-258.

As the world's elderly population drastically increases, aging-related cognitive impairments have become one of the biggest healthcare concerns. In this paper, we present the design of an assistive kitchen system consisting of a user interface with two-way speech communication and an automated cabinet system to help promote aging-in-place. The assistive kitchen system incorporates a cognitive assistance feature that helps the user in overcoming initiation, planning, attention, and memory deficits, while performing kitchen-based activities of daily living (ADLs) such as storing and retrieving items, and obtaining recipes for meal preparation. This feature works synchronously with the automated kitchen cabinet to directly provide the location of an item to a user, bring the item in closer reach and also prompt the user to retrieve the item. An initial prototype of the assistive kitchen system has been developed and performance testing has been conducted. The testing has shown high success rates for users' retrieving and storing specified kitchen items. A small scale study was also conducted measuring the acceptance and use of the proposed system by older adults. The results show promise for the further development and use of the system for the outlined kitchen ADLs.

71. Fischer SH, David D, Crotty BH, Dierks M, Safran C. Acceptance and use of health information technology by community-dwelling elders. *International Journal of Medical Informatics* 2014;83(9):624-635.

Objectives: With the worldwide population growing in age, information technology may help meet important needs to prepare and support patients and families for aging. We sought to explore the use and acceptance of information technology for health among the elderly by reviewing the existing literature. **Methods:** Review of literature using PubMed and Google Scholar, references from relevant papers, and consultation with experts. **Results:** Elderly people approach the Internet and health information technology differently than younger people, but have growing rates of adoption. Assistive technology, such as sensors or home monitors, may help 'aging in place', but these have not been thoroughly evaluated. Elders face many barriers in using technology for healthcare decision-making, including issues with familiarity, willingness to ask for help, trust of the technology, privacy, and design challenges. **Conclusions:** Barriers must be addressed for these tools to be available to this growing population. Design, education, research, and policy all

play roles in addressing these barriers to acceptance and use. (C) 2014 Elsevier Ireland Ltd. All rights reserved.

72. Flanagan S. The REKI project. *Access by Design* 2004(99):26-31.

Reports on the new REKI Project on adapting existing housing to meet the changing needs of older people. REKI is a project of the University of Reading and King's College, London. The project, funded by the Engineering and Physical Sciences Research Council (EPSRC) began in October 2000 and was completed in June 2003. The research looked at both fixed and portable types of assistive technology. A sample of 67 older people were interviewed in their own homes. The adaptability of 82 sample properties was then considered using seven hypothetical user profiles.

73. Fleming R, Sum S. Empirical studies on the effectiveness of assistive technology in the care of people with dementia: a systematic review. *Journal of Assistive Technologies* 2014;8(1):14-34.

To evaluate the use of assistive technology in the care of people with dementia.

MEDLINE, CINAHL, PubMed, PsycINFO, ProQuest, Web of Knowledge, IEEE and the Cochrane Library were searched for articles published from 1995 up to 2011; search terms were reported. Five journals and the reference lists of reviews and related articles were manually searched. Two gerontologists were asked to identify papers they considered to be significant. Studies were assessed for quality using the Forbes approach, which assessed design and allocation of intervention, inclusion, attrition, control of confounders, data collection and statistical validity. Studies that passed at least four criteria and did not fail any criteria were categorised as 'strong'. Studies that passed less than four criteria and did not fail any criteria were categorised as 'moderate'. Studies that failed one or two criteria were categorised as 'weak'. Studies that failed more than two criteria were categorised as 'poor'. Two reviewers independently assessed the studies for validity, with disagreements resolved by consensus.

Study characteristics and results were extracted from each of the studies. The authors did not state how many reviewers undertook data extraction.

Forty-one studies were included in the review: seven studies were considered to be strong (522 participants; range 5 to 136); ten moderate (138 participants; range 3 to 26); and 24 weak (total number of participants unclear).

Studies had very small sample sizes, high drop-out rates, basic statistical analyses, lack of adjustment for multiple comparisons and poor performance of the technology. Independence, prompts and reminders: It appeared that once the evaluation moved from the laboratory, significant practical and methodological problems emerged. Generally, the reported use of the technology made little difference to practical outcomes. Safety and security: The very weak evidence showed that common problems were associated with lack of acceptance by the user, difficulties with use, and technical reliability. Careful assessment was required to discover the likely benefit of the technology to an individual; there was a strong suggestion that the window of opportunity was quite small for the successful application of technology. Telecare and telehealth: Although the literature did not seem to support the use of technology (in the form available) to enhance communication initiated by the person with dementia, it provided some promise that remote carer initiated communication could be used for assessment and simple therapeutic interventions. However, the included studies were not methodologically strong. Therapeutic interventions: There was little convincing evidence to

support the use of Snoezelen technology (multi-sensory stimulation exposure) over other activities to improve the wellbeing of people with dementia. The effects of simulated presence therapy appeared modest and short lived. General use of the assistive technology available did not establish a positive difference to the lives of people with dementia.

The inclusion criteria were broad, but clear. A thorough search of relevant sources was undertaken, although it was not stated whether any language restrictions were applied and limited attempts were made to identify unpublished studies, so some studies may have been missed. Not all stages of the review were undertaken in duplicate, which increased the potential for error and bias. The assessment of study quality appears to have been appropriate, but full results were not reported, so it was not possible to judge study quality. Most studies were categorised as weak, with small sample sizes and high drop-out rates amongst other problems. Study details and results were tabulated for the strong and moderate quality studies, but not the weak studies. The narrative synthesis was quite basic, with a description of the individual studies for each topic area, followed by a broad summary of the evidence. This was a very broad review, which included many poor quality studies. However, the authors' conclusion is very general and appears rather negative, considering that some of the better quality studies had positive results. Practice: The authors did not state any implications for practice. Research: The authors stated that there was a great need for better designed studies with larger samples.

74. Fok D, Polgar JM, Shaw L, Jutai JW. Low vision assistive technology device usage and importance in daily occupations. *Work - a Journal of Prevention Assessment & Rehabilitation* 2011;39(1):37-48.

When selected, accepted and used appropriately, low vision assistive technology devices (ATDs) have the potential to facilitate the performance of occupations that lead to positive outcomes. Objective: This paper identifies some low vision ATDs currently used and explores their relative importance for the performance of daily occupation from participants' perspectives. Participants: 17 adults (M = 56 years old, SD = 15.8) with low vision were recruited through a purposeful sampling strategy. Methods: Through one-on-one semi-structured telephone interviews, ATD usage data, ranking of perceived importance of ATDs and verbal data were collected from the participants. Results: A total of 124 devices were identified by the participants of which 104 (83.9%) were used and 20 (16.1%), mostly adaptive computer technologies, were not. 22 (21%) mainstream aids to daily living were identified (large monitor, large screen TV, DVD player) and they ranked high in terms of perceived importance by the participants for daily activities. Verbal feedback from participants supplemented this finding. Conclusion: Concepts related to usage and ranking of importance of ATDs for daily occupations are multi-faceted and complex (e.g. combination of devices used, multiple equal rankings, etc.). The authors suggested future research opportunities to examine these concepts through qualitative means.

75. Fokkema T, Knipscheer K. Escape loneliness by going digital: a quantitative and qualitative evaluation of a Dutch experiment in using ECT to overcome loneliness among older adults. *Aging & Mental Health* 2007;11(5):496-504.

BACKGROUND: This study evaluates the outcomes of an Internet-at-home intervention experiment that intended to decrease loneliness among chronically ill and physically handicapped older adults through introducing them to the use of an electronic communication facility.

METHOD: To determine the effectiveness of the experiment in terms of reducing loneliness, 15 older adults were interviewed three times: shortly before the start, two years later and immediately after termination of the experiment, while their loneliness scores at zero and post-measurement were compared with those of a control group.

RESULTS: Both the participants and the control persons experienced a reduction in loneliness over time. However, the reduction was only significant for the intervention participants. Moreover, the changes in loneliness were significantly greater among the participants compared to the control persons. When looking more in detail, the effect of the experiment was only significant regarding emotional loneliness and among the highest educated. Findings of the qualitative research enabled us to understand the mechanisms through which the intervention helped alleviate loneliness. E-mail was found to facilitate social contact. Furthermore, the computer and Internet were often used to pass the time, taking people's minds off their loneliness. Unexpectedly, the intervention also improved people's self-confidence.

CONCLUSION: The decline in loneliness is likely to be greater if persons under more favorable circumstances are selected and if more social functions of the Internet are used.

76. Franco JR, Jacobs K, Inzerillo C, Kluzik J. The effect of the Nintendo Wii Fit and exercise in improving balance and quality of life in community dwelling elders. *Technology & Health Care* 2012;20(2):95-115.

INTRODUCTION: This study compared the effect of Nintendo Wii Fit to the Matter of Balance program, a valid and reliable program, on improving balance, and well-being to decrease the risk of falls.

METHODS: Residents of an independent living senior housing facility were recruited and thirty-two residents ages 63 to 90 participated. Participants were separated into three groups: (1) Wii Fit group (n=11) completed balance games on the Wii Fit in individual sessions twice a week and supplemental home exercises; (2) Matter of Balance Group (n=11) completed exercises from the Matter of Balance Program in a group setting twice a week; (3) Control group (n=10) received no intervention. Intervention lasted three weeks. **RESULTS/FINDINGS:** One-way ANOVA's were completed. Scores from the assessments were not statistically significant at post-test Berg Balance Scale (p=0.837); Tinetti Gait and Balance Assessment (p=0.913); SF-36 (p=0.256). Results from a self-report demonstrated that Wii Fit is an enjoyable form of exercise for an elderly population.

CONCLUSION: Although, the interventions failed to significantly increase balance, with an increase in intervention duration of Wii Fit or Matter of Balance balance may be improved. Although results were not significant this study adds to the growing body of evidence regarding the use of Wii Fit as a rehabilitation tool. 2012 - IOS Press and the authors. All rights reserved

77. Garceau M, Vincent C, Robichaud L. [The tele-surveillance as a tool to favour social participation of elderly at home]. *Canadian Journal on Aging* 2007;26(1):59-72.

Little is known as yet about the impact of telesurveillance services on social participation. To document the interaction between telesurveillance services and social participation of the elderly living at home, a study was conducted in the context of a government call center employing nurses. A focus group study was realized with elders (n = 4), caregivers (n = 6), healthcare system practitioners and industry employees (n = 7). A qualitative analysis was performed using the Disability Creation Process model and generally accepted criteria for evaluating telehealth interventions. The results showed, on the

one hand, factors that facilitate the use of telesurveillance services (user's intellectual capabilities, acceptance of clinical settings, relevance of recommendations, cost of service, and accessibility) and, on the other, factors that reinforce such use (user behaviors; level of satisfaction; impact on informal caregiver; system's level of performance; technical features; and life-habit aspects such as personal transportation, sleep, housekeeping, personal care, interpersonal relationships, and recreational activities).

78. Gottlieb AS, Caro FG. Providing low-tech assistive equipment through home care services: the Massachusetts Assistive Equipment Demonstration. *Technology & Disability* 2000;13(1):41-53.

This research demonstration study investigated the potential for distributing low-cost, low-tech assistive equipment to functionally disabled elders through a state-funded home care program. The project strengthened the capacity of home care coordinating agencies to make assistive devices available to clients and then examined the extent to which devices reached clients and were beneficial to them. Using a quasi-experimental design, clients from one home care agency received the intervention six months prior to another agency to permit evaluation of the program and client outcomes. Case managers participated in training sessions that provided an introduction to assistive equipment and guidelines for assessing clients, then worked with their clients to select and order appropriate equipment. Client outcomes were assessed through pre- and post-intervention client interviews and client records. Case managers distributed a modest amount of equipment that addressed a range of daily living activities to nearly 200 clients (average of four items at \$76 per client). While there was no evidence that the project resulted in favorable implications for clients' performance of daily activities, there was evidence that equipment was beneficial on a task-specific basis, and clients reported high satisfaction. The demonstration was instructive and led to recommendations for supporting case managers as gatekeepers for disseminating assistive equipment to elder home care clients.

79. Gramstad A, Storli SL, Hamran T. Exploring the meaning of a new assistive technology device for older individuals. *Disabil Rehabil Assist Technol* 2014:1-6.

Abstract Researching the outcomes of assistive technology devices (ATDs) for older clients is important to facilitate clinical decision-making. However, to understand the outcomes associated with ATDs, one must investigate the users' experiences and acknowledge the user as an active participant in diverse social contexts. **Purpose:** To enhance understanding of the users' perspective regarding ATDs, this study aimed to investigate the meaning of the ATD for older individuals still living in their home environment. **Methods:** To provide descriptions of ATD experiences, older individuals who received a new ATD to compensate for their challenges in moving around, assist in self-care or both were recruited for the study. Participants were interviewed twice, with a few months between interviews, about their experience in using their new ATD. The interview transcripts were analyzed in a hermeneutical-phenomenological research approach. **Results:** The analysis revealed three recurring themes associated with the description of ATD experiences: "enabling performance and choice", "transformation from requiring assistance to assisting others", and "preparing for the future". **Conclusion:** The results show that ATDs are used to enhance competence, mastery, control, self-worth, hope, and preparedness. The ATD service delivery should be client-centered and the client should be acknowledged as an active participant in producing change. **Implications for Rehabilitation** Researching outcomes of assistive technology devices are complicated and should involve the user experience.

Assistive technology devices does not have to be used in concrete actions to involve meaning for the user. Health care professionals should be sensitive towards the meaning dimensions of the assistive technology devices as experienced by the user throughout the service delivery process.

80. Haddon L. Social Exclusion and Information and Communication Technologies: Lessons from Studies of Single Parents and the Young Elderly. *New Media & Society* 2000;2(4):387-406.

Current notions of social exclusion are to an extent anchored in older concerns with relative poverty, which had the merit of considering not just material deprivation but also the social & cultural dimensions of participation or exclusion. The focus of this article is on the role of ICTs in relation to people's ability to participate in society. It draws upon detailed qualitative research on single parent & young elderly households to explore what counts as experiences of inclusion or exclusion & the processes behind them. Dealing mainly, but not exclusively, with the more traditional ICTs of telephony & broadcasting, the article considers processes of self-exclusion as people have mixed evaluations of these technologies derived both from current circumstances & past experiences. It then looks beyond the acquisition of ICTs to show how other modes of access to these resources are important before reflecting upon the quality of experience of ICTs, not just in terms of the functionality on offer but also taking into account that technologies are themselves symbolic goods. Finally, & drawing on more recent research, the article asks what lessons might be learned from these traditional ICTs when considering newly emerging ones like the Internet. 20 References. Adapted from the source document.

81. Haigh KZ, Kiff LM, Ho G. The Independent LifeStyle Assistant: lessons learned. *Assistive Technology* 2006;18(1):87-106.

The Independent LifeStyle Assistant (I.L.S.A.) is an agent-based monitoring and support system to help elderly people live longer in their homes by reducing caregiver burden. I.L.S.A. is a multiagent system that incorporates a unified sensing model, situation assessments, response planning, real-time responses, and machine learning. This paper describes the six-month study of the system we fielded in elders' homes and the major lessons we learned during development.

82. Harbig P, Barat I, Damsgaard EM. Suitability of an electronic reminder device for measuring drug adherence in elderly patients with complex medication. *Journal of Telemedicine & Telecare* 2012;18(6):352-356.

We evaluated an electronic reminder device for detecting non-adherence in elderly patients with complex medication regimens. Randomly selected, home-living elderly patients were studied. The patients were aged over 65 years and were taking more than four drugs. Patients received an electronic reminder device which contained a GSM communications module. They were visited three times over a one-year period by a nurse who counted their medicine supply. We compared the adherence measured by the electronic device with the actual adherence measured by the pill count. Almost half of the 315 patients dropped out of the study for various reasons, so the calculations were performed on 168 patients. The adherence measured by the electronic reminder system was 79% and was 92% measured by pill count ($P < 0.0001$). The limits of agreement estimated by a Bland-Altman analysis were -57 to +30. We also compared electronically measured adherence at morning/evening intake times with pill count adherence in the morning/evening only. For the pill count, there was almost no difference between

morning and evening adherence rates (93%). For electronic measurement, adherence rates were lower in the evening (75%) than in the morning (81%). Electronic reminders were less reliable than the pill count in measuring adherence. However, the electronic system may be a useful supplement to other, more time consuming methods for measuring adherence.

83. Harjumaa M, et al. Expectations and user experience of a multimodal medicine management system for older users. *Journal of Assistive Technologies* 2014;8(2):51-63.

Purpose: The purpose of this paper is to analyse the adoption of a multimodal medication management system (MMS) targeted on older people and home care professionals. The paper aims to describe the expectations of the system and the user experience findings from an empirical qualitative field trial. The field trial results are used to discuss how MMSs should be designed in order to improve adherence to medications. **Design/methodology/approach:** The paper suggests that building a multimodal medicine management system targeted on both older users and home care professionals brings many benefits over electronic medicine dispenser systems or general reminder systems. The research process uses an iterative prototyping approach including phases of requirements analysis and concept design, prototype building and evaluation in a field trial. **Findings:** The study demonstrates how a system that merely satisfied users during the prototype building phase does not necessarily succeed as well as expected in the field trials. It would be important to consider reasons for medication non-adherence and non-technology factors influencing willingness to adopt new assistive devices in order to promote diffusion of new MMSs at home. The paper also discusses how the different persuasive functionalities of the system addressed patient-centred factors influencing non-adherence and how they could be addressed. **Research limitations/implications:** This study has some limitations. The actual adherence to medications was not measured. However, in the future, it will be important to study how the MMSs influence medication adherence. Also, the user experiences of the home care professionals were not studied in the field trials. Home care professionals who were involved in the user studies and trials merely estimated the value for their patients and not for themselves. **Originality/value:** This paper analyses design issues relevant when designing systems to help older people manage their medications.

84. Harrefors C, Axelsson K, Savenstedt S. Using assistive technology services at differing levels of care: healthy older couples' perceptions. *Journal of Advanced Nursing* 2010;66(7):1523-1532.

Title. Using assistive technology services at differing levels of care: healthy older couples' perceptions. **Aim.** The aim of the study was to describe healthy older couples' perceptions of using assistive technology services when needing assistance with care. **Background.** The use of information technology-based assistive technology services in elder care has increased as a result of an increase of care performed in private homes. The use of assistive technology services in care of older people at home has been evaluated as something positive by patients, relatives and nursing staff, while as resistance to their increased use has also been noted. **Method.** Twelve healthy couples, aged over 70 years, from northern Sweden were interviewed in 2005 about their perceptions of using assistive technology services in the case of being in need of assistance with personal care. Open, individual semi-structured interviews supported by written vignettes describing three levels of caring needs were used and the data analysed with content analysis. **Findings.** The findings were interpreted as one main theme with three categories: Asset or threat depends on caring needs and abilities. Three categories were identified within

the theme: Assistive technology services provide an opportunity; The consequences of using assistive technology services are hard to anticipate; and Fear of assistive technology services when completely dependent on care. Conclusion. Trust and security in the care of older people who are severely ill, dependent on care and living at home should be a hallmark in using assistive technology services. Human presence is an important dimension and must be considered when developing concepts for use of assistive technology services.

85. Harris J. The use, role and application of advanced technology in the lives of disabled people in the UK. *Disability & Society* 2010;25(4):427-439.

Disabled people are excited by the potential benefits of using advanced technologies at home. However, many devices are abandoned early and lie unused. This research project aimed to explore why this happens, what the users of such technologies require, how advanced technologies can rise to the challenges of flexibility and user choice, which applications enhance independence and improve quality of life and what the barriers are to take-up and future utilization. It was found that disabled people wish to use advanced technology to increase independence in and beyond home but the cost of both mainstream and 'specialist' devices are prohibitive. The role of advanced technology should be to enhance independence and provide mainstream solutions that disabled people request, rather than designing and engineering 'specialist' expensive products. Furthermore, the application of advanced technology for use in the home should be directed by disabled people, collectively and individually.

86. Hattink BJ, Meiland FJ, Overmars-Marx T, de Boer M, Ebben PW, van Blanken M, et al. The electronic, personalizable Rosetta system for dementia care: exploring the user-friendliness, usefulness and impact. *Disabil Rehabil Assist Technol* 2014:1-11.

Abstract Purpose: This research aimed to integrate three previously developed assistive technology (AT) systems into one modular, multifunctional system, which can support people with dementia and carers throughout the course of dementia. . In an explorative evaluation study, the integrated system, called Rosetta, was tested on usefulness, user-friendliness and impact, in people with dementia, their informal carers and professional carers involved. The Rosetta system was installed in participants' homes in three countries: The Netherlands, Germany and Belgium. **Methods:** Controlled trial with pre- and post-test measures across three countries (randomized controlled trial in Germany; matched groups in the Netherlands and Belgium). Participants completed questionnaires for impact measurement and participated in semi-structured interviews regarding usefulness and user-friendliness of Rosetta. **Results:** All participants agreed that Rosetta is a very useful development. They did not rate the user-friendliness of the system highly. No significant effects were found on impact measurements. **Conclusion:** All participants found Rosetta a very useful development for future care, and would consider using it. Since Rosetta was still in development during evaluation, a discrepancy between expectations and actual functioning of Rosetta existed, which may explain the lack of findings on the impact of the system and the low appreciation of user-friendliness. **Implications for Rehabilitation** People with dementia and carers find assistive technology (AT) a useful future development and they are willing to use it in the future. People with dementia and carers have little privacy issues with AT. If they have concerns, they are willing to accept the trade-off of reduced privacy in exchange for the ability to live in their own homes for longer. Given that a

system works flawlessly, informal carers indicate that integrated AT can reduce their burden and stress. This can in turn help informal carers to provide better care for a longer period of time.

87. Hayes TL, Cobbinah K, Dishongh T, Kaye JA, Kimel J, Labhard M, et al. A study of medication-taking and unobtrusive, intelligent reminding. *Telemedicine Journal & E-Health* 2009;15(8):770-776.

Poor medication adherence is one of the major causes of illness and of treatment failure in the United States. The objective of this study was to conduct an initial evaluation of a context-aware reminder system, which generated reminders at an opportune time to take the medication. Ten participants aged 65 or older, living alone and managing their own medications, participated in the study. Participants took a low-dose vitamin C tablet twice daily at times that they specified. Participants were considered adherent if they took the vitamin within 90 minutes (before or after) of the prescribed time. Adherence and activity in the home was measured using a system of sensors, including an instrumented pillbox. There were three phases of the study: baseline, in which there was no prompting; time-based, in which there was prompting at the prescribed times for pill-taking; and context-aware, in which participants were only prompted if they forgot to take their pills and were likely able to take their pills. The context-based prompting resulted in significantly better adherence (92.3%) as compared to time-based (73.5%) or no prompting (68.1%) conditions ($p < 0.0002$, $\chi^2(2) = 17.0$). In addition, subjects had better adherence in the morning than in the evening. We have shown in this study that a system that generates reminders at an opportune time to take the medication significantly improves adherence. This study indicates that context-aware prompting may provide improved adherence over standard time-based reminders.

88. Health Quality O. Social isolation in community-dwelling seniors: an evidence-based analysis. *Ontario Health Technology Assessment Series* 2008;8(5):1-49.

UNLABELLED: In early August 2007, the Medical Advisory Secretariat began work on the Aging in the Community project, an evidence-based review of the literature surrounding healthy aging in the community. The Health System Strategy Division at the Ministry of Health and Long-Term Care subsequently asked the secretariat to provide an evidentiary platform for the ministry's newly released Aging at Home Strategy. After a broad literature review and consultation with experts, the secretariat identified 4 key areas that strongly predict an elderly person's transition from independent community living to a long-term care home. Evidence-based analyses have been prepared for each of these 4 areas: falls and fall-related injuries, urinary incontinence, dementia, and social isolation. For the first area, falls and fall-related injuries, an economic model is described in a separate report. Please visit the Medical Advisory Secretariat Web site, http://www.health.gov.on.ca/english/providers/program/mas/mas_about.html, to review these titles within the Aging in the Community series. AGING IN THE COMMUNITY: Summary of Evidence-Based Analyses Prevention of Falls and Fall-Related Injuries in Community-Dwelling Seniors: An Evidence-Based Analysis Behavioural Interventions for Urinary Incontinence in Community-Dwelling Seniors: An Evidence-Based Analysis Caregiver- and Patient-Directed Interventions for Dementia: An Evidence-Based Analysis Social Isolation in Community-Dwelling Seniors: An Evidence-Based Analysis The Falls/Fractures Economic Model in Ontario Residents Aged 65 Years and Over (FEMOR) OBJECTIVE OF THE EVIDENCE-BASED ANALYSIS: The objective was to systematically review interventions aimed at preventing or reducing social isolation and

loneliness in community-dwelling seniors, that is, persons > 65 years of age who are not living in long-term care institutions. The analyses focused on the following questions: Are interventions to reduce social isolation and/or loneliness effective? Do these interventions improve health, well-being, and/or quality of life? Do these interventions impact on independent community living by delaying or preventing functional decline or disability? Do the interventions impact on health care utilization, such as physician visits, emergency visits, hospitalization, or admission to long-term care?

BACKGROUND: TARGET POPULATION AND CONDITION Social and family relationships are a core element of quality of life for seniors, and these relationships have been ranked second, next to health, as the most important area of life. Several related concepts—reduced social contact, being alone, isolation, and feelings of loneliness—have all been associated with a reduced quality of life in older people. Social isolation and loneliness have also been associated with a number of negative outcomes such as poor health, maladaptive behaviour, and depressed mood. Higher levels of loneliness have also been associated with increased likelihood of institutionalization. **NOTE:** It is recognized that the terms "senior" and "elderly" carry a range of meanings for different audiences; this report generally uses the former, but the terms are treated here as essentially interchangeable. **METHODS OF THE EVIDENCE-BASED ANALYSIS:** The scientific evidence base was evaluated through a systematic literature review. The literature searches were conducted with several computerized bibliographic databases for literature published between January 1980 and February 2008. The search was restricted to English-language reports on human studies and excluded letters, comments and editorials, and case reports. Journal articles eligible for inclusion in the review included those that reported on single, focused interventions directed towards or evaluating social isolation or loneliness; included, in whole or in part, community-dwelling seniors (> 65 years); included some quantitative outcome measure on social isolation or loneliness; and included a comparative group. Assessments of current practices were obtained through consultations with various individuals and agencies including the Ontario Community Care Access Centres and the Ontario Assistive Devices Program. An Ontario-based budget impact was also assessed for the identified effective interventions for social isolation.

FINDINGS: A systematic review of the published literature focusing on interventions for social isolation and loneliness in community-dwelling seniors identified 11 quantitative studies. The studies involved European or American populations with diverse recruitment strategies, intervention objectives, and limited follow-up, with cohorts from 10 to 15 years ago involving mainly elderly women less than 75 years of age. The studies involved 2 classes of interventions: in-person group support activities and technology-assisted interventions. These were delivered to diverse targeted groups of seniors such as those with mental distress, physically inactive seniors, low-income groups, and informal caregivers. The interventions were primarily focused on behaviour-based change. Modifying factors (client attitude or preference) and process issues (targeting methods of at-risk subjects, delivery methods, and settings) influenced intervention participation and outcomes. Both classes of interventions were found to reduce social isolation and loneliness in seniors. Social support groups were found to effectively decrease social isolation for seniors on wait lists for senior apartments and those living in senior citizen apartments. Community-based exercise programs featuring health and wellness for physically inactive community-dwelling seniors also effectively reduced loneliness. Rehabilitation for mild/moderate hearing loss was effective in improving communication disabilities and reducing loneliness in seniors. Interventions evaluated for informal caregivers of seniors with dementia, however, had limited effectiveness for social isolation or loneliness. Research into interventions for social isolation in seniors has not been broadly based,

relative to the diverse personal, social, health, economic, and environmentally interrelated factors potentially affecting isolation. Although rehabilitation for hearing-related disability was evaluated, the systematic review did not locate research on interventions for other common causes of aging-related disability and loneliness, such as vision loss or mobility declines. Despite recent technological advances in e-health or telehealth, controlled studies evaluating technology-assisted interventions for social isolation have examined only basic technologies such as phone- or computer-mediated support groups.

CONCLUSIONS: Although effective interventions were identified for social isolation and loneliness in community-dwelling seniors, they were directed at specifically targeted groups and involved only a few of the many potential causes of social isolation. Little research has been directed at identifying effective interventions that influence the social isolation and other burdens imposed upon caregivers, in spite of the key role that caregivers assume in caring for seniors. The evidence on technology-assisted interventions and their effects on the social health and well-being of seniors and their caregivers is limited, but increasing demand for home health care and the need for efficiencies warrant further exploration. Interventions for social isolation in community-dwelling seniors need to be researched more broadly in order to develop effective, appropriate, and comprehensive strategies for at-risk populations.

89. Heyn Billipp S. The psychosocial impact of interactive computer use within a vulnerable elderly population: a report on a randomized prospective trial in a home health care setting. *Public Health Nursing* 2001;18(2):138-145.

Quality of care for vulnerable elderly clients makes it important to consider the psychosocial effects of interactive computer use as a means to communicate for social, functional, and/or health care purposes in a home health care setting. In a 3-month randomized prospective trial, telecommunications terminals were installed in the private residences of computer-illiterate persons, 65-years-of-age and older, providing visiting nurses the opportunity to teach computer use with three different training methods. The control group had similar weekly nurse visits, but no computer terminal use. Pre-posttests using the Rosenberg Self-Esteem Scale and the Geriatric Depression Scale compared change in self-esteem and depression scores of computer-use clients with the scores of the control group clients. Interactive computer use, alone, did not significantly change scores. Compared to the control group, however, there was a significant change toward improved self-esteem and depression when interactive computer use was accompanied with weekly nurse computer training. Weekly training with a significant other, as a substitute for the nurse trainer, significantly improved self-esteem scores but not depression scores. Interactive computer use was not associated with decreased self-esteem or increased depression. Attitude changes and responses to the particular telecommunication service used in this study were mixed, suggesting future research should be based on improved telecommunication systems with access to programs that have greater practical application to the needs of elderly clients.

90. Hill K, Goldstein R, Gartner EJ, Brooks D. Daily utility and satisfaction with rollators among persons with chronic obstructive pulmonary disease. *Archives of Physical Medicine & Rehabilitation* 2008;89(6):1108-1113.

OBJECTIVE: To characterize the daily utility and satisfaction with rollators in patients with chronic obstructive pulmonary disease (COPD).

DESIGN: Cross-sectional observational study.

SETTING: Community.

PARTICIPANTS: COPD patients describing dyspnea during activities of living, who had been provided with a rollator by a health care professional within the preceding 5-year period.

INTERVENTIONS: Not applicable.

MAIN OUTCOME MEASURES: Three questionnaires were administered in random order. The St. George's Respiratory Questionnaire was used to measure health-related quality of life, version 2.0 of the Quebec User Evaluation of Satisfaction with Assistive Technology was used to assess satisfaction with the rollator, and a structured questionnaire was used to obtain information regarding daily utility of the device and barriers to its use. Demographic data were obtained through patient interview. Anthropometric data, measurements of resting lung function, and 6-minute walk distance were extracted from the medical records.

RESULTS: Twenty-seven (10 men) patients (forced expiratory volume in 1 second, 35.1%+/-22.3% predicted) completed the study. Sixteen (59%) patients reported daily rollator use. All patients used the rollator to assist with ambulation outdoors, but 16 (59%) patients stated that they did not use the rollator for any activity in their home. Although satisfaction with the rollator was high, women were less satisfied with the weight of the device than men ($P=.008$). Thirteen (48%) patients reported being embarrassed while using the device.

CONCLUSIONS: COPD patients provided with a rollator for use during daily life were most satisfied with its effectiveness and least satisfied with its weight. Daily use was generally high with over half the patients using the rollator on a daily basis. Rollators were more often used outdoors than indoors.

91. Hill W, Schillo L, Weinert C. Effect of a computer-based intervention on social support for chronically ill rural women. *Rehabilitation Nursing Journal* 2004;29(5):169-173.

Social support is a key factor in illness management. Despite the positive effects of support groups, there are barriers to participation by rural dwellers in face-to-face groups. To address these barriers, a computer-based support group intervention, the Women to Women Project, was designed to provide peer support and health information through a computer-based intervention. Data from three groups (intervention, information, comparison) of woman who participated in the program were analyzed. The pattern of improvement in social support was in the anticipated direction, but not significant in the main analysis. Exploratory analysis was conducted on a vulnerable subsample of women reporting low social support and high psychosocial distress. Results suggest that improvement in social support, based on the intervention, was greater for the vulnerable subsample as compared with the sample as a whole. An effective and efficient means of providing social support and facilitating the mobilization of this support is through self-help groups; this study demonstrates that virtual support groups can increase perceived social support.

92. Hoenig H, Pieper C, Branch LG, Cohen HJ. Effect of motorized scooters on physical performance and mobility: A randomized clinical trial. *Archives of Physical Medicine and Rehabilitation* 2007;88(3):279-286.

Objective: To investigate the effects of providing a motorized scooter on physical performance and mobility. **Design:** Randomized clinical trial comparing scooter users with usual care. **Setting:** One academic and 1 Veterans Affairs medical center. **Participants:** Ambulatory, community-dwelling outpatients with rheumatoid arthritis or osteoarthritis of the knee. **Intervention:** Provision of a motorized scooter for 3 months. **Main Outcome Measures:** Six-minute walk distance (6MWD) and mobility methods in diverse locations at

baseline, 1 month, and 3 months, and accidents while using the scooter. Results: The majority of scooter subjects (n=16/22 [72.7%]) used the scooter 4 or more days per week. The difference +/- standard deviation between the 2 groups in change in 6MWD over the study period was not statistically significant (scooter users, 16.9 +/- 73.0m [55.5 +/- 239.6ft]; usual care, 17.2 +/- 72.5m [56.5 +/- 238.0ft], P=.55). Four (18.1%) scooter users reported 9 accidents. Over the study period, the proportion of persons reporting use of a scooter (provided by the study or otherwise available) increased in the scooter-users group (eg, food stores, 16.7% to 52.6%; doctor's office, 0% to 35.7%) but not the usual-care group (food stores, 9.1% to 9.5%; doctor's office, 0% to 0%). Conclusions: Motorized scooters provided to ambulatory persons with arthritis were used intermittently. The greatest short-term risk from scooter usage appeared to be minor collisions.

93. Hoenig H, Taylor DH, Sloan FA. Does assistive technology substitute for personal assistance among the disabled elderly? *American Journal of Public Health* 2003;93(2):330-337.

Objectives. This study examined whether use of equipment (technological assistance) to cope with disability was associated with use of fewer hours of help from another person (personal assistance). **Methods.** In a cross-sectional study of 2368 community dwellers older than 65 years with 1 or more limitations in basic activities of daily living (ADLs) from the 1994 National Long Term Care Survey, the relation between technological assistance and personal assistance was examined. **Results.** Among people with ADL limitations, multivariate models showed a strong and consistent relation between technological assistance and personal assistance, whereby use of equipment was associated with fewer hours of help. **Conclusions.** Among people with disability, use of assistive technology was associated with use of fewer hours of personal assistance.

94. Holthe T, Walderhaug S. Older people with and without dementia participating in the development of an individual plan with digital calendar and message board. *Journal of Assistive Technologies* 2010;4(2):15-26.

The EU-funded project Middleware Platform for eMPOWERing older people and people with cognitive impairments (MPOWER) aims to develop a technical middleware platform that enables rapid development of flexible, domain-specific applications that can be personalised for individual use. This paper presents the findings from a proof of concept application of this platform. Seven older people and their family carers from Trondheim participated in the pilot trial (February 2008-April 2009), which aimed to evaluate the services provided through an individual internet-based digital plan displayed as a calendar page. Both family carers and staff from domiciliary services could, from their home computer, add appointments and messages on the user's digital calendar. The respondents were 5 women and 2 men, aged between 65 and 92, and only 3 of them had used a computer before. The data collection regarding use, usability, utility and acceptance took place on a regular basis after a preset schedule. The results are presented as case histories, and analysis of the causes of the observed effects are divided into personal, technical and structural issues. The main conclusion is that the digital calendar with a message board demonstrated the potential to support older people at home, particularly older people with memory problems who need support in structuring the day and keeping an overview of their daily activities and appointments.

95. Hori M, Furuya A, Kubota M, Koike A, Kinoshita A. [The effect of telecommunication(with Skype)to improve a cognitive function for elderly patients

with dementia and to reduce a care burden for their care givers]. *Gan to Kagaku Ryoho [Japanese Journal of Cancer & Chemotherapy]* 2011;38 Suppl 1:94-96.

We conducted an intervention study to clarify how effectively video-phone(Skype)was used in the communication for elderly patients with dementia being cared at home and their caregivers. For a period of 12 weeks, a patient-caregiver pair(n =8)communicated with a nurse via computer for 30 minutes once a week. The patient and caregiver worked as a pair. Before and after 12-week study period started, the intervention and control group(n=8)patients were assessed on cognitive scale(HDS-R), ADL, care burden scale(J-ZBI_8)and hours of sleep for caregivers. The result on the 12th week showed a significant improvement in hours of sleep on the intervention group of caregivers, and signs of improvement on the intervention group of patients in HDS-R. According to a questionnaire survey for caregivers, many of them said that a videophone communication was a pleasant experience for the family, and it is also useful for information gathering. Therefore, we think that the videophone communication is useful for a cognitive rehab work and giving good feelings for the patient. It also gives a good satisfaction for the family. Furthermore, a patient who had an intervention for 3 times in 2 years showed a sign of improvements in the cognitive function and care burden scale during the intervention period. However, the score dropped for several months. Therefore, it is important that a continuous intervention is necessary.

96. Horii M, Kubota M, Ando K, Kihara T, Takahashi R, Kinoshita A. [The effect of videophone communication (with skype and webcam)for elderly patients with dementia and their caregivers]. *Gan to Kagaku Ryoho [Japanese Journal of Cancer & Chemotherapy]* 2009;36 Suppl 1:36-38.

We conducted an intervention study to clarify how effectively videophone (Skype) was used in the communication for elderly patients with dementia cared at home and their caregivers. For a period of 12 weeks, a patient-caregiver pair(n = 6) communicated with a nurse via computer for 30 minutes once a week. The patient and the caregiver worked as a pair. Before and after the 12-week study period started, the intervention and control group (n = 7) patients were assessed with a cognitive scale (HDS-R), VAS, and a depression scale (SDS) for caregivers. The result on the 12th week showed signs of improvement on the intervention group in HDS-R and SDS. The intervention group kept no change in VAS, an expression of subjective feelings of happiness. Meanwhile, the control group significantly decreased in VAS. By the questionnaire for caregivers, many said that the videophone communication was a pleasure of the family and resulted in more family exchanges. Therefore, we consider that a videophone communication is useful for cognitive rehabilitation and the feelings of the patient, and it is also good for a satisfaction of the family.

97. Horii M, Kubota M, Kinoshita A. [The support system for dementia patient and their caregiver with Skype and webcam]. *Gan to Kagaku Ryoho [Japanese Journal of Cancer & Chemotherapy]* 2008;35 Suppl 1:43-45.

The increase in the number of people suffering from dementia because of aging is a serious problem for caregivers since the feature of this pathology is irreversible and advancing. We designed an intervention study with Skype and webcam for patient with dementia being cared at home by their caregiver to prevent a further memory deterioration (seriousness of dementia) and to reduce a care burden as well. For a period of 12 weeks, a 4-patient-caregiver pair communicated with a hospital nurse through the computer for

30 minutes once a week. The patient and the caregiver worked as a pair. From the beginning of the intervention period, the intervention group and control group (n = 4) were assessed with cognitive scale, ADL scale, care burden scale and depression scale for the caregiver, and the like once in 4 weeks for 12 weeks. The initial report on the 8th week showed signs of improvement on the intervention group in HDS-R, also it improved the scale of moral of the caregiver as their scale of depression decreased.

98. Hudson DL, Cohen ME. Intelligent agent model for remote support of rural healthcare for the elderly. Conference Proceedings: Annual International Conference of the IEEE Engineering in Medicine & Biology Society 2006;1:6332-6335.

With the aging population, the number of individuals requiring long-term care is expected to dramatically increase in the next twenty years, placing an increasing burden on healthcare. Many patients are admitted to assisted living facilities at a fairly early stage due to their inability to perform normal daily living activities. The purpose of this study is to determine if the use of technology for both monitoring and intervention can permit elderly patients to remain in their homes for longer periods of time with the benefit of the comfort of familiar surroundings while at the same time reducing the burden on caregivers. In addition, remote access to healthcare can improve monitoring of the patient's physical and mental condition and involve the patient in his or her own care. The home monitoring and intervention system is based on intelligent agent methodology developed by the authors.

99. Hutchings BL, Olsen RV, Moulton HJ. Environmental evaluations and modifications to support aging at home with a developmental disability. *Journal of Housing for the Elderly* 2008;22(4):286-310.

Increasing numbers of people with developmental disabilities are living into old age and are now residing in community-based housing, largely due to the deinstitutionalization movement. The overlay of age-related impairments onto pre-existing, lifelong disabilities puts this population at a magnified risk for premature behavioral limitations and loss of independence. This article describes a demonstration project designed to enable people with developmental disabilities to age in place. Interviews and observational assessments with 45 older adults with developmental disabilities were conducted in their community-based homes to identify potential barriers to aging in place. An Individualized Environmental Intervention Plan was developed for each study participant, recommending ways to solve problems and eliminate potential barriers. Individualized Environmental Intervention Plans were implemented to the extent possible through home modifications and assistive technology. Preand post-modification task performance and self-report revealed the positive impact that home modifications and assistive technology can have. The study demonstrates the need for ongoing evaluation and assessment sensitive to the needs of people with developmental disabilities and the unique characteristics of supported living settings.

100. Johnson JL. Consumer response to home monitoring: a survey of older consumers and informal care providers. University of Florida. Tilgjengelig fra: <http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=2010284643&site=ehost-live>.

As our population ages, the number of people with a disability, who live alone, and who wish to remain in their own homes, is increasing. These older individuals may require personal care and/or assistive technology. Home monitoring systems are assistive technologies utilized to track an individual's

activity patterns promoting safety and independence. QuietCare is a home monitoring system embedded in the person's environment designed to detect changes in the user's behavior patterns that may indicate an emergency situation. There has been no research on systems like QuietCare relative to whether user needs are being met and if users are satisfied with the system. The purpose of this study was to explore the perceptions and experiences of home monitoring system users and informal caregivers.

The sample included 29 QuietCare users and 30 informal caregivers.

Through an interview, users completed an assessment of functional capacity and a home monitoring survey. The informal caregivers participated in a telephone interview and completed a survey regarding their perceptions of the QuietCare home monitoring system. Data were analyzed using descriptive statistics.

The HMS user sample was mostly female (72%), white (97%), and widowed (83%) with a mean age of 80. The HMS caregivers were mainly female (60%), white (100%), and married (87%) with an average age of 59. Both the users and caregivers were satisfied with QuietCare and felt it was easy to use. Only two of the users experienced emergencies; both were detected and users felt the response time was reasonable. Users and caregivers perceived peace of mind as an advantage of using the system. Overall, users were not concerned about privacy invasion in using the system and felt comfortable being monitored with QuietCare. (Full text of this dissertation may be available via the University of Florida Libraries web site. Please check <http://www.uflib.ufl.edu/etd.html>)

101. Jorgensen MG. Assessment of postural balance in community-dwelling older adults - methodological aspects and effects of biofeedback-based Nintendo Wii training. *Danish Medical Journal* 2014;61(1):B4775.

The overall purpose of this thesis was to examine selected methodological aspects and novel approaches for measuring postural balance older adults, and to examine the effects of biofeedback-based Nintendo Wii training on selected physiological, psychological and functional outcome variables in community-dwelling older adults. In Study I balance control was investigated using force plate analysis of Centre of Pressure (COP) excursion during static bilateral standing in 32 community-dwelling older adults at three different time-points (09:00, 12:30, and 16:00) throughout the day. An overall significant time-of-day effect was observed for all selected COP variables. The greatest change in all COP variables was observed (on average ~15%) between midday (12:30) and the afternoon (16:00), indicating that a systematic time-of-day influence on static postural balance exists in community-dwelling older adults. Consequently, longitudinal (i.e. pre-to-post training) comparisons of postural balance in older adults with repeated assessments should be conducted at the same time-of-day. In Study II a novel approach for measuring postural balance (using the Nintendo Wii Stillness and Agility tests) was examined for reproducibility and concurrent validity in 30 community-dwelling older adults. While the Nintendo Wii Stillness test showed a high reproducibility, a systematic learning effect between successive sessions was observed for the Agility test. Moderate-to-excellent concurrent validity was seen for the Stillness test. In contrast, the Agility test revealed a poor concurrent validity. In conclusion, the Wii Stillness test seems to represent a low-cost objective reproducible test of postural balance in community-dwelling older adults and appears feasible in various clinical settings. A habituation (familiarization) period is necessary for the Wii Agility test to avoid a systematic learning effect between successive test sessions. Study III investigated the effect of ten weeks of biofeedback-based Nintendo Wii training on static postural balance, mechanical lower limb muscle function, and functional performance in 58 community-dwelling older adults. Additionally, the

study investigated the participant motivation for this type of training (Exergaming). Marked improvements in maximal leg muscle strength, rapid force capacity and functional performance were observed following the period of biofeedback-based Nintendo Wii training. Unexpectedly, static bilateral postural balance remained unaltered following the period of intervention. The study participants perceived the Nintendo Wii training as enjoyable and highly motivating, which suggests that this type of exercise may be successfully implemented at senior citizens' centers and/or in the home of the elderly. The results presented in this thesis suggest that strict control of time-of-day is an important methodological aspect when evaluating postural balance in older adults, and an assessment protocol using the Nintendo Wii-Balance Board is reproducible and valid. Biofeedback-based Nintendo Wii exercise intervention appeared unsuccessful in improving static bilateral postural balance, most likely due to a test ceiling effect in the selected outcome measures, but the intervention elicited marked positive changes in various key risk factors associated to fall accidents. Notably, Wii based biofeedback exercise was perceived by the older adults as a highly motivating type of training.

102. Jorgensen MG, Laessoe U, Hendriksen C, Nielsen OB, Aagaard P. Efficacy of Nintendo Wii training on mechanical leg muscle function and postural balance in community-dwelling older adults: a randomized controlled trial. *Journals of Gerontology Series A-Biological Sciences & Medical Sciences* 2013;68(7):845-852.

BACKGROUND: Older adults show increased risk of falling and major risk factors include impaired lower extremity muscle strength and postural balance. However, the potential positive effect of biofeedback-based Nintendo Wii training on muscle strength and postural balance in older adults is unknown.

METHODS: This randomized controlled trial examined postural balance and muscle strength in community-dwelling older adults (75+6 years) pre- and post-10 weeks of biofeedback-based Nintendo Wii training (WII, n = 28) or daily use of ethylene vinyl acetate copolymer insoles (controls [CON], n = 30). Primary end points were maximal muscle strength (maximal voluntary contraction) and center of pressure velocity moment during bilateral static stance.

RESULTS: Intention-to-treat analysis with adjustment for age, sex, and baseline level showed that the WII group had higher maximal voluntary contraction strength (18%) than the control group at follow up (between-group difference = 269 N, 95% CI = 122; 416, and p = .001). In contrast, the center of pressure velocity moment did not differ (1%) between WII and CON at follow-up (between-group difference = 0.23 mm(2)/s, 95% CI = -4.1; 4.6, and p = .92). For secondary end points, pre-to-post changes favoring the WII group were evident in the rate of force development (p = .03), Timed Up and Go test (p = .01), short Falls Efficacy Scale-International (p = .03), and 30-second repeated Chair Stand Test (p = .01). Finally, participants rated the Wii training highly motivating at 5 and 10 weeks into the intervention.

CONCLUSIONS: Biofeedback-based Wii training led to marked improvements in maximal leg muscle strength (maximal voluntary contraction; rate of force development) and overall functional performance in community-dwelling older adults. Unexpectedly, static bilateral postural balance remained unaltered with Wii training. The high level of participant motivation suggests that biofeedback-based Wii exercise may ensure a high degree of compliance to home- and/or community-based training in community-dwelling older adults.

103. Juntunen A. Wellness technology in care of the elderly -- a challenge for services [Finnish]. *Sairaanhoitaja* 2005;78(4):28-30.

Introduction of wellness technology has been viewed as a solution to support the managing of aging people in every day life at their homes. The article examines experiences related to introduction of the wellness technology into home care of the elderly. The data was collected from care personnel, family care givers and the elderly through interviews. The findings indicate that knowledge of wellness technology was scarce. Usability and outlook of the aids applying modern information and communication technology were criticized. Personal characteristics of elderly people and teaching methods were affecting the way they learnt to use technology. It was obvious that the integration of teaching content with previous experiences and life history of the elderly was beneficial from the aspect of learning. Introduction of wellness technology changes the way care personnel work, and brings new challenges for their skills.

104. Kamimura T, Ishiwata R, Inoue T. Medication reminder device for the elderly patients with mild cognitive impairment. *American Journal of Alzheimer's Disease & Other Dementias* 2012;27(4):238-242.

Reminder devices reportedly improve medication adherence in the elderly patients with mild dementia; however, the efficacy of such devices remains unexplored. Therefore, a 3-month before and after study with convenience sampling was conducted to determine the efficacy of a medication reminder device used by 18 participants (aged 81.2 + 6.2 years) with Clinical Dementia Rating scores of 0.5 or 1. At the onset of device use, examiners visited the users' homes to ensure that they and their caregivers understood how to use the device. Caregivers monitored its use during the first week. Values of the self-administration medication rate during 1 week for 13 (72.2%) users showed improvement at 3 months. This result revealed that reminder devices can improve medication adherence in the elderly patients with mild cognitive impairment. Further study is needed to assess the magnitude of this improvement and to enhance its support for users with mild cognitive impairment.

105. Kaminsky TA, Dudgeon BJ, Billingsley FF, Mitchell PH, Weghorst SJ. Virtual cues and functional mobility of people with Parkinson's disease: a single-subject pilot study. *Journal of Rehabilitation Research & Development* 2007;44(3):437-448.

In this study, adults with Parkinson's disease (PD) used virtual cueing spectacles (VCS) mimicking kinesiophobia in home and community settings to assess the impact on mobility and participation. We used an ABA single-subject design with repeated measures. Six adults with PD, akinesia, and stage III or IV Hoehn and Yahr rating scale status used VCS in their homes and communities for a week or more. Our main outcome measures included participant counts of losses of balance and freezes, pre-/postintervention completion of the Parkinson's Disease Questionnaire-39, observation of baseline and intervention gait, and an interview regarding user satisfaction with VCS. We also assessed participants' preuse baseline and return to baseline. Use of VCS decreased length of freezes as well as number of freezes for some participants. All participants expressed satisfaction with VCS. VCS shows promise in simulating kinesiophobia to improve the gait of some adults with PD in the home and community.

106. Karmarkar AM, Collins DM, Kelleher A, Cooper RA. Satisfaction related to wheelchair use in older adults in both nursing homes and community dwelling. *Disability & Rehabilitation Assistive Technology* 2009;4(5):337-343.

PURPOSE: Older adults commonly use wheelchairs for mobility impairments regardless of their living situations. However, limited outcomes data are available to determine quality of the wheelchairs that older Americans are receiving, as well as their satisfaction with wheelchair service delivery programs. The purpose of this article was to analyze satisfaction data collected from three cohorts of older individuals living at nursing homes and in community settings. Ninety participants were residents in VA (n = 60).

METHODS: One hundred thirty two older adults completed the standardized Quebec User Evaluation of Satisfaction with Assistive Technology. Ninety participants were residents in VA (n = 30) or private nursing homes (n = 30), and 42 were community dwelling participants. Those enrolled were either independent manual or power wheelchair users.

RESULTS: The community dwelling group reported significantly higher levels of satisfaction with their manual wheelchairs and service delivery when compared with the private nursing home participants (4.3 versus 2.9, p = 0.002). The satisfaction was also higher for VA nursing homes than private (3.9 versus 2.9, p = 0.004). No significant differences were reported for satisfaction levels regarding powered wheelchairs use between three groups.

CONCLUSION: Level of satisfaction should be incorporated as an outcomes measure for evaluating wheelchair prescriptions and service delivery programs. This study also supports the establishment of a re-evaluation process of wheelchair fit as the users' age, to aide in provision of the best quality wheelchairs and service delivery programs.

107. King AC, Ahn DK, Oliveira BM, Atienza AA, Castro CM, Gardner CD. Promoting physical activity through hand-held computer technology. *American journal of preventive medicine* 2008;34(2):138-142.

BACKGROUND: Efforts to achieve population-wide increases in walking and similar moderate-intensity physical activities potentially can be enhanced through relevant applications of state-of-the-art interactive communication technologies. Yet few systematic efforts to evaluate the efficacy of hand-held computers and similar devices for enhancing physical activity levels have occurred. The purpose of this first-generation study was to evaluate the efficacy of a hand-held computer (i.e., personal digital assistant [PDA]) for increasing moderate intensity or more vigorous (MOD+) physical activity levels over 8 weeks in mid-life and older adults relative to a standard information control arm. **DESIGN:** Randomized, controlled 8-week experiment. Data were collected in 2005 and analyzed in 2006-2007. **SETTING/PARTICIPANTS:** Community-based study of 37 healthy, initially underactive adults aged 50 years and older who were randomized and completed the 8-week study (intervention=19, control=18). **INTERVENTION:** Participants received an instructional session and a PDA programmed to monitor their physical activity levels twice per day and provide daily and weekly individualized feedback, goal setting, and support. Controls received standard, age-appropriate written physical activity educational materials. **MAIN OUTCOME MEASURE:** Physical activity was assessed via the Community Healthy Activities Model Program for Seniors (CHAMPS) questionnaire at baseline and 8 weeks. **RESULTS:** Relative to controls, intervention participants reported significantly greater 8-week mean estimated caloric expenditure levels and minutes per week in MOD+ activity (p<0.04). Satisfaction with the PDA was reasonably high in this largely PDA-naive sample. **CONCLUSIONS:** Results from this first-generation study indicate that hand-held computers may be effective tools for increasing initial physical activity levels among underactive adults.

108. Kinney JM, Kart CS, Murdoch LD, Conley CJ. Striving to provide safety assistance for families of elders: the SAFE House project. *Dementia* (14713012) 2004;3(3):351-370.

We describe the process of installing a monitoring system in the homes of 19 families who were caring for a relative with dementia, and evaluating the use of the system for 24 weeks. The system is Internet-based and consists of cameras and sensors that are routed through a controller unit via a broadband-connected computer to a web site. From the web site, text messages indicating sensor activity are sent to a cell phone that alerts caregivers to activity in the home. Specifically, we discuss "behind the scenes" issues associated with bundling the various technologies together and installing and maintaining the technologies in caregivers' homes, describe the challenges that caregivers confronted while using the technology, and summarize caregivers' experiences with the technologies over the 24-week assessment period. Results indicate that, although the use of technology is not without challenge, it has the potential to facilitate family caregiving.

109. Kjekken I, Darre S, Smedslund G, Hagen KB, Nossum R. Effect of assistive technology in hand osteoarthritis: a randomised controlled trial. *Annals of the Rheumatic Diseases* 2011;70(8):1447-1452.

Objective Hand osteoarthritis (HOA) is a common joint disorder with an expected rise in prevalence due to the increasing ageing population, but with few available effective treatment options. The main aim of this study was to evaluate the effect of assistive technology (AT) in patients with HOA. Methods In this observer-blinded, randomised controlled trial, 35 patients with HOA (AT group) received provision of information and AT (assistive devices and splints), while 35 patients received information only (control group). Primary outcomes were activity performance and satisfaction with performance, measured by the Canadian occupational performance measure (COPM) on a 1-10 scale. Secondary outcomes included measures of disease activity, pain, fatigue and function. Outcome assessments were made at 3 months follow-up. Results Of 70 participants randomised, 66 participants completed all assessments. Provision of AT was associated with improvement in the COPM performance score (mean difference (95% CI) in change scores 1.8 (1.1 to 2.6) and in the satisfaction score (1.7 (0.7 to 2.6)), indicating a moderate to large treatment effect (effect sizes 0.9). There was a significant improvement in the Australian/Canadian hand index function score in the AT group after 3 months (-0.4, $p < 0.001$), and an adjusted mean difference between groups of -0.3 ($p = 0.06$, effect size -0.5). No other differences were found in the secondary outcomes. Self-reported AT usage rate in the AT group was 92%, and participants rated their comfort with AT usage as high. Conclusions Use of AT is well tolerated and significantly improves activity performance and satisfaction with performance in patients with HOA. The trial is registered in the ISRCTN register (ISRCTN40357804).

110. Knight E, Stuckey MI, Petrella RJ. Physical activity prescription and remote self-monitoring technologies: Can we reduce cardiovascular disease risk? *Canadian Journal of Diabetes* 2013;37:S48.

Background: An increasingly aged, overweight and sedentary population has resulted in epidemics of cardiovascular risk factors including hypertension and type 2 diabetes. Previous studies from our research group have demonstrated the efficacy of self-monitoring using remote technologies to manage body weight (BW), blood pressure (BP) and fasting plasma glucose (BG) among patients with or at risk for type 2 diabetes and metabolic syndrome.

The purpose of this study was to test the effectiveness of a home health monitoring study with tailored exercise prescription targeting changes in various intensities of physical activity (PA) (e.g. exercise, sedentary behaviour or both). Method: Forty-five overweight older adults (55 to 75 years) were randomized to 3 intervention groups defined by PA prescription (i.e. exercise, sedentary, comprehensive). All participants were provided with a home health monitoring technology kit, including a pedometer, glucometer and BP monitor, and devices were paired with a study smartphone for self-monitoring over a 12-week intervention period. Results: Data presented as mean + SD. There were no differences between groups at baseline for age, sex distribution, BG, BP, BW or PA ($p > 0.05$). Activity prescription in conjunction with self-monitoring improved BP (pre: 131+16/83+10 mm Hg; post 127+14/79+9 mm Hg) and BW (pre: 87+21 kg; post: 85+20 kg) ($p < 0.05$), with a trend toward improved BG (pre: 6.5+1.5 mmol/L; post: 6.2+1.1 mmol/L, $p = 0.078$). There was no effect for PA, and no differences between groups ($p > 0.05$). Conclusion: Results support the use of remote technologies for self-monitoring of cardiovascular risk markers among overweight older adults.

111. Korotchenko A, Hurd Clarke L. Power mobility and the built environment: the experiences of older Canadians. *Disability & Society* 2014;29(3):431-443.

In this article, we employ data from qualitative interviews with 15 men and 14 women aged 51-92 to examine older Canadian adults' experiences of utilizing power wheelchairs and motorized scooters in the context of the built environment. When functioning properly and utilized within accessible spaces, power mobility devices provided many of the participants with the autonomy they desired. However, the features and functionality of power mobility equipment also constrained participants' abilities to negotiate their surroundings and maintain valued social roles and physical activities. Participants' experiences of power mobility technology as enabling or disabling were further complicated by the organization of the built environment, as the men and women described encountering various barriers to mobility within both public and private spaces. We discuss our findings in relation to the extant literature concerning the social and spatial construction of disability. Adapted from the source document.

112. Kutinara B, et al. Design and evaluation of a kitchen for persons with visual impairments. *Disability and Rehabilitation: Assistive Technology* 2013;8(2):136-139.

Visually impaired people need skills on daily living, such as cooking, and Ratchasuda College offers independent living training for them. In order to fulfill their needs, a suitable kitchen should be designed with the consideration of their limitations. The objective of this study was to design and evaluate a kitchen for persons with visual impairments. Before designing the kitchen, interviews and an observation were carried out to obtain information on the needs of blind and low vision persons. Consequently, a kitchen model was developed, and it was evaluated by 10 persons with visual impairments. After the design improvement, the kitchen was built and has been routinely used for training persons with visual impairments to prepare meals. Finally, a post-occupancy evaluation of the kitchen was conducted by observing and interviewing both trainers and those with visual impairments during the food preparation training. The results of the study indicated that kitchens for persons with visual impairments should have safety and usability features. The results of the post-occupancy evaluation showed that those who attended cooking courses were able to cook safely in the kitchen. However, the kitchen still had limitations in some features.

113. Lachapelle Y, Therrien-Belec M, Lussier-Desrochers D, Caouette M, Guilmette M. Promoting self-determination through innovative iPhone/iPad applications. *Journal of Intellectual Disability Research* 2012;56 (7-8):767.

Aim: Since 2008, the Self-Determination Support Technologies (SDST) Research Chair conducted projects to assess the utility of assistive technologies regarding self-determination of people with an intellectual disability. One area of research focuses on mobile technologies such as Smartphones, iPhone PC Tablets, iPad, and handhelds. **Method:** We conducted a 2-year project using smartphones equipped with AbleLink 'Pocket Compass' software to help individuals with intellectual disabilities (ID) to complete tasks within home and work settings. **Results:** Positive results indicated the technology was very useful in assisting 15 participants with ID to complete targeted tasks at home and at work. It made it easier for them to remember required steps. However, this technology was only available in English and required users to use a computer to build tasks before uploading items to the Smartphone. Based on the research results and recommendations from users and their relatives, we completed a list of modifications. Unable to accomplish this we decided that it would be great to establish a partnership with a local company to achieve this. Through several meetings, brainstorming sessions, and collaborative work we were able to create an iPhone/ iPad application. **Conclusions:** This paper will highlight the study main results and present the application.

114. Lacoste M, Weiss-Lambrou R, Allard M, Dansereau J. Powered tilt/recline systems: why and how are they used? *Assistive Technology* 2003;15(1):58-68.

Prolonged static sitting can lead to discomfort, pain, pressure sores, spinal curvatures, and loss of functional independence. In order to counteract these harmful effects, adjustable tilt and/or recline systems are often prescribed. Considering the current context of assistive technology service delivery and budget cuts, it is essential to have a better knowledge of the use of these technical aids and user's satisfaction with them. The purpose of this study was to characterize the use of powered tilt and recline systems. A questionnaire was developed for this purpose, and 40 subjects were interviewed at home. They were asked to identify, from a list of 25 objectives, the reasons for which they used their repositioning system and to rank these reasons in order of importance. For each objective, they were also asked to identify the frequency and range of use as well as their satisfaction level with their system. Results revealed that 97.5% of the subjects were using their powered tilt and recline system everyday, and their satisfaction was high. The main objectives for using this type of assistive technology were to increase comfort and to promote rest. Although mainly descriptive, results are of clinical relevance and can be helpful when selecting wheelchairs.

115. Laffont I, Dumas C, Pozzi D, Ruquet M, Tissier AC, Lofaso F, et al. Home trials of a speech synthesizer in severe dysarthria: Patterns of use, satisfaction, and utility of word prediction. *Journal of Rehabilitation Medicine* 2007;39(5):399-404.

Objective: The aim of this study was to evaluate a speech synthesizer with respect to patterns of use and satisfaction, during a 2-month trial at home, and the usefulness of the word prediction function. **Design:** Prospective study. **Participants:** Of the 24 patients with severe dysarthria recruited, 10 completed the study. Five patients had cerebral palsy, 3 amyotrophic lateral sclerosis, one locked-in syndrome, and one anoxic brain damage. Mean age was

32 (standard deviation 21) years (range 9-66 years). Methods: Each participant received 10 hours of training with the device (Dialo((R))) and then used it at home for 2 months. The main outcome measures were: level of use recorded by the device, Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST) satisfaction score (maximum = 5), and time needed to take dictations of standard-dictionary and personal-dictionary words with and without word prediction. Results: Level of use varied widely across participants. Overall satisfaction at the end of the home trial was high, with a mean QUEST score of 3.4 (SD 1) and was related to the level of use of the device. Level of satisfaction at the end of the training session could not predict the level or use at home. No significant differences were found in dictation-taking times with and without word prediction. However, 6 of the 10 patients took dictation faster with than without word prediction. Conclusion: This study provides the first evidence supporting the benefits of a speech synthesizer used at home for several weeks. Word prediction is useful for some patients even if increase in dictation speed did not reach significance.

116. Lim I, van Wegen E, Jones D, Rochester L, Nieuwboer A, Willems AM, et al. Does cueing training improve physical activity in patients with Parkinson's disease? *Neurorehabilitation & Neural Repair* 2010;24(5):469-477.

BACKGROUND: Patients with Parkinson's disease (PD) are encouraged to stay active to maintain their mobility. Ambulatory activity monitoring (AM) provides an objective way to determine type and amount of gait-related daily activities.

OBJECTIVE: To investigate the effects of a home cueing training program on functional walking activity in PD.

METHODS: In a single-blind, randomized crossover trial, PD patients allocated to early intervention received cueing training for 3 weeks, whereas the late intervention group received training in the following 3 weeks. Training was applied at home, using a prototype cueing device. AM was applied at baseline, 3, 6, and 12 weeks in the patient's home, to record body movements. Postures and motions were classified as percentage of total time spent on (a) static activity, further specified as % sitting and % standing, and (b) % dynamic activity, further specified as % walking, % walking periods exceeding 5 seconds ($W>5s$) and 10 seconds ($W>10s$). Random coefficient analysis was applied.

RESULTS: A total of 153 patients participated in this trial. Significant improvements were found for dynamic activity ($\beta = 4.46$; $P < .01$), static activity ($\beta = -3.34$; $P < .01$), walking ($\beta = 4.23$; $P < .01$), $W>5s$ ($\beta = 2.63$; $P < .05$), and $W>10s$ ($\beta = 2.90$; $P < .01$). All intervention effects declined significantly at 6 weeks follow-up.

CONCLUSION: Cueing training in PD patients' own home significantly improves the amount of walking as recorded by AM. Treatment effects reduced after the intervention period, pointing to the need for permanent cueing devices and follow-up cueing training.

117. Lindberg B, Nilsson C, Zotterman D, Soderberg S, Skar L. Using Information and Communication Technology in Home Care for Communication between Patients, Family Members, and Healthcare Professionals: A Systematic Review. *International Journal of Telemedicine & Applications* 2013;2013:461829.

Introduction. Information and communication technology (ICT) are becoming a natural part in healthcare both for delivering and giving accessibility to healthcare for people with chronic illness living at home. **Aim.** The aim was to review existing studies describing the use of ICT in home care for communication between patients, family members, and healthcare professionals.

Methods. A review of studies was conducted that identified 1,276 studies. A selection process and quality appraisal were conducted, which finally resulted in 107 studies. Results. The general results offer an overview of characteristics of studies describing the use of ICT applications in home care and are summarized in areas including study approach, quality appraisal, publications data, terminology used for defining the technology, and disease diagnosis. The specific results describe how communication with ICT was performed in home care and the benefits and drawbacks with the use of ICT. Results were predominated by positive responses in the use of ICT. Conclusion. The use of ICT applications in home care is an expanding research area, with a variety of ICT tools used that could increase accessibility to home care. Using ICT can lead to people living with chronic illnesses gaining control of their illness that promotes self-care.

118. Loe M. Doing it my way: old women, technology and wellbeing. *Sociology of Health & Illness* 2010;32(2):319-334.

This article focuses on women in their nineties (nonagenarians) who are ageing in place - or ageing at home - in upstate New York. I analyse these old women's use of everyday technological tools to care for themselves and construct meaning. I argue that despite what we may expect, nonagenarian women can be and are technogenarians in their active and creative uses of everyday technologies. Old women utilise lifelong care work repertoires to identify, adjust, use and reject old and new technologies for their own everyday mobility, communication, nourishment, and physiological health. Perhaps most importantly techno-savvy elders can maintain and achieve health and wellbeing, associated here with bodily comfort, social networks, self-efficacy and intellectual life, in and beyond their homes. In these ways, nonagenarians can teach us how household technologies can be health and ageing technologies; instruments of continuity and control; or just the opposite.

119. Long SO. Bodies, Technologies, and Aging in Japan: Thinking About Old People and Their Silver Products. *Journal of Cross-Cultural Gerontology* 2012;27(2):119-137.

Contemporary Japan is known both for its high tech culture and its rapidly aging population, with 22 % of people currently 65 years and older. Yet there has been little attention to the material culture of the elderly. This paper explores the way aging bodies, official ideology, and consumption of what are called "assistive devices" and "life technologies" come together in the experience of frail old people who depend not only on human caregivers but on "things" such as walkers, kidney dialysis machines, and electric massage chairs. It begins to consider the questions: What technology to aid failing bodies is available, and to whom? How does the advocacy of independence create new forms of consumption? How do "things" mediate ideological change regarding elder care and help to create new understandings of self and one's relation to others? Data come from interviews conducted in 2003-2007 as part of a study of elder care in Japan under the public long term care insurance system that began in 2000. These interviews point both to acceptance of the technology as a way to avoid over-dependence on caregivers, and to resistance to the limitations of aging and to its 21st century definition by the state. Adapted from the source document.

120. Lupton D, Seymour W. Technology, selfhood and physical disability. *Social Science & Medicine* 2000;50(12):1851-1862.

Much has been written in recent times of the interface between technologies and the human body. The vast majority of this literature, however, focuses on

a body that is assumed to be free of physical disability. This article seeks to address this lacuna by presenting findings from an exploratory study using in-depth interviews with fifteen people with physical disabilities living in the Australian city of Adelaide. The dominant research question was to explore the ways in which technologies contribute to the meanings and experiences of the lived body/self with disabilities. The data showed that the interviewees identified several technologies that they used as highly beneficial to allowing them to transcend some aspects of their disabilities. However, the interviewees also identified significant negative aspects to the use of some technologies. They noted that such technologies could serve to mark out people with disabilities as 'different' or 'lacking', acting as a barrier to the achievement and presentation of their preferred body/self. (C) 2000 Elsevier Science Ltd. All rights reserved.

121. Macdonald SJ, Clayton J. Back to the future, disability and the digital divide. *Disability & Society* 2013;28(5):702-718.

The aim of this article is to explore disability and the digital divide using a quantitative methodology. The research investigates what impact digital technologies have had in improving the life-chances for disabled people from deprived neighbourhoods in the northeast of England. The study explores how disabled people engage with digital and assistive technologies in order to overcome disabling barriers and social exclusion. Unfortunately, the analysis found no evidence that digital and assistive technologies had any impact on reducing social exclusion for disabled people. In fact, the research discovered that these technologies seemed to construct new forms of disabling barriers as a consequence of the digital divide. Adapted from the source document.

122. Mann WC, Goodall S, Justiss TD, Tomita M. Dissatisfaction and nonuse of assistive devices among frail elders. *Assistive Technology* 2002;14(2):130-139.

This article is based on the Rehabilitation Engineering Research Center on Aging Consumer Assessments Study. The sample included 1,056 subjects who reported use or nonuse of assistive devices. Of these subjects, 873 identified reasons for not using or being dissatisfied with certain assistive devices. Study participants owned a mean of 14.2 assistive devices, used 84.8% of the devices they owned, and were satisfied with 84.2% of the devices they owned. Devices were grouped into categories based on the type of impairment they addressed (hearing, vision, cognitive, and musculoskeletal/neuromotor). Study participants owned the largest number of devices in the musculoskeletal/neuromotor category (mean of 10.6 devices). Devices in the hearing impairment category were rated lowest by participants in terms of satisfaction. Almost half of all reasons listed for not using certain assistive devices related to perceived lack of need.

123. Martin S, Augusto JC, McCullagh P, Carswell W, Zheng H, Wang H, et al. Participatory Research to Design a Novel Telehealth System to Support the Night-Time Needs of People with Dementia: NOCTURNAL. *International Journal of Environmental Research and Public Health* 2013;10(12):6764-6782.

Strategies to support people living with dementia are broad in scope, proposing both pharmacological and non-pharmacological interventions as part of the care pathway. Assistive technologies form part of this offering as both stand-alone devices to support particular tasks and the more complex offer-

ing of the smart home to underpin ambient assisted living. This paper presents a technology-based system, which expands on the smart home architecture, orientated to support people with daily living. The system, NOCTURNAL, was developed by working directly with people who had dementia, and their carers using qualitative research methods. The research focused primarily on the nighttime needs of people living with dementia in real home settings. Eight people with dementia had the final prototype system installed for a three month evaluation at home. Disturbed sleep patterns, night-time wandering were a focus of this research not only in terms of detection by commercially available technology but also exploring if automated music, light and visual personalized photographs would be soothing to participants during the hours of darkness. The NOCTURNAL platform and associated services was informed by strong user engagement of people with dementia and the service providers who care for them. NOCTURNAL emerged as a holistic service offering a personalised therapeutic aspect with interactive capabilities.

124. Martin S, Kelly G, Kernohan WG, McCreight B, Nugent C. Smart home technologies for health and social care support. *Cochrane Database of Systematic Reviews* 2008(4).

Background The integration of smart home technology to support health and social care is acquiring an increasing global significance. Provision is framed within the context of a rapidly changing population profile, which is impacting on the number of people requiring health and social care, workforce availability and the funding of healthcare systems. **Objectives** To explore the effectiveness of smart home technologies as an intervention for people with physical disability, cognitive impairment or learning disability, who are living at home, and to consider the impact on the individual's health status and on the financial resources of health care. **Search strategy** We searched the following databases for primary studies: (a) the Cochrane Effective Practice and Organisation of Care (EPOC) Group Register, (b) the Cochrane Central Register of Controlled Trials (CENTRAL), (The Cochrane Library, issue 1, 2007), and (c) bibliographic databases, including MEDLINE (1966 to March 2007), EMBASE (1980 to March 2007) and CINAHL (1982 to March 2007). We also searched the Database of Abstracts of Reviews of Effectiveness (DARE). We searched the electronic databases using a strategy developed by the EPOC Trials Search Co-ordinator. **Selection criteria** We included randomised controlled trials (RCTs), quasi-experimental studies, controlled before and after studies (CBAs) and interrupted time series analyses (ITS). **Participants** included adults over the age of 18, living in their home in a community setting. Participants with a physical disability, dementia or a learning disability were included. The included interventions were social alarms, electronic assistive devices, telecare social alert platforms, environmental control systems, automated home environments and 'ubiquitous homes'. **Outcome measures** included any objective measure that records an impact on a participant's quality of life, healthcare professional workload, economic outcomes, costs to healthcare provider or costs to participant. We included measures of service satisfaction, device satisfaction and healthcare professional attitudes or satisfaction. **Data collection and analysis** One review author completed the search strategy with the support of a life and health sciences librarian. Two review authors independently screened titles and abstracts of results. **Main results** No studies were identified which met the inclusion criteria. **Authors' conclusions** This review highlights the current lack of empirical evidence to support or refute the use of smart home technologies within health and social care, which is significant for practitioners and healthcare consumers.

125. McCaig M, Waugh A, Duffy T, Martin CR. The lived experience of older people using assistive technology. *Working with Older People: Community Care Policy & Practice* 2012;16(4):170-174.

Purpose – Little is known about the lived experience of the older user of assistive technology. The aim of the investigation is to gain an appreciation of the experience of assistive technology (AT) in older people. **Design/methodology/approach** – Qualitative phenomenology was conducted on individual interviews undertaken using a Husserlian phenomenological approach. The participants were six individuals, >65 years who all lived in supported housing. **Findings** – Six key themes emerged from interviews: being unsure; being old; being a bother; being on my own; being neighbourly and being independent. **Social implications** – Reactions to assistive technology are highly individualised and salient. In order to humanise the technology it is necessary to understand the person who is using it. Further research in this area is a priority as AT evolves and matures. **Originality/value** – This study offers a novel insight into a neglected but important area of concern for older people.

126. McCreadie C, Tinker A. The acceptability of assistive technology to older people. *Ageing and Society* 2005;25:91-110.

Assistive technology (AT) is defined in this paper as 'any device or system that allows an individual to perform a task that they would otherwise be unable to do, or increases the ease and safety with which the task can be performed' (Cowan and Turner-Smith 1999). Its importance in contributing to older people's independence and autonomy is increasingly recognised, but there has been little research into the viability of extensive installations of AT. This paper focuses on the acceptability of AT to older people, and reports one component of a multidisciplinary research project that examined the feasibility, acceptability, costs and outcomes of introducing AT into their homes. Sixty-seven people aged 70 or more years were interviewed in-depth during 2001 to find out about their use and experience of a wide range of assistive technologies. The findings suggest a complex model of acceptability, in which a 'felt need' for assistance combines with 'product quality'. The paper concludes by considering the tensions that may arise in the delivery of acceptable assistive technology.

127. Miller KJ, Adair BS, Pearce AJ, Said CM, Ozanne E, Morris MM. Effectiveness and feasibility of virtual reality and gaming system use at home by older adults for enabling physical activity to improve health-related domains: a systematic review. *Age & Ageing* 2014;43(2):188-195.

BACKGROUND: use of virtual reality and commercial gaming systems (VR/gaming) at home by older adults is receiving attention as a means of enabling physical activity.

OBJECTIVE: to summarise evidence for the effectiveness and feasibility of VR/gaming system utilisation by older adults at home for enabling physical activity to improve impairments, activity limitations or participation.

METHODS: a systematic review searching 12 electronic databases from 1 January 2000-10 July 2012 using key search terms. Two independent reviewers screened yield articles using pre-determined selection criteria, extracted data using customised forms and applied the Cochrane Collaboration Risk of Bias Tool and the Downs and Black Checklist to rate study quality.

RESULTS: fourteen studies investigating the effects of VR/gaming system use by healthy older adults and people with neurological conditions on activity limitations, body functions and physical impairments and cognitive and emotional well-being met the selection criteria. Study quality ratings were

low and, therefore, evidence was not strong enough to conclude that interventions were effective. Feasibility was inconsistently reported in studies. Where feasibility was discussed, strong retention (>70%) and adherence (>64%) was reported. Initial assistance to use the technologies, and the need for monitoring exertion, aggravation of musculoskeletal symptoms and falls risk were reported.

CONCLUSIONS: existing evidence to support the feasibility and effectiveness VR/gaming systems use by older adults at home to enable physical activity to address impairments, activity limitations and participation is weak with a high risk of bias. The findings of this review may inform future, more rigorous research.

128. Mirza M, Hammel J. Consumer-Directed Goal Planning in the Delivery of Assistive Technology Services for People who are Ageing with Intellectual Disabilities. *Journal of Applied Research in Intellectual Disabilities* 2009;22(5):445-457.

Background A consumer-directed service-delivery approach to assistive technology and environmental modification intervention was examined with people who were ageing with intellectual disabilities. **Material and Methods** The intervention was based on a collaborative approach involving consumers, their social supports and service deliverers. Thirty individuals were randomly selected to receive the intervention from a sample of 75 community-dwelling adults. Outcomes related to consumers' and significant others' perceptions of performance and satisfaction with goal attainment were assessed and the consumer-directed goal planning process examined. **Results** Participants in the intervention group reported significantly higher levels of performance and satisfaction related to goals identified at baseline than participants in the control group. Two broad categories of goals were addressed during the intervention - basic self-care goals and participation/environmental/systems level goals. A 98% direct agreement rate between consumer-identified goals and goals addressed by service deliverers was found during the intervention. Of the environmental strategies employed during the intervention, assistive devices and systems level advocacy and action were the two most frequently used across goals. **Conclusion** Results provide evidence in favour of a consumer-directed approach to assistive technology and environmental modification service delivery for consumers who are ageing with intellectual disabilities.

129. Mitseva A, Peterson CB, Karamberi C, Oikonomou L, Ballis AV, Giannakakos C, et al. Gerontechnology: providing a helping hand when caring for cognitively impaired older adults-intermediate results from a controlled study on the satisfaction and acceptance of informal caregivers. *Current Gerontology & Geriatrics Research* 2012;2012:401705.

The incidence of cognitive impairment in older age is increasing, as is the number of cognitively impaired older adults living in their own homes. Due to lack of social care resources for these adults and their desires to remain in their own homes and live as independently as possible, research shows that the current standard care provisions are inadequate. Promising opportunities exist in using home assistive technology services to foster healthy aging and to realize the unmet needs of these groups of citizens in a user-centered manner. ISISEMD project has designed, implemented, verified, and assessed an assistive technology platform of personalized home care (telecare) for the elderly with cognitive impairments and their caregivers by offering intelligent home support services. Regions from four European countries have carried out long-term pilot-controlled study in real-life conditions. This paper

presents the outcomes from intermediate evaluations pertaining to user satisfaction with the system, acceptance of the technology and the services, and quality of life outcomes as a result of utilizing the services.

130. Moy ML, Weston NA, Wilson EJ, Hess ML, Richardson CR. A pilot study of an Internet walking program and pedometer in COPD. *Respiratory Medicine* 2012;106(9):1342-1350.

BACKGROUND: Higher levels of physical activity are associated with better functional status, fewer hospital admissions, and lower mortality. In this pilot study, we examined the feasibility and safety of a novel program that combines a pedometer with a website to increase walking.

METHODS: 27 persons with stable COPD wore the Omron HJ-720ITC pedometer and used the website for 90 days. They uploaded step-count data to the study server using their home computer and received an email each week with their individualized step-count goal. The website provided step-count feedback, education, and motivational content. Subjects participated in a monthly semi-structured interview by telephone. Subjects reported changes in medical condition by telephone or on the website. Paired T-tests assessed change in daily step counts.

RESULTS: Subjects were males, mean age 72 + 8 years, with moderate COPD, FEV(1) 1.57 + 0.48 L (55 + 16% predicted). 87% and 65% reported no problems using the pedometer and website, respectively. At month 3, 96% reported it was true that they knew their step count goal every day, and 52% reported that they were able to reach their goal. 95% of participants said they would recommend the walking program to another person with COPD. Eight subjects experienced breathing problems unrelated to the intervention. In 24 subjects with step counts at baseline and month 3, there was a significant increase of 1263 steps per day (approximately 1.0 km), $p = 0.0054$.

CONCLUSIONS: The use of a website and pedometer was feasible and safe, and persons increased their daily walking. Published by Elsevier Ltd.

131. Mukherjee D. An exploratory study of older adults' engagement with virtual volunteerism. *Journal of Technology in Human Services* 2010;28(3):188-196.

Virtual volunteering refers to the use of the Internet for volunteer services. The purpose of this study was to explore the participation of older adults (aged 60 years and older) in virtual volunteering activities partially or totally from home or other off-site locations. The study collected data using semi-structured, open-ended interviews with nine older virtual volunteers affiliated with SeniorNet, an organisation that facilitates virtual volunteering for older people. The findings included: all volunteers in the study had enjoyed Internet activities before being introduced to volunteering opportunities online, seven participants said that they opted for virtual volunteering primarily because of the flexibility of time it offers to perform volunteering tasks, five participants looked for Internet opportunities because they could not find organisations in their local area working on issues that interested them, and participants with chronic illness and mobility difficulties identified the Internet as the only avenue for them to engage in volunteering. The author concludes that the findings demonstrate that the use of computers for volunteering generates social engagement for older adults, especially those with mobility problems.

132. Mullen EC. EFFECT OF TELEPHONE COUNSELING ON PHYSICAL ACTIVITY AMONG OLDER ADULT CANCER SURVIVORS. University of Texas at Tyler. Tilgjengelig fra: <http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=2012390089&site=ehost-live>.

The elderly population, especially those with cancer coupled with low health literacy, is at high risk for poor health outcomes. Telephone counseling has been shown to be effective in improving health behaviors among other populations, but it has not been studied for older adult cancer survivors. The purpose of this mixed methods study was to examine the effectiveness of telephone counseling on physical activity among older adult cancer survivors (n=50). The relationship between health literacy level and perceived changes in physical activity was assessed. Based on existing literature and Orem's Theory of Self-care, the following hypotheses were tested: H1: Telephone counseling intervention will improve physical activity of elderly cancer survivors. H2: Among older adult cancer survivors, there will be an inverse relationship between health literacy level and improved physical activity. A one-way paired t-test was used to test pre- and post-intervention activity levels. The relationship between level of health literacy and improved physical activity was evaluated using Spearman's rho. Elderly cancer survivors' perceptions of the challenges, barriers, and beneficial elements of being physically active were assessed using content analysis. One-way paired t-test revealed no significant improvement in older cancer survivors' physical activity level after telephone counseling. Spearman's rho also revealed no significant improvement in the physical activity levels of older cancer survivors with limited health literacy. Although the quantitative data analysis did not reach significance, the open-ended questions revealed that the telephone counseling was beneficial. It provided education and information about physical activity in cancer recovery, provided motivation and promoted accountability, self-encouragement and sustainability.

133. Muller IM, Buchholz M, Ferm U. Text messaging with picture symbols - experiences of seven persons with cognitive and communicative disabilities. *Journal of Assistive Technologies* 2010;4(4):11-23.

A three year project in Sweden is looking at ways of increasing participation for persons with cognitive and communication disabilities. It has a particular focus on text messaging with picture symbols. Three men and four women were given one of two available phone devices that met the aims of the project and their needs; the Micro Rolltalk or the Handifon. Tailored software included a picture symbol database and speech synthesis. Clients' professional and social support networks were instructed in how the equipment was to be used. Semi-structured interviews investigated satisfaction with the mobile phone, handling the phone, involvement in daily life and project participation. At this point participants had been using their phones for between 7 and 13 months. The researchers experienced the anticipated challenges associated with interviewing people with cognitive impairments. Scale and yes/no questions were more easily answered than open questions. A compromise was found in the use of "Talking Mats" (textured mats with topic pictures and visual scales). Overall most participants were satisfied with their mobile phones, found them easy to handle, and liked to use them for a variety of purposes, not just text messaging. All except one wanted to continue to use them after the project ended.

134. Murphy J, Gray CM, Cox S. Talking mats: the effectiveness of a low technology communication framework to help people with dementia express their views. *Journal of Assistive Technologies* 2007;1(2):30-34.

The aims of this project were to establish whether Talking Mats, a low tech communication framework, helps people with dementia to communicate and examine how effective the Talking Mats framework is for people at different

stages of dementia. The project was carried out over 15 months at the University of Stirling, Scotland. Thirty-one people at three stages of dementia were interviewed about their well-being under three interview conditions - an unstructured (ordinary) conversation, a structured conversation and using the Talking Mats framework. The results indicate that conversations using the Talking Mats framework improved communication for people at all stages of dementia but that not all people at late-stage dementia could use the Talking Mats framework effectively. The researchers concluded that the Talking Mats framework may therefore play an important role in improving quality of care by providing a simple low-cost tool that family and staff can use to engage with people with dementia and help them express their views about a range of topics.

135. Nguyen T, Garrett R, Downing A, Walker L, Hobbs D. Telecommunications access--matching available technologies to people with physical disabilities. *Australasian Physical & Engineering Sciences in Medicine* 2006;29(1):87-97.

People with a disability do not have equitable access to the modern telecommunication medium. Many experience difficulty typing, handling the phone, dialling or answering calls. For those who are unable to speak, the only option is to type messages using whatever functional control site exists on their body. The provision of accessible mobile phones for people with disabilities can significantly improve their quality of life through an increased range of accessible activities, and can improve their independence, safety, security and self-esteem. This research was aimed at providing practical ways for people with a disability to participate in the extensive community of home and mobile phone users. The outcomes of ten participants taking part in the evaluation and trial of off-the-shelf telecommunication options are presented. Nine out of ten participants showed high to very high results in terms of their overall performance and satisfaction with the use of the telecommunication equipment provided. With the right policies, processes and support through equipment matching, education, training and delivery, current off-the-shelf solutions can help people with disabilities to effectively communicate with other members of our society and to access the same range of information systems and services enjoyed by able-bodied members of the community.

136. Nygard L, Starkhammar S. The use of everyday technology by people with dementia living alone: Mapping out the difficulties. *Aging & Mental Health* 2007;11(2):144-155.

While the technological development available to society is taking quantum leaps, we have little knowledge of how people with mild dementia manage to cope with familiar technology at home, such as television and electronic household machines, or new technology, such as remote controls, cell phones and computers. As this technology represents a potential problem area, the aim of this qualitative, exploratory study was to identify and characterize difficulties with and hindrances to using everyday technology, as they appeared in data, for persons with early stage dementia. Eight participants with dementia were included in an extensive data collection consisting of repeated interviews and observations made in the home; the data were analyzed adopting a constant comparative approach. The results exhibit a taxonomy of difficulties in four domains, encompassing conditions that interfere with the use of the technology, deficiencies in knowledge and in the communication between users and their technology, and limitations in the use of instructions. Typically, difficulties appeared in complex combinations. They arose when familiar technology was being used, and not only when new technology was to be used. This raised concerns about the need these people have for

support in home and in society. Further research is needed to validate the findings.

137. O'Brien T. Mobile Health Technology Interventions to Improve the Health Status of Older Rural Women. Medical University of South Carolina. Tilgjengelig fra: <http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=2012461350&site=ehost-live>.

Purpose: This dissertation explores obesity among older women living in the Appalachian region and how the use of mobile health technology can assist with behavioral change through the use of technology assisted self-care management.

Design: The concept of obesity was clarified using a dimensional analysis approach. Focus groups were used to collect qualitative data to explore social and contextual factors for influencing obesity. A cross-sectional survey was conducted to collect pilot data pertaining to the accessibility and usage of technology among older adults living in Western, North Carolina, and a feasibility study was used to test a mobile health Internet weight loss program.

Conclusions: Appalachian women are at a great risk for obesity and chronic disease due to limited access to healthcare. A solution to help decrease obesity among a population with limited healthcare access is the use of free mobile technology. This dissertation demonstrates the feasibility for high retention and adherence rates for the use of mobile technology providing group social support to older obese Appalachian women living in two different counties of Western, North Carolina. In addition, weight loss, improved glucose control, and improved minutes of reported weekly physical activity were observed among these women indicating preliminary efficacy of using a free mobile Internet technology for weight loss.

Clinical Relevance: Mobile technology appears to offer many features for improving health knowledge and communication among older Appalachian women and their healthcare providers.

138. Ocepek J, Roberts AE, Vidmar G. Evaluation of treatment in the Smart Home IRIS in terms of functional independence and occupational performance and satisfaction. *Computational & Mathematical Methods in Medicine* 2013;2013:926858.

The development of assistive technologies, home modifications, and smart homes has rapidly advanced in the last two decades. Health professionals have recognised the benefits of these technologies in improving individual's quality of life. The Smart Home IRIS was established in 2008 within the University Rehabilitation Institute in Ljubljana with the aim to enable persons with disabilities and elderly people to test various assistive technologies and technical solutions for their independent living. We investigated the effect of treatments in the Smart Home IRIS. A convenience sample of 59 persons with disabilities and elderly people (aged 24-81 years) who were treated in the Smart Home IRIS from April to December 2011 participated. Standardised instruments--the Canadian Occupational Performance Measure (COPM) and the Functional Independence Measure (FIM)--were administered at the first assessment in the Smart Home IRIS and at a second assessment at the participant's home after 6-12 months. All the outcomes statistically significantly improved from the first to the second assessment. The treatments in the Smart Home IRIS appeared to contribute to higher occupational performance and satisfaction with performance and higher functional independence of persons with disabilities and elderly people.

139. Olsson A, Engstrom M, Skovdahl K, Lampic C. My, your and our needs for safety and security: relatives' reflections on using information and communication technology in dementia care. *Scandinavian Journal of Caring Sciences* 2012;26(1):104-112.

Aim: The present paper reports on a study aimed at describing relatives' reflections on different kinds of information and communication technology (ICT) devices that are used or can be used in the daily care of persons with dementia. **Background:** Many persons with dementia continue living in their own homes, which requires the support of their relatives. One way to meet the needs of relatives and persons with dementia is to use ICT. **Methods:** An interview study was conducted in Sweden (2007-2008) with a purposive sample of 14 spouses of a person with dementia. Qualitative content analysis was used to identify categories and themes in the data. **Findings:** Relatives' reflections on the use of ICT were described as ICT - a support in daily life, ICT - internal and external conditions and ICT - the decision to use or not use. Based on these categories, a theme was revealed: shifting between different perspectives: my, your and our needs for safety and security. **Conclusion:** Relatives struggle to create a situation of safety and security in daily life for themselves and the persons with dementia. ICT devices with the right functionality and used at the right time are regarded as useful in solving everyday problems. In the decision to use or not use ICT, the opportunity to create a safe and secure environment overshadows potential ethical problems. Providing early information about ICT to persons with dementia and their relatives could facilitate joint decision-making regarding use of ICT.

140. O'Neill B, Moran K, Gillespie A. Scaffolding rehabilitation behaviour using a voice-mediated assistive technology for cognition. *Neuropsychological Rehabilitation* 2010;20(4):509-527.

A variety of cognitive deficits can lead to difficulties performing complex behavioural sequences and thus, disability in the performance of routine and rehabilitation behaviours. Interventions to date involve increasing support or providing behavioural training. Assistive technologies for cognition have the potential to augment cognitive capacity thus enabling the performance of behavioural sequences. Guide is an assistive technology for cognition that scaffolds task performance by providing verbal prompts and responding to verbal feedback. Guide was used to provide verbal support and guidance for eight amputees (mean age 64), with cognitive impairment of vascular origin, putting on their prosthetic limbs. Participants were referred to the research due to problems learning the correct behavioural sequence. The research used repeated trials with random assignment to intervention and baseline conditions. The voice-mediated assistive technology for cognition resulted in a significant reduction of safety critical errors and omitted steps. Discussion focuses upon the relation between voice-mediated cognitive support for memory and executive function, and suggestions are made for future research.

141. Oppenheim M. Speech and touch enhanced interface for visually impaired users. *Journal of Assistive Technologies* 2013;7(3):149-159.

Purpose: This paper presents a novel interface system to aid people with visual impairment to become proficient with operating unfamiliar devices. The system works by adding touch sensors that trigger audio tags to tactile controls. The touch sensors trigger the audio tags before the control is activated. **Design/methodology/approach:** The paper describes how several devices were enhanced with the new technology, tested and evaluated. Initial informational interviewing with visually impaired people was followed by user

studies with blindfolded but visually able people. A final evaluation of the system was conducted by a visually impaired group. Findings: This paper shows that the technology is of benefit to a visually impaired user when using a complex unfamiliar device. Originality/value: This novel application of touch sensors coupled with audio tags has the potential to benefit visually impaired people. This technology can easily be incorporated into commercial devices. The idea can also be implemented using off the shelf development boards coupled with smart phones.

142. Palumbo F, Ullberg J, Stimec A, Furfari F, Karlsson L, Coradeschi S. Sensor network infrastructure for a home care monitoring system. *Sensors* 2014;14(3):3833-3860.

This paper presents the sensor network infrastructure for a home care system that allows long-term monitoring of physiological data and everyday activities. The aim of the proposed system is to allow the elderly to live longer in their home without compromising safety and ensuring the detection of health problems. The system offers the possibility of a virtual visit via a tele-operated robot. During the visit, physiological data and activities occurring during a period of time can be discussed. These data are collected from physiological sensors (e.g., temperature, blood pressure, glucose) and environmental sensors (e.g., motion, bed/chair occupancy, electrical usage). The system can also give alarms if sudden problems occur, like a fall, and warnings based on more long-term trends, such as the deterioration of health being detected. It has been implemented and tested in a test environment and has been deployed in six real homes for a year-long evaluation. The key contribution of the paper is the presentation of an implemented system for ambient assisted living (AAL) tested in a real environment, combining the acquisition of sensor data, a flexible and adaptable middleware compliant with the OSGi standard and a context recognition application. The system has been developed in a European project called GiraffPlus.

143. Parker R, Frampton C, Blackwood A, Shannon A, Moore G. An electronic medication reminder, supported by a monitoring service, to improve medication compliance for elderly people living independently. *Journal of Telemedicine & Telecare* 2012;18(3):156-158.

We conducted a pilot study of a personal medication reminder unit, supported by a monitoring service. A total of 31 elderly residents were offered the reminder service for a period of eight weeks (1736 person-days of service). A telephone call from the monitoring service was made after four weeks to check that each participant was happy with the service and keen to continue. No one opted out and users of the service found it easy to manage, helpful and acceptable. There was a significant improvement ($P = 0.012$) in the rate of self-assessed medication compliance, from pre (52%) to post (81%) service introduction. There was a significant improvement in people's perceived ability to look after themselves at home (self-care ability) ($P = 0.001$). The percentage of participants rating their ability to look after themselves at home as excellent increased from 42% to 68%. Health-related quality of life measures, such as physical and mental health, showed positive improvement, but the changes were not significant. The service has the potential to improve health and well-being outcomes for people on multiple medications living independently in the community.

144. Peek STM, Wouters EJM, van Hoof J, Luijkx KG, Boeije HR, Vrijhoef HJM. Factors influencing acceptance of technology for aging in place: A systematic review? *International Journal of Medical Informatics* 2014;83(4):235-248.

Purpose: To provide an overview of factors influencing the acceptance of electronic technologies that support aging in place by community-dwelling older adults. Since technology acceptance factors fluctuate over time, a distinction was made between factors in the pre-implementation stage and factors in the post-implementation stage. **Methods:** A systematic review of mixed studies. Seven major scientific databases (including MEDLINE, Scopus and CINAHL) were searched. Inclusion criteria were as follows: (1) original and peer-reviewed research, (2) qualitative, quantitative or mixed methods research, (3) research in which participants are community-dwelling older adults aged 60 years or older, and (4) research aimed at investigating factors that influence the intention to use or the actual use of electronic technology for aging in place. Three researchers each read the articles and extracted factors. **Results:** Sixteen out of 2841 articles were included. Most articles investigated acceptance of technology that enhances safety or provides social interaction. The majority of data was based on qualitative research investigating factors in the pre-implementation stage. Acceptance in this stage is influenced by 27 factors, divided into six themes: concerns regarding technology (e.g., high cost, privacy implications and usability factors); expected benefits of technology (e.g., increased safety and perceived usefulness); need for technology (e.g., perceived need and subjective health status); alternatives to technology (e.g., help by family or spouse), social influence (e.g., influence of family, friends and professional caregivers); and characteristics of older adults (e.g., desire to age in place). When comparing these results to qualitative results on post-implementation acceptance, our analysis showed that some factors are persistent while new factors also emerge. Quantitative results showed that a small number of variables have a significant influence in the pre-implementation stage. Fourteen out of the sixteen included articles did not use an existing technology acceptance framework or model. **Conclusions:** Acceptance of technology in the pre-implementation stage is influenced by multiple factors. However, post-implementation research on technology acceptance by community-dwelling older adults is scarce and most of the factors in this review have not been tested by using quantitative methods. Further research is needed to determine if and how the factors in this review are interrelated, and how they relate to existing models of technology acceptance. (C) 2014 The Authors. Published by Elsevier Ireland Ltd. All rights reserved.

145. Pekkarinen S, Kuosmanen P, Melkas H, Karisto A, Valve R, Kempas K. Review: Roles and Functions of User-oriented Gerontechnology: mStick and hStick. *Journal of Medical and Biological Engineering* 2013;33(4):349-355.

This study focuses on the role of user-oriented gerontechnology in elderly care services. The memory and reminiscence stick (mStick) and health stick (hStick) concepts have been developed to increase user involvement in services and to make the service chains smoother, which has been the focus of the health and social policies in many countries. The mStick is a biographical memory store where personal documents, like family photographs, texts, and audio and video clips, are stored. The hStick is used for storing health-related data, needed in the case of emergency or in self care, especially in health promotion. Eighteen pilot cases were investigated throughout their implementation to assess the roles and functions of the sticks. Qualitative data were collected in the years 2010 to 2012 via interviews, learning diaries, photographs, memos, and participatory observation diaries. Qualitative content analysis was conducted. In the analysis, ten roles and functions of the sticks were found at three levels, namely the organizational and societal level, "the meso-level" (relationships between an individual and the social environment), and the individual level. The simplicity and versatility of the sticks has facilitated acceptance of these kinds of concepts.

146. Power K, Kirwan G, Palmer M. A comparison of text and technology based training tools to improve cognitive skills in older adults. *Studies in Health Technology & Informatics* 2011;167:98-102.

Research has indicated that use of cognitive skills training tools can produce positive benefits with older adults. However, little research has compared the efficacy of technology-based interventions and more traditional, text-based interventions which are also available. This study aimed to investigate cognitive skills improvements experienced by 40 older adults using cognitive skills training tools. A Solomon 4 group design was employed to determine which intervention demonstrated the greatest improvement. Participants were asked to use the interventions for 5-10 minutes per day, over a period of 60 days. Pre and post-tests consisted of measures of numerical ability, self-reported memory and intelligence. Following training, older adults indicated significant improvements on numerical ability and intelligence regardless of intervention type. No improvement in self-reported memory was observed. This research provides a critical appraisal of brain training tools and can help point the way for future improvements in the area. Brain training improvements could lead to improved quality of life, and perhaps, have financial and independent living ramifications for older adults.

147. Price C. Evaluation of an activity monitoring system for people with dementia. *Journal of Assistive Technologies* 2007;1(2):11-17.

The aim of this evaluation was to carry out an evaluation of the Just Checking activity monitoring system, which supports people with dementia in their own homes. The study was carried out with Warwickshire County Council's social services, and a number of their service users. The system was installed in the homes of six people with dementia, and used by their family carers and care professionals, whose experiences were gathered in semi-structured interviews. In total 15 people took part in interviews, including two of the people with dementia. The system gave family carers and professionals a better insight into the activities of the person with dementia and how they were managing in their own homes. The majority of users were surprised at the consistency of the daily pattern of activity of the person with dementia and, as a result, their view of the capabilities of the person changed. The data from the system reassured family carers and proved a useful assessment tool for professionals to which to plan care. Contrary to expectations, the monitoring system gave people with dementia more control of their lives by providing a means by which they could communicate their capabilities in their home environment.

148. Price JD, Hermans DG, Grimley Evans J. Subjective barriers to prevent wandering of cognitively impaired people. *Cochrane Database of Systematic Reviews* 2000(4):CD001932.

BACKGROUND: People with dementia often wander, at times putting themselves at risk and presenting challenges to carers and institutional staff. Traditional interventions to prevent wandering include restraint, drugs and locked doors. Cognitively impaired people may respond to environmental stimuli (sounds, images, smells) in ways distinct from healthy people. This has led to trials of visual and other selective barriers (such as mirrors, camouflage, grids/stripes of tape) that may reduce wandering.

OBJECTIVES: We assess the effect of subjective exit modifications on the wandering behaviour of cognitively impaired people. The second objective is to inform the direction and methods of future research.

SEARCH STRATEGY: The search strategy includes electronic searches of relevant bibliographic and trials databases, citation indices and relevant medical journals.

SELECTION CRITERIA: Randomized controlled trials and controlled trials provide the highest quality evidence, but interrupted time series are also considered as they may contribute useful information. Participants are people with dementia or cognitive impairment who wander, of any age, and in any care environment - hospital, other institution, or their own home. Interventions comprise exit modifications that aim to function as subjective barriers to prevent the wandering of cognitively impaired people. Locks, physical restraints, electronic tagging and other types of barrier are not included.

DATA COLLECTION AND ANALYSIS: The criteria for inclusion or exclusion of studies are applied independently by two reviewers. All outcomes that are meaningful to people making decisions about the care of wanderers are recorded. These include the number of exits or carer interventions, resource use, acceptability of the intervention and the effects on carer and wanderer anxiety or distress. heterogeneity of clinical area, of study design and of intervention was substantial.

MAIN RESULTS: No randomized controlled or controlled trials were found. The other experimental studies that we identified were unsatisfactory. Most were vulnerable to bias, particularly performance bias; most did not classify patients according to type or severity of dementia; in all studies, outcomes were measured only in terms of wandering frequency rather than more broadly in terms of quality of life, resource use, anxiety and distress; no studies included patients with delirium; no studies were based in patients' homes.

REVIEWER'S CONCLUSIONS: There is no evidence that subjective barriers prevent wandering in cognitively impaired people. [References: 41]

149. Raik BL, Phongtankuel V. Fun, socialization and helpful strategies: Support in chronic conditions through a virtual senior center program. *Journal of the American Geriatrics Society* 2014;62:S217.

Background: 3.6 million older adults with multiple medical and functional problems are considered homebound. Obtaining needed medical care is problematic and they are also socially isolated and unable to attend programs designed to help them self-manage their chronic problems. Technological advances allow them to participate in a "Virtual Senior Center" (VSC) through home computers and internet connection. This was a feasibility study of a novel means of engaging this underserved population. **Methods:** Selfhelp, a social service agency in New York City, has offered Virtual Senior Center program to members of its independent living and care management programs who are homebound, with hearing and cognition intact, able to use the computer and the audio/video ("Skype-like") system with technical support from Selfhelp. The "Being Well" program was a 4 week series of 1 hour workshops open to all 50 members of the VSC (maximum 14 at each session) that adapted techniques and theory from the Chronic Disease Self Management Program. Participants could see and speak to each other. Pre- and post-questionnaires were administered by phone to the participants regarding their self reported health and symptoms, and self-confidence in managing their health. **Results:** 23 of 50 potential participants joined in at least 1 workshop, 8 participated in 3 or more workshops and 11 provided pre and post questionnaires. 20 of 23 participants were female, with average age 82.7 years and average 15.2 years of education. After participation in the workshop, more than half reported increased confidence in managing their illness by doing activities other than taking medication. Over 70% had improved plans to prepare a list of questions for their doctors. The participants were

positive about enjoying and recommending the workshop to others. Self-reported health status was unchanged. Conclusion: "Being well" workshop was well received by the VSC members. Although we could not measure improvement in self-reported health status, we found improvement in measures of self-efficacy such as plans to ask questions of their doctors at future visits. A continuation of these workshops with Geriatric fellows leading the sessions has been similarly well received. These results suggest expansion of similar telehealth technology with interactive communication could benefit this homebound population.

150. Rantz MJ, Skubic M, Koopman RJ, Alexander GL, Phillips L, Musterman K, et al. Automated technology to speed recognition of signs of illness in older adults. *Journal of Gerontological Nursing* 2012;38(4):18-23.

Our team has developed a technological innovation that detects changes in health status that indicate impending acute illness or exacerbation of chronic illness before usual assessment methods or self-reports of illness. We successfully used this information in a 1-year prospective study to alert health care providers so they could readily assess the situation and initiate early treatment to improve functional independence. Intervention participants showed significant improvements (as compared with the control group) for the Short Physical Performance Battery gait speed score at Quarter 3 ($p = 0.03$), hand grip-left at Quarter 2 ($p = 0.02$), hand grip-right at Quarter 4 ($p = 0.05$), and the GAITRite functional ambulation profile score at Quarter 2 ($p = 0.05$). Technological methods such as these could be widely adopted in older adult housing, long-term care settings, and in private homes where older adults wish to remain independent for as long as possible. Copyright 2012, SLACK Incorporated.

151. Reeder B, Chung J, Lazar A, Joe J, Demiris G, Thompson HJ. Testing a Theory-Based Mobility Monitoring Protocol Using In-Home Sensors A Feasibility Study. *Research in Gerontological Nursing* 2013;6(4):253-263.

Mobility is a key factor in the performance of many everyday tasks required for independent living as a person ages. The purpose of this mixed-methods study was to test a theory-based mobility monitoring protocol by comparing sensor-based measures to self-report measures of mobility and assess the acceptability of in-home sensors with older adults. Standardized instruments to measure physical, psychosocial, and cognitive parameters were administered to 8 community-dwelling older adults at baseline, 3-month, and 6-month visits. Semi-structured interviews to characterize acceptability of the technology were conducted at the 3-month and 6-month visits. Technical issues prevented comparison of sensor-based measures with self-report measures. In-home sensor technology for monitoring mobility is acceptable to older adults. Implementing our theory-based mobility monitoring protocol in a field study in the homes of older adults is a feasible undertaking but requires more robust technology for sensor-based measure validation.

152. Reeder B, Meyer E, Lazar A, Chaudhuri S, Thompson HJ, Demiris G. Framing the evidence for health smart homes and home-based consumer health technologies as a public health intervention for independent aging: A systematic review. *International Journal of Medical Informatics* 2013;82(7):565-579.

Introduction: There is a critical need for public health interventions to support the independence of older adults as the world's population ages. Health smart homes (HSH) and home-based consumer health (HCH) technologies may play a role in these interventions. Methods: We conducted a systematic

review of HSH and HCH literature from indexed repositories for health care and technology disciplines (e. g., MEDLINE, CINAHL, and IEEE Xplore) and classified included studies according to an evidence-based public health (EBPH) typology. Results: One thousand, six hundred and thirty-nine candidate articles were identified. Thirtyone studies from the years 1998-2011 were included. Twenty-one included studies were classified as emerging, 10 as promising and 3 as effective (first tier). Conclusion: The majority of included studies were published in the period beginning in the year 2005. All 3 effective (first tier) studies and 9 of 10 of promising studies were published during this period. Almost all studies included an activity sensing component and most of them used passive infrared motion sensors. The three effective (first tier) studies all used a multicomponent technology approach that included activity sensing, reminders and other technologies tailored to individual preferences. Future research should explore the use of technology for self-management of health by older adults; social support; and self-reported health measures incorporated into personal health records, electronic medical records, and community health registries. (C) 2013 Elsevier Ireland Ltd. All rights reserved.

153. Riazi A, et al. Home modification guidelines as recommended by visually impaired people. *Journal of Assistive Technologies* 2012;6(4):270-284.

The aim of this study was to gather evidence from the perspective of people with visual impairment due to age-related macular degeneration about the home modifications they find useful and would recommend to others with similar visual impairment. Based on the belief that people with impairments may not be aware of their own coping strategies until they are asked, the authors took a qualitative approach using semi-structured individual interviews. These were recorded and then transcribed verbatim into text for thematic analysis using Nvivo 8. In total, 31 individuals (mean age 79.1 years) with AMD and no other ocular diseases were recruited in a metropolitan city in Australia. Interviewees had not received any formal home modification assessment from a government provider. Nevertheless, 70 per cent of participants said that they had undertaken home modifications themselves or with the assistance of family and friends. They perceived the most important functional modifications as; hand rails, non-slip matting, colour contrasting safety stair nosing, single lever taps, slip resistant flooring, lift chairs, and motion sensors that activated pathway lighting. Kitchens, steps and bathrooms were seen as hazardous locations. Most participants had difficulties with reading fine-print material on kitchen appliances, washing machines, microwave ovens and remote controls for electronic devices in the home.

154. Rosenberg L, Nygard L. Learning and using technology in intertwined processes: a study of people with mild cognitive impairment or Alzheimer's disease. *Dementia: the International Journal of Social Research and Practice* 2014;13(5):662-677.

People with mild cognitive impairment and Alzheimer's disease are likely to be challenged by the multitude of everyday technology in today's society. The aim of this study was to explore how they try to prohibit, avoid or solve problems in everyday technology use, maintain skills, and learn to use new technology. To explore how the participants applied and reasoned about using everyday technology in real-life situations interviews were conducted while the participants used their own technology in their homes. Interviews were conducted with 20 participants with mild cognitive impairment (n = 10) or Alzheimer's disease (n = 10). The analyses were inspired from grounded theory and resulted in one core category and three sub-categories that represent

sub-processes in the core. The core finding presents a continuous, intertwined process of learning and using everyday technology, highlighting how the context was interwoven in the processes. The participants used a rich variety of management strategies when approaching technology, including communication with the everyday technologies on different levels. The findings underscore that it is important to support continued use of everyday technology as long as it is valued and relevant to the person with mild cognitive impairment or Alzheimer's disease. The intertwined process of learning and using everyday technology suggests how support could target different sub-processes.

155. Rowe MA, Kairalla JA, McCrae CS. Sleep in dementia caregivers and the effect of a nighttime monitoring system. *Journal of Nursing Scholarship* 2010;42(3):338-347.

PURPOSE: The purpose of this study was to determine if a nighttime home monitoring system, designed to track the movements of a care recipient with dementia, would relieve worry and improve sleep in caregivers of persons with dementia.

DESIGN AND METHODS: In this controlled clinical trial, 49 dementia caregivers were followed for up to 1 year. Sleep was measured for 7-day intervals at nine points in time using actigraphy and a sleep diary.

FINDINGS: Although the experimental caregivers generally reported that the system was "of great help" in relieving worry about nighttime activity, no significant group differences were found using multilevel modeling analyses.

With regard to total sleep time, time awake after sleep onset, and sleep quality, multilevel models did not demonstrate any changes in sleep between groups, either averaged over time or for the interaction of group and time.

CONCLUSIONS: Since previous analysis of our qualitative data suggested improvements in caregiver worry and sleep, problems other than night awakenings may be perpetuating the sleep problem. Future studies should include testing of multimodal sleep interventions.

CLINICAL RELEVANCE: Caregivers have high amounts of unwanted wake time during the night and additional research is needed to identify effective interventions to improve their sleep.

156. Rushton PW, Kairy D, Archambault P, Pituch E, Torkia C, El Fathi A, et al. The potential impact of intelligent power wheelchair use on social participation: perspectives of users, caregivers and clinicians. *Disabil Rehabil Assist Technol* 2014.

Abstract Purpose: To explore power wheelchair users', caregivers' and clinicians' perspectives regarding the potential impact of intelligent power wheelchair use on social participation. **Methods:** Semi-structured interviews were conducted with power wheelchair users (n = 12), caregivers (n = 4) and clinicians (n = 12). An illustrative video was used to facilitate discussion. The transcribed interviews were analyzed using thematic analysis. **Results:** Three main themes were identified based on the experiences of the power wheelchair users, caregivers and clinicians: (1) increased social participation opportunities, (2) changing how social participation is experienced and (3) decreased risk of accidents during social participation. **Conclusion:** Findings from this study suggest that an intelligent power wheelchair would enhance social participation in a variety of important ways, thereby providing support for continued design and development of this assistive technology. **Implications for Rehabilitation** An intelligent power wheelchair has the potential to: Increase social participation opportunities by overcoming challenges associated with navigating through crowds and small spaces. Change how social participation is experienced through "normalizing" social interactions and

decreasing the effort required to drive a power wheelchair. Decrease the risk of accidents during social participation by reducing the need for dangerous compensatory strategies and minimizing the impact of the physical environment.

157. Russ LS. The effect of home monitoring technology on reducing burden in caregivers of older adults with disabilities. State University of New York at Buffalo. Tilgjengelig fra: <http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=2009714632&site=ehost-live>.

Computer-based home monitoring systems can be useful to caregivers of frail older adults living alone by enhancing contact between the caregiver and care recipient via e-mail use and a personal assistance security system (PASS). The study utilized a two group quasi-experimental design of 50 caregivers to frail elders living alone who participated in the Smart Home Project by the Technology and Aging Research at the University at Buffalo. This was the last piece of the project, and is the first study focusing on the impact of smart home technology on caregivers of persons without cognitive impairment. The intervention involved installation of the PASS in the care recipient's home, a system which can be activated by the care recipient to contact the caregiver by telephone in emergencies. Caregivers received a questionnaire at 0, 6, and 12 months that included the Zarit Burden Interview, the Center for Epidemiological Studies Depression Scale, the Picot Caregiver Reward Scale, and questions pertaining to their background characteristics, attitudes and levels of involvement regarding caregiving and computer e-mail use. Care recipients' health and functional status were examined to determine their influence on the caregivers' outcome measures.

The study sample was divided into treatment (care recipients receiving PASS) and control (care recipients without PASS) groups. These groups were further divided into e-mail users and non-users. Analysis of the sample data comparing depression, burden, and caregiving satisfaction between the groups over time using repeated measures ANOVA found that the PASS appears to be effective in preventing a significant increase in caregiver depression and burden, but does not have any effect on caregiving satisfaction. E-mail use was found to be effective in preventing a significant increase in caregiver depression and burden in specific segments of the sample, but had no effect on caregiving satisfaction. PASS and e-mail use combined is the most effective way to prevent significant increases in caregiver depression and burden.

The findings indicate that practical and low cost technology, such as the PASS and e-mail, can have a positive impact for certain caregivers. Use of these technologies should be encouraged to enhance caregiver well-being.

158. Shapira N, Barak A, Gal I. Promoting older adults' well-being through Internet training and use. *Aging & Mental Health* 2007;11(5):477-484.

The purpose of the current research was to test the psychological impact of learning how to use computers and the Internet in old age, hypothesizing that such activities would contribute to seniors' well-being and personal sense of empowerment. Employing a quasi-experimental research design, we offered a course, conducted in small groups, in computer operation and Internet browsing to 22 older adults (mean age of 80) who went to day-care centers for the elderly or resided in nursing homes. A comparison group of 26 participants (similar in all major respects) was engaged in other activities. Both groups were administered measures of physical functioning, life satisfaction, depression, loneliness and self-control at pre- and post-intervention four months later. Individual semi-structured interviews were conducted with participants who finished the computer course. ANCOVA was employed

for controlling the effects of control variables and pre-intervention differences on participants who completed the activities. Results showed a significant improvement among participants in the intervention group in all measures except physical functioning, whereas deterioration in all measures was detected in the comparison group. Computer and Internet use seems to contribute to older adults' well-being and sense of empowerment by affecting their interpersonal interactions, promoting their cognitive functioning and contributing to their experience of control and independence.

159. Sheffield C, Smith CA, Becker M. Evaluation of an Agency-Based Occupational Therapy Intervention to Facilitate Aging in Place. *Gerontologist* 2013;53(6):907-918.

Purpose: The United States faces a growing population of older adults and accompanying functional disabilities, coupled with constrained public resources and diminishing informal supports. A variety of interventions that aim to improve client outcomes have been studied, but to date, there is limited translational research that examines the efficacy of moving such interventions from clinical trials to agency settings. **Methods:** A randomized controlled trial was conducted to evaluate a restorative occupational therapy intervention relative to usual care among community-dwelling older adults. The intervention included a detailed assessment from a person-environment perspective and provision of adaptive equipment and home modifications where appropriate. The intervention (n 31) and control groups (n 29) were evaluated at 3 months and assessed for changes in functional status, home safety, falls, health-related quality of life (HRQoL; EQ5D), depression, social support, and fear of falling; a 4 subgroup analysis also examined outcomes by waiting list status. An informal economic evaluation compared the intervention to usual care. **Results:** Findings indicated improvements in home safety ($p < .0005$, b 15.87), HRQoL (p .03, b 0.08), and fear of falling ($p < .05$, b 2.22). Findings did not show improvement in functional status or reduction in actual falls. The intervention resulted in a 39% reduction in recommended hours of personal care, which if implemented, could result in significant cost savings. **Implications:** The study adds to the growing literature of occupational therapy interventions for older adults, and the findings support the concept that restorative approaches can be successfully implemented in public agencies.

160. Shore S, Juillerat S. The impact of a low cost wheelchair on the quality of life of the disabled in the developing world. *Medical Science Monitor* 2012;18(9):CR533-CR542.

Background: People with disabilities in the developing world do not have equal and adequate access to education, employment, or medical care. Their physical or mental condition, compounded by a lack of financial and technological resources, imposes a burden on both the family and the State. A wheelchair is a form of assistive technology which eases that burden for many. This study examines the impact of a simple, donated chair on the health, quality of life, and function of a subject population. **Material/Methods:** Surveys were administered to 519 disabled recipients of a semi-rigid depot style wheelchair in 3 different countries at the time they received their chair and again after 12 months of use. Surveys evaluated physical and emotional health, functional independence, and lifestyle. **Results:** On initial reports, 46.6% of subjects said they never left home, 52.3% were hospitalized one or more days/month, 70.3% reported daily pain, and 48.7% reported a negative mood state. Following 12 months of using the wheelchair, both the reported overall health rating and mood state increased by 20%; pain was significantly diminished. Although some areas in the ICF function measure

improved more than others, the overall reported level of independence rose by 11%. Conclusions: A representative sample of the disabled in 3 countries of the world is socially isolated, in poor health, and with limited function. Receipt of a simple, depot style wheelchair significantly improved their quality of life, health indicators, and the ICF function measure following 12 months of use.

161. Silveira P, van de langenberg R, van het Reve E, Daniel F, Casati F, de Bruin ED. Tablet-Based Strength-Balance Training to Motivate and Improve Adherence to Exercise in Independently Living Older People: A Phase II Pre-clinical Exploratory Trial. *Journal of Medical Internet Research* 2013;15(8).

Background: Reaction time, coordination, and cognition performance typically diminish in older adults, which may lead to gait impairments, falls, and injuries. Regular strength-balance exercises are highly recommended to reduce this problem and to improve health, well-being, and independence in old age. However, many older people face a lack of motivation in addition to other strong barriers to exercise. We developed ActiveLifestyle, an information technology (IT)-based system for active and healthy aging aiming at improving balance and strength. ActiveLifestyle is a training app that runs on a tablet and assists, monitors, and motivates older people to follow personalized training plans autonomously at home. **Objective:** The objectives were to (1) investigate which IT-mediated motivation strategies increase adherence to physical exercise training plans in older people, (2) assess the impact of ActiveLifestyle on physical activity behavior change, and (3) demonstrate the effectiveness of the ActiveLifestyle training to improve gait speed. **Methods:** A total of 44 older adults followed personalized, 12-week strength and balance training plans. All participants performed the exercises autonomously at home. Questionnaires were used to assess the technological familiarity and stage of behavior change, as well as the effectiveness of the motivation instruments adopted by ActiveLifestyle. Adherence to the exercise plan was evaluated using performance data collected by the app and through information given by the participants during the study. Pretests and posttests were performed to evaluate gait speed of the participants before and after the study. **Results:** Participants were 75 years (SD 6), predominantly female (64%), held a trade or professional diploma (54%), and their past profession was in a sitting position (43%). Of the 44 participants who enrolled, 33 (75%) completed the study. The app proved to assist and motivate independently living and healthy older adults to autonomously perform strength-balance exercises (median 6 on a 7-point Likert scale). Social motivation strategies proved more effective than individual strategies to stimulate the participants to comply with the training plan, as well as to change their behavior permanently toward a more physically active lifestyle. The exercises were effective to improve preferred and fast gait speed. **Conclusions:** ActiveLifestyle assisted and motivated independently living and healthy older people to autonomously perform strength-balance exercises over 12 weeks and had low dropout rates. The social motivation strategies were more effective to stimulate the participants to comply with the training plan and remain on the intervention. The adoption of assistive technology devices for physical intervention tends to motivate and retain older people exercising for longer periods of time.

162. Singh DK, Rajaratnam BS, Palaniswamy V, Pearson H, Raman VP, Bong PS. Participating in a virtual reality balance exercise program can reduce risk and fear of falls. *Maturitas* 2012;73(3):239-243.

OBJECTIVE: The objective of this study was to quantify the effectiveness of virtual reality balance games (VRBG) to decrease risk and fear of falls among women.

METHODS: Thirty six community dwelling women aged 56 and above were randomly divided into experimental (exercises using VRBG focus on improving balance) and control (conventional balance exercises) groups. Both groups attended a twice 6 weekly exercise session for an hour. Risk and fear of falls were measured with Physiological Profile Approach (PPA) and Activity Specific Balance Scale (ABC-6). Pre and post intervention differences between the groups were examined using two way repeated measures ANOVA.

RESULTS: Both VRBG and conventional balance exercise groups had significant decrease in PPA ($p < 0.001$) and ABC-6 ($p < 0.01$) after the interventions. However, no significant effects were demonstrated between the groups in PPA ($p = 0.18$) and ABC-6 ($p = 0.25$) post intervention. Time and group interaction effect were not significant for PPA ($p = 0.18$) and ABC-6 ($p = 0.45$).

CONCLUSIONS: Practising VRBG can increase balance confidence and decrease risk of falls among community dwelling women. Copyright 2012 Elsevier Ireland Ltd. All rights reserved.

163. Singh DK, Rajaratnam BS, Palaniswamy V, Raman VP, Bong PS, Pearson H. Effects of balance-focused interactive games compared to therapeutic balance classes for older women. *Climacteric* 2013;16(1):141-146.

OBJECTIVE: The prospective pre-post control study was designed to evaluate the effect of introducing balance-focused interactive virtual-reality games to community-dwelling older women to improve their agility, balance and functional mobility.

METHOD: The study was set in a senior citizens' club in Cheras, Kuala Lumpur, Malaysia. The participants were 36 community-dwelling older women. Participants were randomly divided into either a group undertaking balance-focused virtual-reality games or a group doing therapeutic balance exercises. The program lasted 6 weeks and was conducted twice a week for 40 min during each session. As the main outcome measures, the results of the Ten Step Test (TST), postural sway (overall performance index, OPI) and the Timed Up and Go test (TUG) were measured pre- and post-intervention to evaluate agility, balance and functional mobility, respectively.

RESULTS: Although both groups improved in OPI ($F = 4.63$, $p < 0.001$), TST ($F = 46.15$, $p < 0.001$) and TUG ($F = 52.57$, $p = 0.03$), combined time and group interaction only improved in the TUG ($F = 4.54$, $p < 0.05$). No significant differences between the two groups were found in terms of TST ($F = 0.02$, $p = 0.86$), OPI ($F = 0.66$, $p = 0.42$), and TUG ($F = 0.11$, $p = 0.74$).

CONCLUSION: Older people could improve their agility, balance and functional mobility by complementing therapeutic balance exercises with active participation in interactive virtual-reality games at home or in the community.

164. Sjolinder M, Avatare Nou A. Indoor and outdoor social alarms: understanding users' perspectives. *JMIR MHealth and UHealth* 2014;2(1):e9.

The elderly population is increasing and there is a need to provide care and safety at a high level with limited resources. New social alarm solutions may contribute to safety and independence for many elderly. However, it is important to understand the needs within the user group. This work studied social alarms in a broad sense and from several user perspectives. In the first study, social alarm use and its aspects were investigated. To understand where there may be problems and weaknesses, users, caregivers, managers of municipalities, and personnel at alarm centers were interviewed. The in-

interviews helped identify a number of problems. For municipalities, the processes of procuring new alarms and managing their organization were found to be complex. The effect of this was that the same social alarm systems had been ordered over and over again without taking into account new user needs or new technical solutions. For alarm users, one large problem was that the alarms had very limited reach and were designed for indoor use only. This has resulted in users hesitating to leave their homes, which in turn has negative effects due to lack of physical activity and fewer social contacts. One important result from the first study was the need for a social alarm solution that worked outdoors. In a second study, needs regarding outdoor social alarms were investigated. The results from this study showed that wearable outdoor alarms must be easy to use, provide communication, and be well designed. Finally, these alarms must work both indoors and outdoors, and the user should not have to worry about where he/she is or who is acting on an alarm.

165. Slegers K, van Boxtel M, Jolles J. Effects of computer training and internet usage on cognitive abilities in older adults: a randomized controlled study. *Aging-Clinical & Experimental Research* 2009;21(1):43-54.

BACKGROUND AND AIMS: According to the concepts of 'use it or lose it' and cognitive reserve, cognitively challenging activities may boost cognitive abilities in older adults. Using computers and the internet provides divergent cognitive challenges to older persons, and the positive effects of computers and internet use on the quality of life have been found in earlier studies.

METHODS: We investigated whether prolonged guided computer use by healthy older adults (64-75) may be beneficial to cognitive ability in a randomized controlled study. The intervention consisted of brief training and subsequent use of a personal computer with an internet connection at home for a 12-month period. 191 participants were randomly assigned to three groups: Intervention, Training/No intervention, or No training/No intervention. A fourth group consisted of 45 participants with no interest in computer use. The effect of the intervention was assessed by a range of well-established cognitive instruments that probed verbal memory, information processing speed, and cognitive flexibility. Data were collected at baseline and after four and twelve months.

RESULTS: Intensive interaction with a personal computer with standard software applications had no effect on cognitive measures; no differences in changes in cognitive parameters over time were found between groups.

CONCLUSION: Learning to use a computer and the internet does not benefit healthy, communitydwelling older adults with respect to many domains of cognitive functions. The implications of these findings for future studies that use cognitive challenge to counteract usual cognitive aging are discussed.

166. Slijper A, Svensson KE, Backlund P, Engstrom H, Sunnerhagen KS. Computer game-based upper extremity training in the home environment in stroke persons: a single subject design. *Journal of Neuroengineering & Rehabilitation* 2014;11:35.

BACKGROUND: The objective of the present study was to assess whether computer game-based training in the home setting in the late phase after stroke could improve upper extremity motor function.

METHODS: Twelve subjects with prior stroke were recruited; 11 completed the study.

DESIGN: The study had a single subject design; there was a baseline test (A1), a during intervention test (B) once a week, a post-test (A2) measured directly after the treatment phase, plus a follow-up (C) 16-18 weeks after the treatment phase. Information on motor function (Fugl-Meyer), grip force

(GripitR) and arm function in activity (ARAT, ABILHAND) was gathered at A1, A2 and C. During B, only Fugl-Meyer and ARAT were measured. The intervention comprised five weeks of game-based computer training in the home environment. All games were designed to be controlled by either the affected arm alone or by both arms. Conventional formulae were used to calculate the mean, median and standard deviations. Wilcoxon's signed rank test was used for tests of dependent samples. Continuous data were analyzed by methods for repeated measures and ordinal data were analyzed by methods for ordered multinomial data using cumulative logistic models. A p-value of < 0.05 was considered statistically significant.

RESULTS: Six females and five males, participated in the study with an average age of 58 years (range 26-66). FMA-UE A-D (motor function), ARAT, the maximal grip force and the mean grip force on the affected side show significant improvements at post-test and follow-up compared to baseline. No significant correlation was found between the amount of game time and changes in the outcomes investigated in this study.

CONCLUSION: The results indicate that computer game-based training could be a promising approach to improve upper extremity function in the late phase after stroke, since in this study, changes were achieved in motor function and activity capacity.

167. Sparrow D, Gottlieb DJ, Demolles D, Fielding RA. Increases in muscle strength and balance using a resistance training program administered via a telecommunications system in older adults. *Journals of Gerontology Series A-Biological Sciences & Medical Sciences* 2011;66(11):1251-1257.

BACKGROUND: Resistance training programs have been found to improve muscle strength, physical function, and depressive symptoms in middle-aged and older adults. These programs have typically been provided in clinical facilities, health clubs, and senior centers, which may be inconvenient and/or cost prohibitive for some older adults. The purpose of this study was to investigate the effectiveness of an automated telemedicine intervention that provides real-time guidance and monitoring of resistance training in the home.

METHODS: A randomized clinical trial in 103 middle-aged or older participants. Participants were assigned to use of a theory-driven interactive voice response system designed to promote resistance training (Telephone-Linked Computer-based Long-term Interactive Fitness Trainer; $n = 52$) or to an attention control ($n = 51$) for a period of 12 months. Measurements of muscle strength, balance, walk distance, and mood were obtained at baseline, 3, 6, and 12 months.

RESULTS: We observed increased strength, improved balance, and fewer depressive symptoms in the intervention group than in the control group. Using generalized estimating equations modeling, group differences were statistically significant for knee flexion strength ($p = .035$), single-leg stance time ($p = .029$), and Beck Depression Inventory ($p = .030$).

CONCLUSIONS: This computer-based telecommunications exercise intervention led to improvements in participants' strength, balance, and depressive symptoms. Because of their low cost and easy accessibility, computer-based interventions may be a cost-effective way of promoting exercise in the home.

168. Spiliotopoulou G, Fowkes C, Atwal A. Assistive technology and prediction of happiness in people with post-polio syndrome. *Disability & Rehabilitation Assistive Technology* 2012;7(3):199-204.

PURPOSE: To explore the relationship between level of happiness in people with post-polio syndrome (PPS) and assistive technology (AT) by taking into

account confounding factors such as age, gender and house composition. Method: Existing data from 218 adults with PPS, who had completed a cross-sectional survey conducted by the British Polio Fellowship in 2007, were used for a secondary quantitative analysis. Ordinal logistic regression was applied to determine whether ownership of or the need for AT predicted happiness in people with PPS. Results: Ownership of AT did not predict happiness, whereas the perceived need for AT was a significant predictor of feeling less happy ($p=0.028$). Among the different types of AT needed, only need of home adaptations combined with major equipment was close to being significantly associated with less happiness ($p=0.078$). Being older ($p<0.001$) and living with a partner ($p<0.001$) significantly increased the likelihood of feeling happier.

CONCLUSION: The findings indicate the importance of the contribution of need for AT in explaining happiness in people with PPS. The fact that users reported unmet equipment needs urge for increased user decision making and better understanding of why perceived needs are not resolved. [Box: see text].

169. Spring HJ, Rowe MA, Kelly A. Improving Caregivers' Well-Being by Using Technology to Manage Nighttime Activity in Persons with Dementia. *Research in Gerontological Nursing* 2009;2(1):39-48.

This article reports the qualitative arm of a mixed-methods study designed to test an in-home nighttime monitoring system (NMS) that tracks the nighttime activity of persons with dementia. Fourteen caregiver interviews were analyzed using grounded theory/full conceptual description methods to determine the issues associated with providing care at night and to explore the benefits of using the NMS. Caregivers not using the NMS experienced sleep disruption, overwhelming worry, and loss of personal space, leading to decreased energy and changes in mood. When the NMS was used, caregivers reported improved "peace of mind." The fear and uncertainty associated with worry was alleviated by reliable alerts regarding the whereabouts of the person with dementia. Some caregivers were able to better balance needs for personal space with needs to remain in contact with the person with dementia. Generally, caregivers reported improved quality of sleep, although some caregivers reported more awakenings due to the system alerts.

170. Standen PJ, Rees F, Brown DJ. Effect of playing computer games on decision making in people with intellectual disabilities. *Journal of Assistive Technologies* 2009;3(2):4-12.

People with intellectual disabilities have difficulty making decisions and this may hinder their independence and inclusion in society. Interactive computer software may give them the opportunity to practice the underlying components of this skill. This study analysed whether repeated sessions playing a computer game involving aspects of decision making, such as collecting relevant information and controlling impulsivity, would improve performance in two non-computer based tests of decision making. Twelve adults with intellectual disabilities were randomly assigned to either an intervention group or control group. They were all exposed to 10 twice-weekly sessions, playing either the intervention game or the control game, which involved simple reaction time only. After repeated sessions, the intervention group showed a significant improvement in game score, with researcher assistance significantly decreasing. At follow up, the intervention group showed a significant decrease from baseline in the number of guesses made before guessing correctly on both of the decision-making tests. The decrease observed in the control group failed to reach significance.

171. Tierney M, Fraser A, Kennedy N. Users' experience of physical activity monitoring technology in rheumatoid arthritis. *Musculoskeletal Care* 2013;11(2):83-92.

OBJECTIVES: The aim of the present study was to qualitatively explore users' experiences of home monitoring of health with specific regard to physical activity monitors.

METHODS: Fourteen participants were randomly selected from a larger sample of individuals with rheumatoid arthritis (RA) who had taken part in a physical activity monitoring study and had worn two physical activity monitors for seven days in their homes. These individuals were assigned to one of two focus groups. Each focus group lasted for between 40 minutes and an hour and was audio-recorded. A semi-structured questioning route was used, followed by subsequent theoretical thematic analysis.

RESULTS: No statistically significant differences were noted in the demographic factors between those who took part in the focus groups and the entire RA sample. Three distinct themes were identified: i) Experiences of having health monitored in the home, which was found to be largely positive; ii) Experiences of use of specific technology to monitor physical activity, which was generally reported as unobtrusive and not to impact significantly negatively on their daily life; iii) Perceptions and experiences of physical activity and exercise, which monitoring was reported to facilitate focusing on physical activity choices.

CONCLUSIONS: These focus groups were the first to highlight the perceptions held by individuals with RA regarding home monitoring and, in particular, physical activity monitoring. This has implications for those planning interventions for this group which involve home monitoring. Interesting findings were also highlighted regarding the perceptions and understanding of physical activity and exercise among people with RA. Copyright 2012 John Wiley & Sons, Ltd.

172. Torrens GE, Smith NC. Evaluation of an assistive technology product design using a paired comparisons method within a mixed methods approach: a case study evaluating preferences for four types of cutlery with 34 upper limb impaired participants. *Disability & Rehabilitation Assistive Technology* 2013;8(4):340-347.

The purpose of the study was the assessment of preferences for four types of assistive technology (AT) domestic cutlery with 24 female and 10 male participants who had a range of upper limb impairments. A mixed-methods methodology, that included a paired comparisons analysis, was used to inform product development. Qualitative and quantitative data collected at the time provided triangulation of cohort preferences and insight into the reasoning of the participants. The results indicate that a high friction surface on AT cutlery handles is useful for all upper limb impaired users; however, the unconventional shapes of the Caring Cutlery better match the grip patterns generated by those with arthritis. Conventionally shaped handles are favoured by those who generate conventional grip patterns. Statistical analysis of the paired comparisons results indicated a clear preference for the Caring Cutlery by those with arthritis. The Etan Cutlery set was favoured by those using one hand that predominantly had hemiplegia following a stroke. The paired comparisons method was used as part of a mixed methodology that was considered to be cost effective. The authors concluded that the methodology was useful to help validate a new inclusive/universal product design when the desired attributes are not accurately known.

173. Tsai IH, Graves DE, Lai CH. The association of assistive mobility devices and social participation in people with spinal cord injuries. *Spinal Cord* 2014;52(3):209-215.

Objective: We assumed that assistive technology in mobility devices (that is, wheelchairs with external power and driving modified vehicle (MV) with or without driving on wheelchair) may facilitate social participation for wheelchair users who have spinal cord injuries (SCIs). This study examined the relationship between mobility devices and social participation in this population. **Methods:** We included 2986 individuals who had received initial rehabilitation at one of 18 regional centers of the Model Spinal Cord Injury System in the United States, had been interviewed between 2004 and 2010, and were wheelchair users (use a wheelchair \geq 40 h per week and cannot ambulate 150 feet at home). We performed secondary panel-data analysis using a mixed-effect model on data from 3498 follow-up interviews. Participation (measured by the Craig Handicap Assessment and Reporting Technique-Short Form (CHART-SF) and employment status) and the use of wheelchair and MV were recorded. **Results:** Among the participants, 33% drove an MV, and 44% used an external-powered wheelchair. The use of an MV was positively related to employment and CHART-SF score, regardless of driving directly or driving with a wheelchair. People who drove an MV were found to have approximately two more business associates to contact to once a month and similar to 2 additional days out of home per week compared with those without an MV. No significant association was shown between the type of wheelchair used and participation. **Conclusion:** The use of an MV was found to be positively associated with social participation in an SCI population.

174. Upton D, et al. Evaluation of the impact of touch screen technology on people with dementia and their carers within care home settings. Worcester: Memory Apps for Dementia. University of Worcester; 2011.

Although the benefits of restorative memory interventions for people with dementia are well known, implementation of these interventions remains limited. Touchscreen technology such as the iPad has the potential to provide an easily accessible medium for such interventions and so increase uptake. This evaluation provides an independent assessment of pilot projects using iPad touchscreen devices with adults with dementia within the West Midlands and South West regions. Commissioned by Department of Health West Midlands and conducted by researchers at the University of Worcester, the evaluation aimed to assess the effectiveness and impact of the use of touchscreen technology on the day-to-day lives of people with dementia and the staff engaged in their care. Staff and residents' experience of touchscreen technology was explored using a combination of topic guided interviews, focus groups, case studies and field observations. People with dementia and the staff involved in their care reported mainly positive experiences of using touchscreen technology. The use of touchscreen devices such as the iPad in dementia care was found to have a number of advantages: supporting reminiscence; aiding recall; increasing interpersonal interactions; intergenerational communication; staff-resident relationships; improving quality of life; ease of use; and impact on the wider care environment. Some difficulties related to using the technology were also noted; however. These tended to be perceived as challenges to be overcome rather than limitations preventing its use. The main issues were ergonomics, complexity of the interface, staff confidence, and connectivity. The evidence gathered for this evaluation lends support to the idea that touchscreen technology can make a positive contribution to helping people to live well with dementia.

175. Uustal H, Minkel JL. Study of the Independence IBOT 3000 Mobility System: an innovative power mobility device, during use in community environments. *Archives of Physical Medicine & Rehabilitation* 2004;85(12):2002-2010.

OBJECTIVE: To test the safe and effective use of a new mobility device, the Independence IBOT 3000 Mobility System, by people with a disability.

DESIGN: A prospective, balanced, open-label evaluation that used participants as their own controls.

SETTING: Home and community environments.

PARTICIPANTS: Twenty subjects who use a mobility device.

INTERVENTIONS: Subjects used the test device for up to 2 weeks in their home and community environments.

MAIN OUTCOME MEASURE: Safety was determined by comparing the number of reported adverse events, including falls, in the test device compared with their own device. Effectiveness was measured by comparing scores from the Community Drive Test in the test device versus their own chair.

RESULTS: No adverse event requiring medical attention was reported for either device and a similar number of device falls were reported for each device. The scored driving test results found that the test device was shown to statistically improve ($P < .001$) the subjects independent functional mobility skills in a community environment. Ten of 20 subjects were able climb stairs independently; the remaining 10 subjects were able to climb stairs with the assistance of only 1 person.

CONCLUSIONS: People who are properly assessed, and participate and successfully complete the training, will benefit through increased independence in community mobility activities.

176. van Boxtel MP, Slegers K, Jolles J, Ruijgrok JM. Risk of upper limb complaints due to computer use in older persons: a randomized study. *BMC Geriatrics* 2007;7:21.

BACKGROUND: We studied whether the twelve-month use of a standard computer would induce complaints of upper limb pain or functional limitations in older novice computer users.

METHODS: Participants between 64 and 76 of age were randomly assigned to an Intervention group ($n = 62$), whose members received a personal computer and fast Internet access at their homes, or a No Intervention control group ($n = 61$), whose members refrained from computer use during the twelve month study period.

RESULTS: Difference scores between baseline and twelve months assessments on both complaint (SFS) and functional health scales (SF-36) did not differ between groups (all $p > .05$).

CONCLUSION: Prolonged, self-paced use of a standard computer interface does not put older persons at a risk of upper limb complaints or reduce functional health in older adults.

177. Van Der Heide LA, Willems CG, Spreeuwenberg MD, Rietman J, De Witte LP. Implementation of CareTV in care for the elderly: The effects on feelings of loneliness and safety and future challenges. *Technology and Disability* 2012;24(4):283-291.

Background: The number of lonely elderly is expected to increase due to demographic changes. CareTV is a technological solution, which allows users to interact with carers, family and friends from their home. In prior research users mentioned that CareTV expanded their social contacts, but it had not

been measured if feelings of loneliness as a consequence have decreased. Objective: Investigate whether CareTV is a valid instrument for elderly to engage in meaningful social contacts by a video connection to avoid loneliness. Evaluate the implementation process and identify the remaining future challenges. Methods: From March 2008, elderly people receiving homecare from Proteion Thuis were informed about CareTV and asked to participate in the study. The CareTV duplex video/voice network allowed clients to communicate 24 hours, 7 days a week with a nurse practitioner. Applications of CareTV are (1) Alarm Service (2) Care Service (3) Good morning/good evening service (4) Welfare and housing and (5) Family Contact. During the one year trial period, feelings of loneliness and safety were measured using a questionnaire. In addition, clients' experiences were evaluated in open questions in the survey. The implementation was evaluated retrospectively with a framework developed by Broens. Results: 180 clients of homecare organization Proteion Thuis were connected to CareTV. 130 clients with the average age of 73.2 years were included in the study. The results show that the average feeling of loneliness at group level significantly ($p < 0.001$) decreased from 5.97 (sd 2.77) to 4.02 (sd 3.91) between the start and end of the study on a scale from 0 till 11. Social loneliness (5-items) as well as emotional loneliness (6-items) showed significant decreases. To evaluate safety, no sum score could be calculated, but on item level: for 5 out of 9 items, most clients felt less safe after one year. For one item most clients had improved feelings of safety and for three items, most clients had an equal score. Evaluation of implementation shows what has been done and what needs to be done in future for the specific determinants. Conclusion: Feelings of loneliness significantly decreased within one year. As loneliness is a problem in an estimated 30-40% of the elderly, CareTV seems to be a suitable instrument for elderly, to live longer at home with less feelings of loneliness. Feelings of safety on item level did not seem to improve, this might be due to the fact that no validated scale was used. On the other hand, individual clients indicated that they felt safe with careTV. In future, a study with a validated safety scale should be performed in order to clarify the effect of CareTV on feelings of safety. The analysis of the development and implementation process indicates that the business development approach may be strengthened and that the homecare organization itself may take the lead in that process. 2012 - IOS Press and the authors. All rights reserved.

178. van Hoof J, Kort HSM, Rutten PGS, Duijnste MSH. Ageing-in-place with the use of ambient intelligence technology: Perspectives of older users. *International Journal of Medical Informatics* 2011;80(5):310-331.

Introduction: Ambient intelligence technologies are a means to support ageing-in-place by monitoring clients in the home. In this study, monitoring is applied for the purpose of raising an alarm in an emergency situation, and thereby, providing an increased sense of safety and security. Apart from these technological solutions, there are numerous environmental interventions in the home environment that can support people to age-in-place. The aim of this study was to investigate the needs and motives, related to ageing-in-place, of the respondents receiving ambient intelligence technologies, and to investigate whether, and how, these technologies contributed to aspects of ageing-in-place. Methodology: This paper presents the results of a qualitative study comprised of interviews and observations of technology and environmental interventions in the home environment among 18 community-dwelling older adults with a complex demand for care. These respondents had a prototype of the Unattended Autonomous Surveillance system, an example of ambient intelligence technology, installed in their homes as a means to age-in-place. The UAS-system offers a large range of functionalities, including mobility monitoring, voice response, fire detection, as well as wandering

detection and prevention, which can be installed in different configurations. Results: The respondents had various motives to use ambient intelligence technologies to support ageing-in-place. The most prominent reason was to improve the sense of safety and security, in particular, in case of fall incidents, when people were afraid not to be able to use their existing emergency response systems. The ambient intelligence technologies were initially seen as a welcome addition to strategies already adopted by the respondents, including a variety of home modifications and assistive devices. The systems tested increased the sense of safety and security and helped to postpone institutionalisation. Respondents came up with a set of specifications in terms of the operation and the design of the technology. False alarms were also regarded as a sign that the ambient intelligence technology is functioning. Moreover, a good integration of the new technologies in the provision of health care is indispensable, and installation should be done in an acceptable and unobtrusive manner. Ambient intelligence technologies can contribute to an increased safety and security at home. The technologies alone offer no all encompassing solution as home care and additional environmental interventions are still needed to support ageing-in-place. Results of the study are used to further improve the ambient intelligence technologies and their implementation. (C) 2011 Elsevier Ireland Ltd. All rights reserved.

179. Verheijden Klompstra LSM, Stromberg A, Turolla A, Jaarsma T. Are virtual reality applications feasible to increase physical activity in heart failure patients? A systematic review. *European Journal of Heart Failure, Supplement* 2011;10:S55.

Purpose: Physical activity is an important self care behavior and is related to better prognoses in heart failure. Virtual reality applications can provide encouragement to increase the physical activity. The aims of our study were to evaluate if virtual reality applications could increase physical activity and examine if virtual reality applications are feasible to use in heart failure patients. Methods: A literature search was undertaken till December 2010 in the following databases: PsychInfo, PUBMED, Scopus, Web of Science and CINAHL. The Keywords used were Virtual reality, VR, computer games, video games, physical activity, daily activity, feasibility, usability and exergames in a number of different combinations. In the different databases a total of 757 articles were found. The abstracts were scanned for the study objective, study population, virtual reality application, the training procedure, used measurements and conclusion through two reviewers and evaluated on methodological quality using a classification system. Results: A total of 25 articles were included in this review, with 15 studies using a randomized design and the studies had no follow up data. The 25 studies had a total of 1042 participants. The mean age of the studies is relative young 31 (8-79). Nineteen studies used a commercial virtual reality application, the most common was the Nintendo Wii. All studies show an increase of physical activity in healthy participants, obese participants, elderly with disabilities and patients with stroke or cardiac diseases. The virtual reality applications also enhanced the motivation, exercise self-efficacy, positive mood, and reduced depression. No adverse effects or accidents were reported in the studies and the applications were evaluated as safe and feasible. Conclusion: Until now there are no studies published on using virtual reality in heart failure patients. However virtual reality applications are successfully used in elderly persons and in patients with stroke and cardiac disease. Virtual reality applications to increase physical activity can be a potentially useful tool for heart failure patients.

180. Wilson BA, Emslie HC, Quirk K, Evans JJ. Reducing everyday memory and planning problems by means of a paging system: a randomised control crossover study. *Journal of Neurology, Neurosurgery & Psychiatry* 2001;70(4):477-482.

OBJECTIVES: To evaluate a paging system designed to improve independence in people with memory problems and executive deficits.

METHODS: After a successful pilot study, a randomised control trial was conducted involving a crossover design with 143 people aged between 8 and 83 years. All had one or more of the following: memory, planning, attention, or organisation problems. Most had sustained a traumatic head injury or a stroke although a few had developmental learning difficulties or other conditions. The crossover design ensured that some people received a pager after a 2 week baseline whereas others were required to wait for 7 weeks after the baseline before receiving the pager. Participants were assessed at three time periods-namely, at baseline, 7 weeks, and at 14 weeks postbaseline.

RESULTS: More than 80% of those who completed the 16 week trial were significantly more successful in carrying out everyday activities (such as self care, self medication, and keeping appointments) when using the pager in comparison with the baseline period. For most of these, significant improvement was maintained when they were monitored 7 weeks after returning the pager.

CONCLUSIONS: This particular paging system significantly reduces everyday failures of memory and planning in people with brain injury.

181. Wilson DJ, Mitchell JM, Kemp BJ, Adkins RH, Mann W. Effects of Assistive Technology on Functional Decline in People Aging With a Disability. *Assistive Technology* 2009;21(4):208-217.

This study used a randomized control group design to investigate the impact of an assistive technology and home modification intervention on function for individuals who are aging with a disability. There were 91 participants with polio, rheumatoid arthritis, cerebral palsy, spinal cord injury, stroke, and other impairments. Outcome data were collected at 12 and 24 months through in-home interviews using the Older Americans Resources and Services Instrument (OARS) and the Functional Independence Measure (FIM), and through monthly telephone contact on the hours of in-home care, hospitalizations, and acquisition of AT. The treatment group received an in-home evaluation of their equipment and home modification needs. All recommended AT and home modifications were provided and paid for in full or in part by the study. The control group received the standard community-available health care. A significant "group by time" interaction for the FIM suggested a slower decline in function for the treatment group over 2 years. Further analyses found that the treatment group was more likely to use equipment to maintain independence vs. personal assistance. This study supports the value of assistive technology for adults aging with a disability and suggests that it be provided earlier in the aging process.

182. Wolters KM, Engelbrecht K-P, Goedde F, Moeller S, Naumann A, Schleicher R. Making it easier for older people to talk to smart homes: the effect of early help prompts. *Universal Access in the Information Society* 2010;9(4):311-325.

It is well known that help prompts shape how users talk to spoken dialogue systems. This study investigated the effect of help prompt placement on older users' interaction with a smart home interface. In the dynamic help condition, help was only given in response to system errors; in the inherent help condition, it was also given at the start of each task. Fifteen older and

sixteen younger users interacted with a smart home system using two different scenarios. Each scenario consisted of several tasks. The linguistic style users employed to communicate with the system (interaction style) was measured using the ratio of commands to the overall utterance length (keyword ratio) and the percentage of content words in the user's utterance that could be understood by the system (shared vocabulary). While the timing of help prompts did not affect the interaction style of younger users, it was early task-specific help supported older users in adapting their interaction style to the system's capabilities. Well-placed help prompts can significantly increase the usability of spoken dialogue systems for older people.

183. Wong AMK, Chang W-H, Ke P-C, Huang C-K, Tsai T-H, Chang H-T, et al. Technology Acceptance for an Intelligent Comprehensive Interactive Care (ICIC) System for Care of the Elderly: A Survey-Questionnaire Study. *Plos One* 2012;7(8).

The key components of caring for the elderly are diet, living, transportation, education, and safety issues, and telemedical systems can offer great assistance. Through the integration of personal to community information technology platforms, we have developed a new Intelligent Comprehensive Interactive Care (ICIC) system to provide comprehensive services for elderly care. The ICIC system consists of six items, including medical care (physiological measuring system, Medication Reminder, and Dr. Ubiquitous), diet, living, transportation, education (Intelligent Watch), entertainment (Sharetouch), and safety (Fall Detection). In this study, we specifically evaluated the users' intention of using the Medication Reminder, Dr. Ubiquitous, Sharetouch, and Intelligent Watch using a modified technological acceptance model (TAM). A total of 121 elderly subjects (48 males and 73 females) were recruited. The modified TAM questionnaires were collected after they had used these products. For most of the ICIC units, the elderly subjects revealed great willingness and/or satisfaction in using this system. The elderly users of the Intelligent Watch showed the greatest willingness and satisfaction, while the elderly users of Dr. Ubiquitous revealed fair willingness in the dimension of perceived ease of use. The old-old age group revealed greater satisfaction in the dimension of result demonstrability for the users of the Medication Reminder as compared to the young-old and oldest-old age groups. The women revealed greater satisfaction in the dimension of perceived ease of use for the users of Dr. Ubiquitous as compared to the men. There were no statistically significant differences in terms of gender, age, and education level in the other dimensions. The modified TAM showed its effectiveness in evaluating the acceptance and characteristics of technologic products for the elderly user. The ICIC system offers a user-friendly solution in telemedical care and improves the quality of care for the elderly.

184. Woodward AT, Freddolino PP, Blaschke-Thompson C, Wishart DJ, Fox M, Bakk L, et al. THE TECHNOLOGY AND AGING PROJECT (TAP): OUTCOMES FROM A RANDOMIZED FIELD TRIAL. *Gerontologist* 2010;50:505-505.

185. Woolham J. *Safe at home: the effectiveness of assistive technology in supporting the independence of people with dementia: the safe at home project*. London: Hawker; 2006.

Northamptonshire Safe at Home is a groundbreaking project to evaluate the role of assistive technology in helping people with dementia stay at home for as long as possible. This second evaluation looks at the impact that using as-

sistive technology has had on the lives of people with dementia and their carers. It concludes that: most of the technology used worked reliably, but several important factors affected its reliable use; use of assistive technology usually provided support to unpaid carers; it was very effective in helping service users to remain living independently in their own homes; and it was highly cost effective.

186. Woolham J, et al. The safe at home project: using technology to support the care of people with dementia in their own homes. London: Hawker; 2002.

Describes the Safe at Home project, which uses technology to help people with dementia to remain in their own homes in Northampton, and outline the results of a formal evaluation of the scheme.

187. Wu G, Keyes L, Callas P, Ren X, Bookchin B. Comparison of telecommunication, community, and home-based Tai Chi exercise programs on compliance and effectiveness in elders at risk for falls. *Archives of Physical Medicine & Rehabilitation* 2010;91(6):849-856.

OBJECTIVE: To compare the adherence to and effectiveness of Tai Chi exercise program through a live, interactive, telecommunication-based exercise (Tele-ex) with that of a similar program through a community center-based exercise (Comm-ex) and a home video-based exercise (Home-ex) among community-dwelling elders who are at risk for falls.

DESIGN: Three groups randomized controlled trial with pretests and post-tests.

SETTING: Exercise programs were community-based, and the outcome measures were laboratory-based.

PARTICIPANTS: Adults (N=64) age 65+ years with positive fall history in the previous year and/or significant fear of falling.

INTERVENTION: A 24-form, Yang-style Tai Chi for 15 weeks, 3 hours a week.

MAIN OUTCOME MEASURES: Exercise compliance, number of falls, fear of falling (Activities-specific Balance Confidence [ABC] score), self-perceived health (Medical Outcomes Study 36-Item Short Form Health Survey [SF-36]), Timed Up & Go (TUG), single leg stance (SLS), and body sway during quiet stance (medial-lateral foot center of pressure [ML-COP]).

RESULTS: Tele-ex and Comm-ex groups demonstrated significantly higher exercise attendance and in-class practice time than the Home-ex group ($P < .01$) and significant reductions in the mean number of falls and injurious falls ($P < .01$). There were significant improvements posttraining in SLS, ABC, ML-COP, and Physical Health subscore of the SF-36 ($P < .05$). Both Tele-ex and Comm-ex groups demonstrated larger improvements than the Home-ex group in TUG, ML-COP, and the Social Function, Mental Health, and Physical Health subscores of the MOS SF-36.

CONCLUSION: Compared with the Home-ex, the Tele-ex and Comm-ex groups are better in exercise compliance, fall reduction and balance and health improvements. Tele-ex is an effective, affordable, and acceptable choice of exercise for elders. Copyright 2010 American Congress of Rehabilitation Medicine. Published by Elsevier Inc. All rights reserved.

188. Yasuda K, Kuwahara N, Kuwabara K, Morimoto K, Tetsutani N. Daily assistance for individuals with dementia via videophone. *American Journal of Alzheimer's Disease & Other Dementias* 2013;28(5):508-516.

We previously developed remote reminiscence conversation and schedule prompter systems via the videophone to improve psychological stability and to assist individuals with dementia to perform household tasks. Our results

showed that the psychological stability of 1 patient persisted for 3 hours after remote conversations. The task completion rate afforded by the schedule prompter system, which displays a video reminder series automatically, was 52%. In the present study, we also investigated whether psychological stability was sustained in other patients. Furthermore, motivational prompter videos were added to enhance the original schedule prompter system. We found that 1 in 4 patients living at home showed greater stability while conversing with a conversation partner on the videophone than while watching television programs, and that she remained stable for 3 hours after remote conversations. The task completion rate afforded by the revised schedule prompter system was 82%. These 2 remote systems are promising tools for assisting individuals with dementia in their daily lives.

189. Yesilyaprak SS, Senduran M, Tomruk M, Altin O, Algun ZC. The effects of exercises performed with virtual reality system on balance and fall risk in the elderly, Yaslılarda sanal gerçeklik sistemi ile yapılan egzersizlerin denge ve düşme riski üzerine etkisi. [Turkish, English]. *Fizyoterapi Rehabilitasyon* 2014;1):S73-S74.

Purpose: To determine the effects of virtual reality balance training (VRBT) in treatment of balance dysfunction in elderly with risk of falling and compare these effects with the effects of conventional balance training (CBT). **Materials and Methods:** Eighteen volunteers who live in Republic Of Turkey, Ministry of Family and Social Studies Narlıdere Nursing Home Elderly Care and Rehabilitation Center, aged 65 years & over, with Berg Balance Score (BBS) 45-52 and no serious cardiac, neurologic, pulmonary disease were included. Medical history, cognitive status, basic functional mobility, balance, risk of balance-fall of the elderly were evaluated. Computerized VRBT were given to Virtual Reality Group (VR) whereas Conventional Exercise Group (CE) did simple calisthenics and balance exercises for 3 days/week during 6 weeks. **Results:** The median (min-max) age of the participants was 72 (65-82) years and the median BMI was 26.28 (18.01-40.69) kg/m². There was no significant difference between baseline results of groups ($p > 0.05$). Following the intervention, BBS increased and risk of falling decreased in both groups (VR $p = 0.02$, CE $p = 0.03$). FES-I score decreased only in CE, thus the fear of falling reduced ($p = 0.04$). VR showed improvements in eyes closed one leg stance duration (right & left) ($p = 0.05$) compared to CE group. Eyes closed tandem stance duration ($p = 0.03$) and Timed-Up and Go test scores ($p = 0.03$) increased in VR. **Discussion:** Both VRBT and CBT improved balance. VRBT improved static & dynamic balance skills and functional mobility better, compared to CBT. Virtual reality systems can be used as an effective rehabilitation technique for improving balance and reducing risk of falling, by creating safe environments similar to activities of daily living in elderly.

Referanser

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2. omsorgsdepartementet H-o. NOU 2011:11: Innovasjon i omsorg.
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8. Martin S, Kelly G, Kernohan WG, McCreight B, Nugent C. Smart home technologies for health and social care support. *Cochrane Database of Systematic Reviews* 2008(4).

Vedlegg

Søkestrategier

Søketreff totalt: 5494

Søketreff etter dublettkontroll: 5242

MEDLINE og Embase

Dato: 22.9.2014

Søketreff Embase: 751 (linje 1 1-54, 105-106)

Søketreff Medline: 2648 (linje 55-106)

Søketreff etter Ovid dublettkontroll: 3399

1. *housing/ and (*technology/ or *automation/)
2. (gerontechnolog* or gerotechnolog* or ((assistive or assistive living or assistive device* or assist device* or enabl* or consumer* or mobility or compensat*) adj (technolog* or health* technol*)) or consumer* electronic* or ambient assist* living*).tw.
3. (*architecture/ or *furniture/) and (*technology/ or *automation/)
4. *Robotics/ or robot*.tw.
5. *Sensor/ or (sensor* system* or sensor* technolog* or sensor-based or wireless sensor*).tw.
6. (human factor* design* or psychological engineering or engineering psychology or engineering psychophysiology or human engineering or man machine* or human computer interaction* or user computer interaction or smart environment* or smart technolog*).tw.
7. *virtual reality/ or virtual realit*.tw.
8. *human computer interaction/
9. (smart care or smartcare).tw.
10. ((*self care/ or *self help/) and (*technology/ or *automation/)) or (electronic self-help or electronic selfhelp).tw.
11. ((ageing or aging) adj2 technolog*).tw.
12. (household technolog* or (technolog* adj2 environment*) or technolog* device* or ((electronic* or technolog*) adj assistive device*) or technical* aid* or technolog* aid*).tw.
13. (*Aged/ or *Disabled Person/) and (*technology/ or *automation/)
14. (warning system* or warning technolog* or alarm* system* or positioning system* or positioning technolog* or locali?ation system* or locali?ation technolog* or electronic tagging or radio frequency identification or patient identification system* or remote assistance or remote support or remote help or activity monitoring or

- monitor* system* or monitor* technolog* or (remote adj2 monitor*) or monitor* device*).tw.
15. ((safety or security or accident* or fall* or wandering) adj5 ((automation* or technol*) not in-house technolog*).tw.
16. (*accident prevention/ or *home accident/ or *falling/ or *wandering behavior/) and (*technology/ or *automation/)
17. (elevator* or transfer lift* or (remote adj2 (light* or heat* or window* or door* or lock* or stove*)) or (remote control* or digital assistan* or computer assisted instruction* or perceptive space*)).tw.
18. ((wc or toilet* or personal hygiene or occupational therap* or ergonomic*) adj5 ((automation* or technol*) not in-house technolog*).tw.
19. (*personal hygiene/ or *Occupational Therapy/ or *bioengineering/) and (*technology/ or *automation/)
20. *Reminder System/ or (ambient reminder* or reminder device* or electronic reminder* or electronic* medication* reminder*).tw.
21. *telecommunication/ or *e-mail/ or *mobile phone/ or *videoconferencing/ or *wireless communication/
22. *social media/
23. (Telecommunicat* or tele communicat* or communicat* technol* or mobile phone* or mobile communication device* or cellular phone* or smartphone* or mobile device* or videophone* or personal computer* or home computer* or computer resourc* or touch screen* or chat or Skype or touchscreen* or social media* or Facebook or Twitter or Paro or webcam* or remote communication* or computer assistan* or digital assistan* or computer game* or nintendo wii or x-box or interactive screen* or social interactive device*).tw.
24. ((social support or conversation* partner* or animal* or (pet not pet-scan) or dog or (cat not cat-scan)) adj5 ((automation* or technol*) not in-house technolog*).tw.
25. (*social support/ or *domestic animal/ or *pet animal/) and (*technology/ or *automation/)
26. *Bionics/ or *biosensor/ or (bionic* or biosensor* or biosensing).tw.
27. *Biomedical Engineering/ or biomedical engineering.tw.
28. (electronic medicine cabinet* or electronic pill box* or Health Buddy or Health-Buddy or I-cat).tw.
29. (*telemedicine/ or *telemonitoring/ or (smart care or telemed* or telehealth or tele-health or tele-nursing or e-health or telemetry or telecare or mobile health or remote monitor* or telemonitor* or remote health* or remote care).tw.) and (*Aged/ or *disabled Person/ or exp *disability/ or exp *Intellectual impairment/ or (gerontolog* or elderly or ageing or aging or "the older" or senior* or "the aged" or old* adult* or old* population* or old* people* or disabled or handicap* or special need* or impair* or disabilit* or dement*).tw.)
30. or/1-29
31. (home or homes or homebound or domestic or domicil* or community-dwelling).tw.
32. home/ or home environment/ or homebound patient/
33. Housing/
34. (independent aging or independent ageing or independent living or aging in place or ageing in place or age in place or supported independence or support of independence or self sufficien* or self-contain* or self-relian* or self-sustain* or self-support* or self-help or selfhelp or self care).tw.
35. independent living/
36. or/31-35
37. 30 and 36
38. (smart home* or smarthome* or smart hous* or smarthous* or smart kitchen* or smart toilet*).tw.
39. 37 or 38

40. ((systematic* adj2 review*) or meta-anal*).mp. or (review.mp. and (pubmed or medline).tw.) or ((systematic* or database* or literature) adj2 search*).tw.
41. 39 and 40 [Systematiske oversikter]
42. Aged/ or disabled Person/ or exp disability/ or exp Intellectual impairment/ or (gerontolog* or elderly or elder* or ageing or aging or "the older" or senior* or "the aged" or old* adult* or old* population* or old* people* or disabled or handicap* or special need* or impair* or disabilit* or dement*).tw.
43. 37 and 42
44. 38 or 43
45. (study or studies or studied or trial* or research* or outcome* or evaluat* or assessment* or analys* or empiric* or quantitative* or qualitative* or quasi* or random* or effect* or efficacy or group* or control* or compar* or experiment* or interview* or experience* or result* or prospective* or retrospective* or cohort* or time series or repeated measure* or focus group* or observat*).mp.
46. 44 and 45 [Primærstudier]
47. 41 or 46 [Systematiske oversikter eller primærstudier]
48. limit 47 to exclude medline journals
49. (abstract or conference or conference paper or conference proceeding or conference proceeding article or conference proceeding conference paper or conference proceeding editorial or conference proceeding note or "conference proceeding review").pt.
50. 47 and 49 [Konferansepubliasjoner beholdes]
51. 48 or 50
52. (editorial or journal letter or journal note or "journal review" or journal short survey or letter or note or survey).pt.
53. 51 not 52
54. 53 use emez
55. housing/ and (technology/ or automation/ or Biomedical Technology/)
56. (gerontechnolog* or gerotechnolog* or ((assistive or assistive living or assistive device* or assist device* or enabl* or consumer* or mobility or compensat*) adj (technolog* or health* technol*)) or consumer* electronic* or ambient assist* living*).tw.
57. (architecture as topic/ or "facility design and construction"/ or "interior design and furnishings"/) and (technology/ or automation/ or Biomedical Technology/)
58. Robotics/ or robot*.tw.
59. (sensor* system* or sensor* technolog* or sensor-based or wireless sensor*).tw.
60. (human factor* design* or psychological engineering or engineering psychology or engineering psychophysiology or human engineering or man machine* or human computer interaction* or user computer interaction or smart environment* or smart technolog*).tw.
61. man-machine systems/ or virtual realit*.tw.
62. user-computer interface/
63. (smart care or smartcare).tw.
64. (exp Self-Help Devices/ and (technology/ or automation/ or Biomedical Technology/)) or (electronic self-help or electronic selfhelp).tw.
65. ((ageing or aging) adj2 technolog*).tw.
66. (household technolog* or (technolog* adj2 environment*) or technolog* device* or ((electronic* or technolog*) adj assistive device*) or technical* aid* or technolog* aid*).tw.
67. (Aged/ or exp Disabled Persons/) and (technology/ or automation/ or Biomedical Technology/)
68. (warning system* or warning technolog* or alarm* system* or positioning system* or positioning technolog* or localisation system* or localisation technolog* or electronic tagging or radio frequency identification or patient identification system* or remote assistance or remote support or remote help or activity monitoring or

- monitor* system* or monitor* technolog* or (remote adj2 monitor*) or monitor* device*).tw.
69. ((safety or security or accident* or fall* or wandering) adj5 ((automation* or technol*) not in-house technolog*).tw.
70. (accident prevention/ or accidental falls/ or accidents, home/ or Wandering Behavior/) and (technology/ or automation/ or Biomedical Technology/)
71. (elevator* or transfer lift* or (remote adj2 (light* or heat* or window* or door* or lock* or stove*)) or (remote control* or digital assistan* or computer assisted instruction* or perceptive space*).tw.
72. "Elevators and Escalators"/
73. ((wc or toilet* or personal hygiene or occupational therap* or ergonomic*) adj5 ((automation* or technol*) not in-house technolog*).tw.
74. (Toilet Facilities/ or exp Hygiene/ or Occupational Therapy/ or Human engineering/) and (technology/ or automation/ or Biomedical Technology/)
75. Reminder Systems/ or (ambient reminder* or reminder device* or electronic* reminder* or electronic* medication* reminder*).tw.
76. telecommunications/ or Electronic Mail/ or Wireless Technology/
77. social media/
78. (Telecommunicat* or tele communicat* or communicat* technol* or mobile phone* or mobile communication device* or cellular phone* or smartphone* or mobile device* or videophone* or personal computer* or home computer* or computer resourc* or touch screen* or chat or Skype or touchscreen* or social media* or Facebook or Twitter or Paro or webcam* or remote communication* or computer assistan* or digital assistan* or computer game* or nintendo wii or x-box or interactive screen* or social interactive device*).tw.
79. ((social support or conversation* partner* or animal* or (pet not pet-scan) or dog or (cat not cat-scan)) adj5 ((automation* or technol*) not in-house technolog*).tw.
80. (social support/ or animals, domestic/ or pets/) and (technology/ or automation/ or Biomedical Technology/)
81. Bionics/ or Biosensing Techniques/ or (bionic* or biosensor* or biosensing).tw.
82. Biomedical Engineering/ or biomedical engineering.tw.
83. (electronic medicine cabinet* or electronic pill box* or Health Buddy or Health-Buddy or I-cat).tw.
84. (Telemedicine/ or (smart care or telemed* or telehealth or tele-health or tele-nursing or e-health or telemetry or telecare or mobile health or remote monitor* or telemonitor* or remote health* or remote care).tw.) and (Aged/ or exp Disabled Persons/ or exp Delirium, Dementia, Amnestic, Cognitive Disorders/ or (gerontolog* or elderly or elder* or ageing or aging or "the older" or senior* or "the aged" or old* adult* or old* population* or old* people* or disabled or disabil* or handicap* or special need* or impair* or dement*).tw.)
85. or/55-84
86. (home or homes or homebound or domestic or domicil* or community-dwelling).tw.
87. Homebound Persons/
88. exp Housing/
89. (independent aging or independent ageing or independent living or aging in place or ageing in place or age in place or supported independence or support of independence or self sufficien* or self-contain* or self-relian* or self-sustain* or self-support* or self-help or selfhelp or self care).tw.
90. independent living/
91. or/86-90
92. 85 and 91
93. (smart home* or smarthome* or smart hous* or smarthous* or smart kitchen* or smart toilet*).tw.
94. 92 or 93

95. ((systematic* adj2 review*) or meta-anal*).mp. or (review.pt. and (pubmed or medline).tw.) or ((systematic* or database* or literature) adj2 search*).tw.
96. 94 and 95 [Systematiske oversikter]
97. Aged/ or exp Disabled Persons/ or exp Delirium, Dementia, Amnestic, Cognitive Disorders/ or (gerontolog* or elder* or ageing or aging or "the older" or senior* or "the aged" or old* adult* or old* population* or old* people* or disabled or disabil* or handicap* or special need* or impair* or dement*).tw.
98. 93 or (92 and 97)
99. (study or studies or studied or trial* or research* or outcome* or evaluat* or assessment* or analys* or empiric* or quantitative* or qualitative* or quasi* or random* or effect* or efficacy or group* or control* or compar* or experiment* or interview* or experience* or result* or prospective* or retrospective* or cohort* or time series or repeated measure* or focus group or observat*).mp.
100. 98 and 99 [Primærstudier]
101. 96 or 100 [Systematiske oversikter eller primærstudier]
102. (comment or editorial or letter or news).pt.
103. 101 not 102
104. 103 use pmoz
105. 54 or 104 [Embase eller Medline]
106. remove duplicates from 105

Cinahl

Dato: 22.9.2014

Søketreff: 397

Limit to academic journals and dissertations.

S65	S50 OR S64
S64	S60 AND S63
S63	S61 OR S62
S62	(MH "Research+")
S61	TI (study or studies or studied or trial* or research* or outcome* or evaluat* or assessment* or analys* or empiric* or quantitative* or qualitative* or quasi* or random* or effect* or efficacy or group* or control* or compar* or experiment* or interview* or experience* or prospective* or retrospective* or cohort* or "time series" or (repeated W1 measure*) or (focus W1 group*)) OR AB (study or studies or studied or trial* or research* or outcome* or evaluat* or assessment* or analys* or empiri ...
S60	S43 OR S58
S59	S43 OR S58
S58	S42 AND S57
S57	S51 OR S52 OR S53 OR S54 OR S55 OR S56
S56	TI dementia OR AB dementia
S55	(MH "Delirium, Dementia, Amnestic, Cognitive Disorders+")
S54	(MH "Intellectual Disability+") OR (MH "Developmental Disabilities")

S53	(MH "Disabled+")
S52	(MH "Health Services for the Aged") OR (MH "Frail Elderly") OR (MH "Housing for the Elderly") OR (MH "Aged+") OR (MH "Aged, 80 and Over") OR "elderly"
S51	TI (gerontolog* or elder* or ageing or aging or "the older" or senior* or "the aged" or (old* W1 adult*) or (old* W1 population*) or (old* W1 people*) or disabled or handicap* or (special W1 need*) or impair* or disabilit*) OR AB (gerontolog* or elder* or ageing or aging or "the older" or senior* or "the aged" or (old* W1 adult*) or (old* W1 population*) or (old* W1 people*) or disabled or handicap* or (special W1 need*) or impair* or disabilit*)
S50	S44 AND S48
S49	S44 AND S48
S48	S45 OR S46 OR S47
S47	TI ((systematic* W1 review*) or (meta W1 analys*)) OR AB ((systematic* W1 review*) or (meta W1 analys*))
S46	(MH "Meta Analysis")
S45	(MH "Systematic Review")
S44	S42 OR S43
S43	TI ((smart W1 home*) or smarthome* or (smart W1 hous*) or smarthous* or (smart W1 kitchen*) or (smart W1 toilet*)) OR AB ((smart W1 home*) or smarthome* or (smart W1 hous*) or smarthous* or (smart W1 kitchen*) or (smart W1 toilet*))
S42	S36 AND S41
S41	S37 OR S38 OR S39 OR S40
S40	TI ("independent aging" or "independent ageing" or "independent living" or "aging in place" or "ageing in place" or "age in place" or "supported independence" or "support of independence" or (self W1 sufficien*) or (self W1 contain*) or (self W1 relian*) or (self W1 sustain*) or (self W1 support*) or (self W1 help) or selfhelp or (self W1 care) OR "healthy aging" or "healthy ageing") OR AB ("independent aging" or "independent ageing" or "independent living" or "aging in place" or "ageing in pl ...
S39	(MH "Assisted Living")
S38	(MH "Accidents, Home") OR (MH "Home Occupational Therapy")
S37	TI (home or homes or homebound or domestic or domicil* or "community-dwelling") OR AB (home or homes or homebound or domestic or domicil* or "community-dwelling")
S36	S1 OR S2 OR S3 OR S4 OR S5 OR S6 OR S7 OR S8 OR S9 OR S10 OR S11 OR S12 OR S13 OR S14 OR S15 OR S16 OR S17 OR S18 OR S19 OR S20 OR S21 OR S22 OR S23 OR S24 OR S25 OR S26 OR S27 OR S28 OR S31 OR S33 OR S34 OR S35

S35	(MH "Telehealth+")
S34	(MH "Assistive Technology Devices") AND (MH "Environment, Controlled")
S33	S30 AND S32
S32	(MH "Architecture+")
S31	S29 AND S30
S30	(MH "Technology+")
S29	(MH "Pets")
S28	TI ("electronic medicine cabinet" or "electronic pill box" or "Health Buddy" or HealthBuddy or "I-cat") OR AB ("electronic medicine cabinet" or "electronic pill box" or "Health Buddy" or HealthBuddy or "I-cat")
S27	TI "biomedical engineering" OR AB "biomedical engineering"
S26	(MH "Biomedical Engineering")
S25	(MH "Bionics")
S24	TI (bionic* or biosensor* or biosensing) OR AB (bionic* or biosensor* or biosensing)
S23	TI ("social support" or (conversation* W1 partner*) or animal* or (pet not pet-scan) or dog or (cat not cat scan)) N5 ((automation* or technol*)) OR AB ("social support" or (conversation* W1 partner*) or animal* or (pet not pet-scan) or dog or (cat not cat scan)) N5 ((automation* or technol*))
S22	TI (Telecommunicat* or "tele communication" or (communication W1 technol*) or (mobile W1 phone*) or (mobile W1 communication device*) or (cellular W1 phone*) or smartphone* or (mobile W1 device*) or videophone* or (personal W1 computer*) or (home W1 computer*) or (computer W1 resourc*) or (touch W1 screen*) or chat or Skype or touchscreen* or (social W1 media*) or Facebook or Twitter or Paro or webcam* or "remote communication" or (computer W1 assistan*) or (digital W1 assistan*) or (computer W ...
S21	(MH "Social Media")
S20	(MH "Telecommunications")
S19	(MH "Reminder Systems")
S18	TI ((ambient W1 reminder*) OR (reminder* W1 device*) OR (electr* W1 reminder*) OR (electr* W1 medical W1 reminder*)) OR AB ((ambient W1 reminder*) OR (reminder* W1 device*) OR (electr* W1 reminder*) OR (electr* W1 medical W1 reminder*))
S17	TI ((wc or toilet* or hygiene or (occupational W1 therap*) or ergonomic*) N5 ((automation* or technol*)) OR AB ((wc or toilet* or hygiene or (occupational W1 therap*) or ergonomic*) N5 ((automation* or technol*))
S16	TI ((elevator* or (transfer W1 lift*) or (remote N2 (light* or heat* or window* or door* or lock* or stove*)) or ((remote W1 control*) or (digital W1 assistan*) or (computer W1 assisted W1 instruction*) or (perceptive W1 space*)))) OR AB ((elevator* or (transfer W1 lift*) or (remote N2 (light* or heat* or window* or

	door* or lock* or stove*)) or ((remote W1 control*) or (digital W1 assistan*) or (computer W1 assisted W1 instruction*) or (perceptive W1 space*)))
S15	TI ((safety or security or accident* or fall* or wandering) N5 (automation* or technol*)) OR AB ((safety or security or accident* or fall* or wandering) N5 (automation* or technol*))
S14	TI ((warning W1 system*) or (warning W1 technolog*) or (alarm* W1 system*) or (positioning W1 system*) or (positioning W1 technolog*) or (locali?ation W1 system*) or (locali?ation W1 technolog*) or (electronic W1 tagging) or (radio W1 frequency W1 identification) or "remote assistance" or "remote support" or "remote help" or "activity monitoring" or (monitor* W1 system*) or (monitor* W1 technolog*) or (remote W2 monitor*) or (monitor* W1 device*)) OR AB ((warning W1 system*) or (warning W1 te ...
S13	TI ((household W1 technolog*) or (technolog* W2 environment*) or (technolog* W1 device*) or ((electronic* or technolog*) N2 assistive device*) or (technical* W1 aid*) or (technolog* W1 aid*)) OR AB ((household W1 technolog*) or (technolog* W2 environment*) or (technolog* W1 device*) or ((electronic* or technolog*) N2 assistive device*) or (technical* W1 aid*) or (technolog* W1 aid*))
S12	TI ((ageing or aging) N2 technolog*) OR AB ((ageing or aging) N2 technolog*)
S11	TI ((selfcare or "self care" or "self help") N2 technolog*) OR AB ((selfcare or "self care" or "self help") N2 technolog*)
S10	TI ("smart care" or smartcare) OR AB ("smart care" or smartcare)
S9	(MH "User-Computer Interface")
S8	(MH "Virtual Reality")
S7	TI "virtual reality" OR AB "virtual reality"
S6	TI ("human factors design" or "psychological engineering" or "engineering psychology" or "engineering psychophysiology" or "human engineering" or "man machine" or "human computer interaction" or "user computer interaction" or (smart W1 environment*) or (smart W1 technolog*)) OR AB ("human factors design" or "psychological engineering" or "engineering psychology" or "engineering psychophysiology" or "human engineering" or "man machine" or "human computer interaction" or "user computer interact ...
S5	TI ((sensor* W1 system*) OR (sensor* W1 technolog*) OR "sensor-based" or (wireless W1 sensor*)) OR AB ((sensor* W1 system*) OR (sensor* W1 technolog*) OR "sensor-based" or (wireless W1 sensor*))
S4	(MH "Robotics")
S3	(MH "Assistive Technology") OR (MH "Assistive Technology Services")
S2	TI robot* OR AB robot*

S1	TI (gerontechnolog* or gerotechnolog* or ((assistive or "assistive living" or "assistive device" or "assist device" or enabl* or consumer* or mobility or compensat*) W1 (technolog* or health* technol*)) or "consumer* electronics" or "ambient assisted living") OR AB (gerontechnolog* or gerotechnolog* or ((assistive or "assistive living" or "assistive device" or "assist device" or enabl* or consumer* or mobility or compensat*) W1 (technolog* or health* technol*)) or "consumer* electronics" or " ...
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ISI Web of Science

Dato: 22.9.2014

Søketreff: 1048

# 22	#19 OR #14 Refined by: Databases: (WOS) AND Databases: (WOS)
# 21	#19 OR #14 Refined by: Databases: (WOS)
# 20	#19 OR #14
# 19	#17 AND #16 Refined by: Databases: (WOS)
# 18	#17 AND #16
# 17	TOPIC: ("study" or "studies" or "trial*" or "research")
# 16	#15 OR #9 OR #8
# 15	#7 AND #6 AND #3
# 14	#12 AND #11 Refined by: Databases: (WOS)
# 13	#12 AND #11
# 12	TOPIC: ("systematic review" or "meta-analys*")
# 11	#10 OR #9 OR #8
# 10	#6 AND #3
# 9	TITLE: (((("ageing" or "aging" or "elderly" or "disab*" or "dement*" or "self-care" or "self-help") and ("technol*" or "robot*" or "automation*" or "smart*"))))
# 8	TOPIC: ("smart home*" or "smarthome*" or "smart kitchen*" or "smart care" or smartcare or "smart environment")

# 7	TOPIC: ("gerontolog*" or "elderly" or "elder*" or "ageing" or "aging" or "the older" or "senior*" or "the aged" or "old* adult*" or "old* population*" or "old* people*" or "disabled" or "handicap*" or "special need*" or "im-pair*" or "disabilit*" or "dement*")
# 6	#5 OR #4
# 5	TOPIC: ("independent aging" or "independent ageing" or "independent living" or "aging in place" or "ageing in place" or "age in place" or "sup-ported independence" or "support of independence" or "self sufficien*" or "self-contain*" or "self-relian*" or "self-sustain*" or "self-support*" or "self-help" or "selfhelp" or "self care")
# 4	TOPIC: ("home" or "homes" or "homebound" or "domestic" or "domicil*" or "community-dwelling")
# 3	#2 OR #1
# 2	TOPIC: ("Assistive technolog*" or "assistive living technolog*" or "assistive device technolog*" or "assist device technolog*" or "enabling technolog*" or "consumer technolog*" or "mobility technolog*" or "compensational tech-nolog*" or "Assistive health technolog*" or "assistive living health tech-nolog*" or "assistive device technolog*" or "assist device technolog*" or "enabling health technolog*" or "consumer health technolog*" or "mobility health technolog*" or "compensational health technolog*" or smartcare or "smart care" or "smart healthcare" or "smart health care")
# 1	TOPIC: (gerontechnolog* or gerotechnolog*)

Cochrane Library

Cochrane Database of Systematic Reviews: 97

DARE: 10

HTA: 4

Central: 79

#1 (gerontechnolog* or gerotechnolog* or ((assistive or "assistive living" or (assis-tive next device*) or (assist next device*) or enabl* or consumer* or mobility or com-pensat*) next (technolog* or (health* next technol*))) or (consumer* next elec-tronic*) or (ambient next assist* next living*)):ti,ab,kw

#2 (sensor* next system*) or (sensor* next technolog*) or "sensor-based" or (wire-less next sensor*):ti,ab,kw

#3 ((ageing or aging) near/2 technolog*):ti,ab,kw

#4 ((human next factor* next design*) or "psychological engineering" or "engi-neering psychology" or "engineering psychophysiology" or "human engineering" or "man machine" or "man-machine" or "human computer interaction" or "user com-puter interaction" or (smart next environment*) or (smart next tech-nolog*)):ti,ab,kw

#5 (virtual next realit*):ti,ab,kw

#6 ("smart care" or smartcare):ti,ab,kw

#7 ((electr* next self next help) or "electronic selfhelp"):ti,ab,kw

#8 ((selfcare or "self care" or "self help") near/5 technolog*):ti,ab,kw

- #9 ((household next technolog*) or (technolog* next environment*) or (technolog* next device*) or ((electronic* or technolog*) near/2 assistive device*) or (technical* next aid*) or (technolog* next aid*)):ti,ab,kw
- #10 ((warning next system*) or (warning next technolog*) or (alarm* next system*) or (positioning next system*) or (positioning next technolog*) or (locali?ation next system*) or (locali?ation next technolog*) or (electronic next tagging) or (radio next frequency next identification) or "remote assistance" or "remote support" or "remote help" or "activity monitoring" or (monitor* next system*) or (monitor* next technolog*) or (remote near/2 monitor*) or (monitor* next device*)):ti,ab,kw
- #11 ((safety or security or accident* or fall* or wandering) near/5 (robot* or automation* or technol* or computer* or electronic* or artificial* intelligen*)):ti,ab,kw
- #12 ((remote next (light* or heat* or window* or door* or lock* or stove*)) or (remote next control*) or (digital next assistan*) or (computer next assisted next instruction*) or (perceptive next space*)):ti,ab,kw
- #13 ((wc or toilet* or hygiene or (occupational next therap*) or ergonomic*) near/5 (robot* or automation* or technol* or computer* or electronic* or artificial* intelligen*)):ti,ab,kw
- #14 ((ambient next reminder*) or (reminder* next device*) or (electr* next reminder*) or (electr* next medical next reminder*)):ti,ab,kw
- #15 (Telecommunicat* or (tele next communicat*) or (communicat* next technol*) or (mobile next phone*) or (mobile next communication next device*) or (cellular next phone*) or smartphone* or (mobile next device*) or videophone* or (personal next computer*) or (home next computer*) or (touch next screen*) or chat or Skype or touchscreen* or "social media" or Facebook or Twitter or Paro or webcam* or (remote next communication*) or (computer next assistan*) or (digital next assistan*) or (computer next game*) or "nintendo wii" or "x-box" or (interactive next screen*) or (social next interactive next device*)):ti,ab,kw
- #16 (("social support" or (conversation* next partner*) or animal* or (pet not "pet-scan") or dog or (cat not "cat-scan")) near/5 (robot* or automation* or technol* or computer* or electronic* or artificial* intelligen*)):ti,ab,kw
- #17 (bionic* or biosensor* or biosensing):ti,ab,kw
- #18 ("biomedical engineering"):ti,ab,kw
- #19 ("electronic medicine cabinet" or "electronic pill box" or "Health Buddy" or HealthBuddy or "I-cat"):ti,ab,kw
- #20 MeSH descriptor: [Architecture as Topic] explode all trees
- #21 MeSH descriptor: [Interior Design and Furnishings] explode all trees
- #22 MeSH descriptor: [Technology] explode all trees
- #23 (#20 or #21) and #22
- #24 MeSH descriptor: [Robotics] explode all trees
- #25 MeSH descriptor: [Man-Machine Systems] explode all trees
- #26 MeSH descriptor: [User-Computer Interface] explode all trees
- #27 MeSH descriptor: [Self-Help Devices] this term only
- #28 #27 and #22
- #29 MeSH descriptor: [Accident Prevention] explode all trees
- #30 MeSH descriptor: [Accidental Falls] explode all trees
- #31 MeSH descriptor: [Accidents, Home] explode all trees
- #32 MeSH descriptor: [Wandering Behavior] explode all trees
- #33 #29 or #30 or #31 or #32
- #34 #33 and #22
- #35 MeSH descriptor: [Toilet Facilities] explode all trees
- #36 MeSH descriptor: [Hygiene] this term only
- #37 MeSH descriptor: [Occupational Therapy] explode all trees
- #38 MeSH descriptor: [Human Engineering] this term only
- #39 #35 or #36 or #37 or #38

- #40 #39 and #22
- #41 MeSH descriptor: [Reminder Systems] explode all trees
- #42 MeSH descriptor: [Telecommunications] this term only
- #43 MeSH descriptor: [Social Media] explode all trees
- #44 MeSH descriptor: [Social Support] explode all trees
- #45 MeSH descriptor: [Pets] explode all trees
- #46 (#44 or #45) and #22
- #47 MeSH descriptor: [Bionics] explode all trees
- #48 MeSH descriptor: [Biosensing Techniques] explode all trees
- #49 MeSH descriptor: [Telemedicine] this term only
- #50 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16 or S17 or S18 or S19 or S23 or S24 or S25 or S26 or S28 or S34 or S40 or S41 or S42 or S43 or S46 or S47 or S48 or S49
- #51 (home or homes or homebound or domestic or domicil* or "community-dwelling"):ti,ab,kw
- #52 MeSH descriptor: [Homebound Persons] explode all trees
- #53 MeSH descriptor: [Housing] explode all trees
- #54 ("independent aging" or "independent ageing" or "independent living" or "aging in place" or "ageing in place" or "age in place" or "supported independence" or "support of independence" or (self next sufficien*) or (self next contain*) or (self next relian*) or (self next sustain*) or (self next support*) or (self next help) or self-help or "self care"):ti,ab,kw
- #55 MeSH descriptor: [Independent Living] explode all trees
- #56 #51 or #52 or #53 or #54 or #55
- #57 #50 and #56
- #58 ((smart next home*) or smarthome* or (smart next hous*) or smarthous* or (smart next kitchen*) or (smart next toilet*)):ti,ab,kw or ((ageing or aging) near/2 technolog*):ti,ab,kw
- #59 #57 or #58
- #60 (gerontolog* or elderly or ageing or aging or "the older" or senior* or "the aged" or old* adult* or (old* next population*) or (old* next people*) or disabled or disabil* or handicap* or (special next need*) or impair* or dement*):ti,ab,kw
- #61 MeSH descriptor: [Disabled Persons] explode all trees
- #62 MeSH descriptor: [Delirium, Dementia, Amnestic, Cognitive Disorders] explode al

PubMed

Dato: 23.9.2014

Søketreff: 47

((("assistive technology" OR gerontechnology or "enabling technology" or "assistive device technology") AND (home* OR aged OR elderly OR disabil* or disable* or dement*) OR smart house) AND (study OR studies OR trial* OR research OR review OR meta-analys*) AND publisher [sb])

Sociological Abstracts og Social Services Abstracts

Dato: 23.9.2014

Søketreff: 351

S10 ti(technolog* and (ageing or aging or elderly or disab* or dement* or impair*))

S9 S5 or S7 or S8

S8 all(("smart home*" or "smarthome*" or "smart kitchen*" or "smart care" or smartcare or "smart environment"))

S7 S3 and S6

S6 all(("gerontolog*" or "elderly" or "elder*" or "ageing" or "aging" or "the older" or "senior*" or "the aged" or "old* adult*" or "old* population*" or "old* people*" or "disabled" or "handicap*" or "special need*" or "impair*" or "disabilit*" or "dement*"))

S5 S3 and S4

S4 all(("independent aging" or "independent ageing" or "independent living" or "aging in place" or "ageing in place" or "age in place" or "supported independence" or "support of independence" or "self sufficien*" or "self-contain*" or "self-relian*" or "self-sustain*" or "self-support*" or "self-help" or "selfhelp" or "self care")) OR all(("home" or "homes" or "homebound" or "domestic" or "domicil*" or "community-dwelling"))

S3 all(("Assistive technolog*" OR "assistive living technolog*" OR "assistive device technolog*" OR "assist device technolog*" OR "enabling technolog*" OR "consumer technolog*" OR "mobility technolog*" OR "compensational technolog*" OR "Assistive health technolog*" OR "assistive living health technolog*" OR "assistive device technolog*" OR "assist device technolog*" OR "enabling health technolog*" OR "consumer health technolog*" OR "mobility health technolog*" OR "compensational health technolog*" OR smartcare OR "smart care" OR "smart healthcare" OR "smart health care")) OR all(: (gerontechnolog* or gerotechnolog*))

Campbell Library

Dato: 23.9.2014

Søketreff: 3

Title: technol* or gerontechnol* or smart* or robot*

Keywords: technol* or gerontechnol* or smart* or robot*

CRD Databases

Dato: 23.9.2014

Søketreff: 27

1 ("Assistive technolog*" OR "assistive living technolog*" OR "assistive device technolog*" OR "assist device technolog*" OR "enabling technolog*" OR "consumer technolog*" OR "mobility technolog*" OR "compensational technolog*" OR "Assistive health technolog*" OR "assistive living health technolog*" OR "assistive device technolog*" OR "assist device technolog*" OR "enabling health technolog*" OR "consumer health technolog*" OR "mobility health technolog*" OR "compensational health technolog*" OR smartcare OR "smart care" OR "smart healthcare" OR "smart health care" OR gerontechnolog* or gerotechnolog*):TI

2 ("smart home*" or "smarthome*" or "smart kitchen*" or "smart care" or smartcare or "smart environment"):TI

3 (technolog* and (ageing or aging or elderly or disab* or dement* or impair*)):TI

4 #1 OR #2 OR #3

5 (#1 OR #2 OR #3) IN DARE, HTA

Social Care online

Dato: 30.9.2014

Søketreff: 349

Søk 1

All fields: "assistive technolog*" or "compensational technolog*" or gerontechnolog* or "smart home*" or smarthome* or smarthouse or smartcare

AND

All fields: "systematic review" or "meta-analysis" or "meta-analyses"

Søk 2

Title: (elder* or old* or ageing or aging or disab* or impair* or dement*) and technolog*

Søk 3

Abstract: "assistive technolog*" or "compensational technolog*" or gerontechnolog* or "smart home*" or smarthome* or smarthouse or smartcare

AND

Abstract: elder* or old* or ageing or aging or disab* or impair* or dement*

AND

Abstract: home* or living or "in place"

Social Science Research Network

Dato: 25.9.2014

Søketreff: 34

Title, Abstract, Abstract ID & Keywords: "assistive technology"

Title, Abstract, Abstract ID & Keywords: "Assistive technologies"

Title, Abstract, Abstract ID & Keywords: gerontechnology

Title only: ageing technology

Title only: aging technology

Title only: disability technology

Title only: disabilities technology

Title only: disabled technology

Title, Abstract, Abstract ID & Keywords: "smart home"