ICT based applications to improve social health and social participation in older adults with dementia. A systematic literature review.

Aging and Mental Health 'Special issue on social health'

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Authorship

APB and MFM developed the original idea. APB, JAGC and MFM performed the search strategy, extracted data, and wrote the manuscript. CJR and EC contributed to the drafts of the paper and provided valuable comments during the process of writing this manuscript.

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Background:

Information and communication technologies (ICT) developers, together with dementia experts have created several technological solutions to improve and facilitate social health and social participation and quality of life of older adults living with dementia. However, there is a need to carry out a systematic literature review that focuses on the validity and efficacy of these new technologies assessing their utility to promote "social health" and "active ageing" in people with dementia.

Method:

Searches in electronic databases identified 3824 articles of which 6 met the inclusion criteria and were coded according to their methodological approach, sample sizes, type of outcomes and results.

Results:

Six papers were identified reporting the use of 10 different interventions with people with dementia. Qualitative studies (four) show a benefit of the use of technologies to foster social participation in people with dementia. At the same time, barriers to a widespread use of these technologies in this population were identified. A Quantitative study and a mixed-method study with quantitative outcomes show that ICT based interventions promote more social behaviours than non-technology based interventions.

Conclusions:

In the last years several technological devices for living independently and fostering social health and social participation in people with dementia have been developed. However, specific outcome measures to assess social health and social participation are needed. Even though the analysed studies provided some evidence-base for the use of technology in this field there is an urge for develop high quality studies and specific outcome measures.

Keywords: dementia, technology, social health, social participation, older adults

Introduction

According to the World Health Organization (2015) about 47 million people suffer from dementia around the world. The World Alzheimer Report (Alzheimer's Disease International, 2015) estimates that there are about 10.5 million people living with dementia in Europe with an estimated prevalence rate of 5.9%. Every year there are 8 million people newly diagnosed. Mild cognitive impairment (MCI) is described as a series of symptoms that, while not seriously interfering in daily life, increase risk of dementia (Alzheimer's Society, 2015). In a review that was carried out by Roberts and Knopman (2013) prevalence estimates of MCI ranged from 16% to 20% of people over 65 around the world. In addition to this, according to Panza et al. (2010) there is comorbidity between depression and MCI. Women with MCI are at greater risk of social isolation (Artero et al., 2008). As a matter of fact, several authors have proved that loneliness, social isolation and also the presence of negative social interactions are related to a higher probability of having MCI (Wilson et al., 2007; Cacioppo & Hawkley, 2009; Shankar, Hamer, McMunn & Steptoe, 2013). Wang et al. (2015) suggested that more interventions fostering social networks and social participation in older adults are necessary to prevent cognitive decline.

Huber et al. (2011) proposed a definition of health that includes several dimensions of social health such as the people's capacity to fulfil their potential and obligations, the ability to manage their life with some degree of independence despite a medical condition, and the ability to participate in social activities including work. This definition has created the need to widen the scope of psychosocial studies about health, including new types of outcome measures in an area that used to focus on cognitive functions, mood and

activities of daily living. Adapting to the environment and participation in social activities are central aspects of an effective management of life that leads to being involved with meaningful activities; and social interaction, social ties and meaningful relationships (Huber et al. 2011). Social participation is regarded as a key determinant of successful and healthy ageing (Levasseaur et al., 2010). Even though, some authors have been using this term in relation to concepts of social interaction, social inclusion or social activity. Levasseur et al. (2010) described this concept as person's involvement in activities that provide interactions with others in society. This inconsistent use of the term shows that a clear definition of social participation is still needed (Piskur et al.,2013).

In 2015, the global population was ageing at a rate not seen in the past (United Nations, 2015). Europe is the continent where this ageing process is likely to be of major significance in the coming decades (Eurostat, 2016). In the last years, "active ageing" is being promoted by governments and institutions (World Health Organization, 2015). The World Health Organization defines "Active ageing" as the process of optimising opportunities for health, participation and security in order to enhance older adults' quality of life. This definition encompasses a series of related concepts; the word "active" refers to continuing participation in social, economic and cultural activities, being older adults a contributory element in families, communities and nations. The active ageing process goes further than physical well-being or managing daily life activities, it pursues the inclusion of older adults in society. On the other hand, "active ageing" seeks to maintain older adults' autonomy and independence through the promotion of integral health (physical, mental and social wellbeing) (World Health Organization, 2015). Another concept highly linked to active ageing is "Ageing in Place", which was defined by Davey, Nana, de Joux, & Arcus (2004 p20) as the ageing policies of remaining living in the community, with some level of independence, rather than in residential care. These

policies have been promoted by the World Health Organization and the Organization for economic co-operation and development (OECD) due to several studies that have shown that the economic costs of ageing in place are lower than those of ageing in residential care homes (Chappel et al. 2004). Furthermore, "ageing in place" enables the maintenance of social connections to family and friends improving the quality of life of older adults (Wiles et al. 2011).

In the last decade information and communication technologies (ICT) developers have been working for the implementation of interventions creating several technological solutions to improve and facilitate ageing in place, social participation , personal autonomy, independence and quality of life of older adults (Padilla y Sánchez-López, 2007). García-Lizana (2013) holds that a new integrated model of health and social services focusing on citizen-patient is necessary to the future of our health systems and the only way to make them efficient and dynamic is using new technologies. According to Doherty and Mendenhall (2006) citizen-patient health care model is defined as a way to engage patients, families, and communities as coproducers of health and health care. It goes beyond the activated patient to the activated community, with professionals acquiring community organizing skills for working with individuals and families who see themselves as citizens of health care-builders of health in the clinic and community rather than merely as consumers of medical services.

Several ICT based approaches and innovations have been developed in the field of older adults´ care (Padilla, 2008). These, can be grouped as technological aids and ambient assisted-living systems (technological gadgets that help older adults with certain daily life activities in order to improve their quality of life); cognitive assessment or cognitive interventions based on ICT(adapting pencil and paper batteries to technological

environments, or creating new ICT-based interventions) to provide cognitive and emotional support for older adults and their carers (Boots, de Vugt, van Knippenber, Kempen & Verhey, 2014; Franco-Martín, Gónzalez Palau, Ruiz, Vargas & Solís, 2011; Oriani et al. 2003; García-Casal et al. 2016); and technologies and interventions to foster older people´s social participation and the creation and maintenance of social relationships through technology (Padilla, 2008). (Annex 1, Online version). However, some factors may affect the implementation of these systems like their design (Marcos, 2002), acceptability (Placencia, 2001), accessibility (Jiménez-Lara, 2000) and lack of usability studies.

Due to the diversity of technological solutions developed to foster social participation, this systematic literature review aims to assess the effects of ICT based interventions evaluating their utility to promote "active ageing" and "social health" in people with dementia.

Method

A systematic literature search of four scientific databases was performed, covering literature published up to May 2016.

Types of interventions and participants:

This article focuses in the social aspect of existing ICT interventions whose aim is to maintain, facilitate and improve social participation, inclusion and networks of people living with dementia. This included different technology hardware such as computers, laptops, mobile phones, monitoring devices and tablets. The aim of these technologies is to avoid the social isolation of people living with dementia encouraging their social

participation and social contacts in the community through leisure and cognitive activities.

Search engines:

Searches in electronic databases for this systematic review were conducted in May 2016 using PsycInfo, PubMed, CINAHL with full text and Scielo.

Search Terms:

A unified search term using Boolean operators was applied for three out of four databases (PsycInfo, PubMed, CINAHL with full text): (Aged OR Dementia OR MCI OR Mild Cognitive Impairment OR Elderly OR Old OR Older adults) AND (active ageing OR active aging OR cognitive stimulation OR psychosocial OR social OR Aging in Place) AND (Computer OR computing OR ICT OR Technolog*). However, Scielo database does not allow a unified search using Boolean, in which case terms were used in combination. (See Table 1).

Inclusion Criteria:

(1) Qualitative and quantitative research which analyse the effect of ICT-based interventions to facilitate social participation and social health among people living with Dementia.

(2) Studies whose participants are aged 55 years old or older with a diagnosis of dementia (both, living in the community or in residential care facilities)

(3) Publications written in English

Exclusion Criteria:

(4) Articles in languages different from English

(5) Results coming from mixed interventions (both, technology based and non-technology based interventions) that did not specify the effect of ICT-based interventions on social outcomes

(6) Studies that do not report data about social outcomes

(7) Articles whose population differ from our target population (older adults in general, Parkinson disease, schizophrenia, Huntington, HIV, smokers…)

Selected studies:

The search yielded 3,824 papers, of which 468 duplicates were automatically removed; other duplicates were removed in the following steps (321). The first author checked the remaining 3035 titles and abstracts to determinate their relevance. Other three authors also checked one third of the titles and abstracts each. The final inclusion of papers was discussed in a consensus meeting, in case of discrepancies the articles were considered again until consensus was reached. This first screening resulted in a total of 68 relevant papers; those articles were then assessed by two authors on the basis of abstracts and full copies of the article when needed. Finally, after carefully reading researchers agreed that 6 articles met the inclusion criteria.

Data analysis and synthesis:

Data on types of ICT applications, sample size and characteristics, dropouts and measures were extracted from the selected studies and classified in an ad-hoc table (See Table 2). Data coding was conducted by the first author with the second author supervision, when these authors could not reach an agreement about the inclusion of papers a third author with expertise in the studied field was included in a consensus meeting.

Due to the heterogeneous characteristics of the included studies a narrative synthesis of

qualitative studies was performed according to Lipsey & Wilson (2001) recommendation. While, a presentation of the quantitative findings were described in the results section.

Quality appraisal:

To assess the quality of the qualitative selected studies we used Critical Appraisal Skills Programme guidance in order to distinguish the studies in terms of overall methodological quality (Splittehouse, 2000). The criteria of CASP Qualitative Checklist enable to assess the trustworthiness, relevance and results of published qualitative papers (Critical Appraisal Skills Programme, 2015). This checklist consists of 10 questions designed to help researches think about rigour and relevance of qualitative research, this appraisal included questions as: Are the aims described? Is there a statement of the findings? Is there description of the sample? Every question has to be answered with "yes", "no" and "can't tell". Afterwards, a total score from 0 to 10 was calculated for every study included in the review, allowing the authors to compare the quality of the studies.

Results

Characteristics of Examined Studies:

All studies selected were published between 2006 and 2013. They were conducted in four European countries (United Kingdom, the Netherlands, Sweden and Finland). Four of the studies approaches were qualitative while one was a mixed-method study and the last one a quantitative study (See table 3).

However, there was a difference between the instruments and measures used to assess the outcomes. Four of them used interviews, two used focus groups or workshops, two used different types of behavioural observations and two used quantitative data in order to

categorise their participants and outcomes. Turning to the technologies used in the interventions, most of the studies included several devices in each intervention. One of them used four different devices for the two areas of intervention included in the studio: improvement of quality of life and experienced autonomy of the persons with dementia(sensors, web interface, a hub and a cognitive assistant) (Meiland et al., 2007). Two other studies described the use of a touch screen computer (Astell et al., 2010; Nihjof et al., 2013)et al., 2013). One paper assessed the use of 29 different technological devices (Riikonen et al., 2013). Finally, a study assessed the use of television, radio and telephone in a technology-based leisure activity for people living with dementia (Nijhof et al. 2013). The ICT intervention was implemented in the regular living environments in three out of six of the studies, while one took place in a nursing home and two were implemented both in the regular living environment and in public spaces.

Characteristics of Participants:

The studies comprised a total sample of 79 people living with dementia. Sample sizes varied from 18 to 34. Most of the studies utilised convenience sampling, and most of the participants were women. Four of the studies included the perceptions of carers.

Dependent Variables and Outcomes Measures:

Due to the lack of a clear definition of social participation, the operationalization of the concept in the selected studies was heterogeneous. None of the articles selected used a quantitatively measured outcome to assess all of the levels included in the social participation meaning (social interaction, social inclusion…).

In the qualitative method papers the effects of ICT use on social variables were examined through interviews exploring the effects of technologies in people with dementia and their social networks. Meiland et al. (2007) focused in the needs from technology support for social contacts. Riikonen et al. (2013) analysed the importance of the social network for the use of technology, and the effect of the technology in the attitude and personality of people with dementia. The study carried out by Brittain et al. (2010) analysed how technology non-specifically designed for people with dementia could encourage them to participate in the society.

Turning to the mixed-method study and the quantitative study, the outcome measures used to assess social health and social participation were limited to some aspects of the whole concepts. Nijhof et al. (2013) used the Oshkosh Social Behaviour Coding (OSBC) scale, in order to answer the research questions related to the occurrence of social behaviour during the intervention. This scale include both verbal and non-verbal, social and non-social behaviour, which are divided in 21 items (Lunsman et al., 2007). By contrast, in Astell et al. (2010) a coding or verbal and not verbal behaviour were measured through online observations from videotapes by two blinded researchers. Verbal behaviour was categorized in two groups: Choosing with prompt (amount of times the person with dementia chose what they wanted to talk) and Initiation (when the person with dementia made the first comment on viewing/listening to new stimulus). Nonverbal behaviour was categorized in for groups: singing, moving to music, pointing to draw attention and laughter. Afterwards, using a behavioural software package the data was quantitatively analysed.

Study quality

The methodical quality of the studies was poor. The total score for all studies on each question of the CASP checklist ranged from 0/6 (relationship between researcher and participants) to 6/6. The average score was 7, equivalent to a 70% of the possible marks (Table 2).

Quantitative findings:

The results provided by Astell et al. (2010) regarding to the utility of ICT-based reminiscence intervention (CIRCA) compared with a non-ICT based reminiscence intervention (TRAD) show that people with dementia using CIRCA made more choices ($t(10)=3.6717$, $p<.005$). The people with dementia who used the non technological reminiscence programme spent more time asking direct questions ($t(10)=3.13$ $p<.01$). By contrast, lower levels of initiation conversation where reported with TRAD ($z= 2.03$, $p<.05$). Turning to the nonverbal measures: people with dementia sang more with CIRCA than with TRAD: ($t=(10)=2.191$ $p<.05$).

Nijhof et al. (2013) compared two leisure activities, one technology-supported (The Chitchatters, CC) and a non-technology supported one (The Question Game, QG). The results reported than the mean of social behaviours are lower using The Chitchatters than The Question Game. (CC Mean 5.09 SD 3.31- QG Mean 7.41 SD 4.03, $p<.15$).

Discussion

This systematic review is, to our knowledge, the first to assess the effects of ICT solutions on the social health of people living with dementia encouraging their participation in social activities. It is necessary to develop, operationalise and describe the areas that Social Health as a concept should include; the lack of a strong conceptualisation and

operationalisation of the Huber (2011) dimensions of social health makes it difficult to hold a reliable approach to this field. We have defined social health as the capacity of people living with dementia to actively participate in social networks within their communities.

Some reviews have been carried out by different authors in the last years (Dickens et al. 2011; Chen et al. 2016) which provide emerging evidence to support the use of ICT to foster social participation in older adults with dementia and cognitive impairment (Chen at al. 2016). However, as this review shows, that evidence has not been tested in methodologically robust clinical trials.

The potential for developing technological solutions to meet the needs of an ageing population is increasingly being recognised (Astell et al. 2010). On the other hand, the great variability in ICT´s themselves (where systems using several technological devices as computers, mobiles phones, alarm gadgets, etc. are treated as equals) make it difficult to classify the interventions into homogeneous groups to compare them.

In the articles analysed in this review, the technologies used for the alleviation of social isolation include among other electronic tagging (Astell, 2006), sensorised homes (Meiland et al. 2007) and the alternative use of regular computers, adapting their components to the needs of people with dementia (Astell et al. 2010; Riikonen et al. 2013). This variability, again, may magnify the challenges to use technologies by people with dementia and those who care for them (Astell et al. 2010) taking into account that most of the people living with dementia and their carers have no extensive experience using technology and that they have to learn how to manage most of the technological gadgets used in these interventions (Placencia, 2001).

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According to this systematic search there is a wide range of interventions for people with dementia using technologies. While Nijhof et al. (2013) explored the use of technology-based leisure activities developed for people with dementia including four interactive objects in order to stimulate social behaviour in groups, Astell et al. (2010) used technology in a reminiscence program (CIRCA) and in a dyad (people with dementia and their carer). On the other hand, Brittain et al. (2010) are interested in how technologies of place mediate between people with dementia and their physical and social environment, defined as "universal" technologies that are intended for general use, and not only for specific groups (Hansson, 2007).

These interventions show how different approaches and technologies can contribute positively to tackling the problems faced by people with dementia and could improve their social wellbeing (Astell, 2006).

The limited examination of the general concept of social health and social participation as constructs are a barrier to develop appropriate outcome measures. Sansoni et al. (2010) in their 'Final report for an effective assessment of social isolation' recommend the use of the Lubben Social Network Scale, the Jong-Gierveld Loneliness Scale, the Medical Outcomes Study Social Support Survey and the Multidimensional Scale of perceived Social Support none of which are specific for social health or social participation. However, any of these scales were used in the selected studies which tried to overcome the absence of specific outcome measures developing tailored qualitative outcomes to assess the views of people with dementia (Brittain et al. 2010).

The findings of this review suggest that people with dementia can benefit from ICT interventions and there are different technologies and interventions that could help them to maintain, facilitate and create social networks. However, further research on this topic

is urgently needed in order to provide insights into which approaches are the most useful for people with dementia to increase their social participation.

Limitations:

The conclusions drawn from this review must be considered in the context of some limitations. This review focused in the social health aspects of psychosocial interventions with ICT for people living with dementia. While there is evidence that this type of treatments could be beneficial for older adults (Chen et al. 2016) there is a lack of high quality studies specific for people with dementia; thus, the conclusions of this systematic literature review are based on limited evidence. Even though some interventions have been developed for this specific target population, this lack of ==high quality experimental== studies make it impossible to currently assess the conveniences or inconveniences of using technologies to foster social health. In addition, as the studies were heterogeneous in terms of design, sample sizes, methods, and interventions it was impossible to statistically pool the data to perform a quantitative meta-analysis to explore the evidence of the effectiveness of the treatments for social health of people living with dementia.

Conclusions

Even though the concept of social health is relatively new in the dementia area, it is surprising the lack of papers assessing this fundamental aspect of psychosocial interventions. The scarce evidence gathered in this review shows promising results based in mostly qualitative studies. The two studies that provided quantitative results show that ICT based interventions promote more social behaviours than the non-ICT based interventions used in the control group. traditional ones.

==Although technology has been included in several psychosocial interventions during the==

last decades, most of the ICT-based interventions focuses in the cognitive decline (ICT-based cognitive interventions) and needs for the daily life activities (assistive technology) that people living with dementia undergoes.

There is a need to develop specific outcome measures to assess all the aspects related to social health as a whole in psychosocial interventions with people with dementia. Further research is also needed in this area and there is also a need for medium and long term follow-ups to examine longer term intervention effects,. Most importantly what we need are high quality randomised controlled trials.

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Table 1. Key Words for search in Scielo

Sample	Type of intervention	Technologies
Aged	Active ageing	Computer
Dementia	Active aging	Computing
Elderly	Ageing in place	ICT
MCI	Cognitive stimulation	Technology
Mild cognitive impairment	Psychosocial	
Old	Social	
Older adults		

Figure 1. Flowchart of the search strategy

Systematic literature search (n = 3.824)
PsycInfo= 1814
Medline= 1409
CINAHL= 477
Scielo= 124

Exclusion of duplicates (n = 789)

Potentially relevant articles (n =3.035)

Excluded on Title/Abstract (n = 3.029)

- Neurosciences & drugs (53)
- Older adults other interventions (285)
- Older adults ICT social interventions (48)
- Other populations (2.188)
- Social Network but not ICT (13)
- Social Networks other populations (35)
- Protocol, editorial, articles (33)
- No social outcomes (68)
- Older adults attitudes towards ICT (104)
- Reviews (74)
- Other language (7)
- Description of software and/or hardware (121)
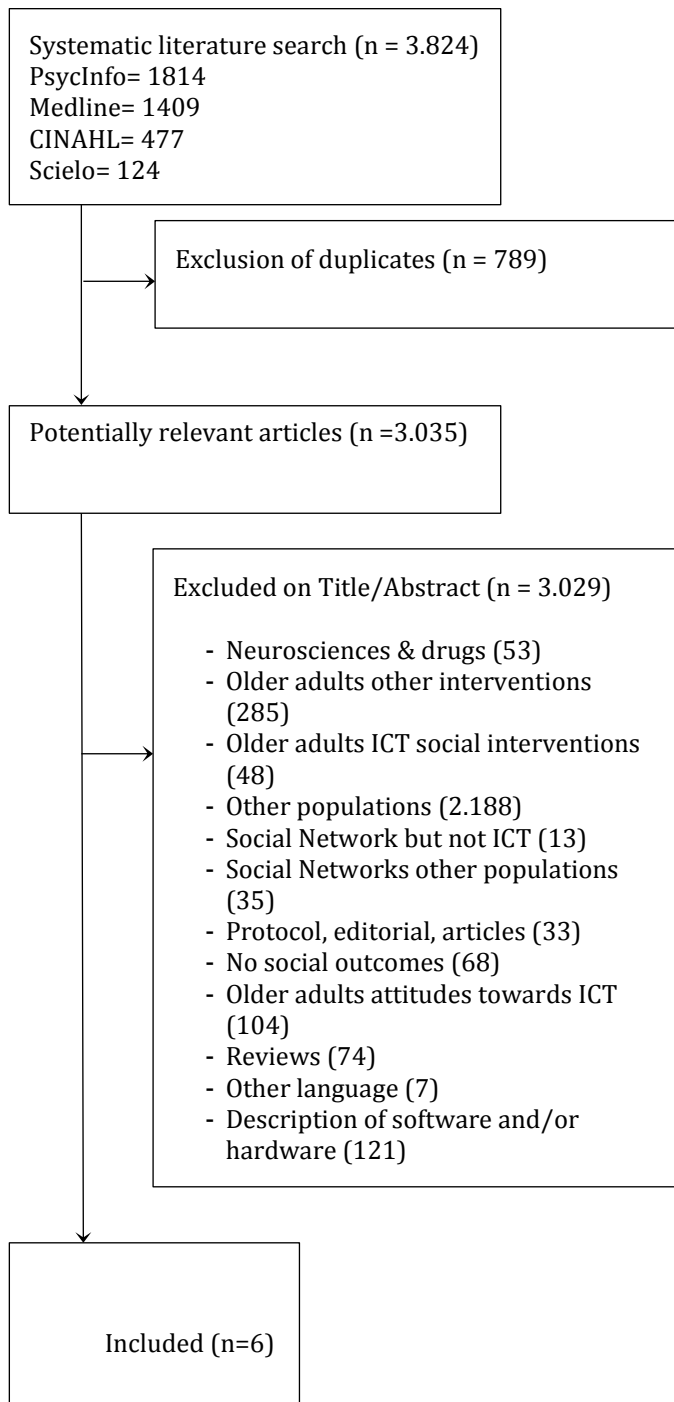
Included (n=6)

Table 2. Critical Appraisal Skills Programme (CASP) Qualitative Checklist

Author	Clear Statement	Appropriate methodology	Appropriate Research design	Appropriate Recruitment strategy	Data collection justified	Relationship researcher / participants	Ethical issues considerated	Rigorous data Analysis	Clear statement of findings	Research value	Total
Astell, 2006	1	1	0	n.a	1	0	1	0	0	1	5
Brittain et al. 2010	1	1	1	0	1	0	1	0	1	1	7
Meiland et al. 2007	1	1	1	1	1	0	1	0	1	1	8
Riikonen et al. 2013	1	1	1	1	1	0	0	1	1	1	8
Astell et al. 2010	1	1	0	1	1	0	1	1	1	1	8
Nijhof et al. 2013	1	1	0	1	1	0	1	1	1	1	8
Total	6	6	3	4	6	0	5	3	5	6	44/60

Notes: 1 = Yes; 0 = No; n.a. = not applicable.

Table 3. ICT-based applications to improve social health

Authors/Year/Country	Participants (n, age)	Home delivered	Technology	Intervention	Adm.	Outcome measures	Results/Findings
Astell, 2006 (UK)	PWD*	Both, home and outside	Electronic tagging, assistive technology	Cognitive training, physical activity, reality orientation…	Caregivers	Qualitative	Electronic tagging: Controversial technology associated with control and restraint. Other possible interventions that could be made in the dementia care environment should be considered before tagging. In favour: more freedom of movement and personhood. Had the potential to remain people in their own homes. Assistive technology: Promoting independence, anticipate the needs of people with dementia and take account of their strengths. Criticisms of dehumanisation as electronic tagging. Psychosocial interventions: foster the contact with others and reduce "problem" behaviour and increased "positive" behaviour.
Astell et al. 2010 (UK)	11 PWD (83.54 SD 8.98) and their carers	Yes	Computer multimedia system (CIRCA)	Reminiscence therapy	Caregivers	Quantitative	CIRCA as a tool to facilitate the social participation compared with treatment as usual. Verbal coding categories: Offered a choice more often by the caregivers (t(10)=5.9 p<.0005) PWD made more choices (t(10)=3.6717, p<.005). Non technological programme spend more time asking direct questions (t(10)=3.13 p<.01). Lower levels of initiation conversation with TRAD (z= 2.03, p<.05) Nonverbal measures: PWD Sing more with CIRCA that with TRAD: (t=(10)=2.191 p<.05) Caregivers sing more with CIRCA (z=2.33, p<.05) Caregivers moved to music more with CIRCA (t=2.39, p<.05). Nonverbal measures ANOVA: Gaze effect (F(2,40)=19.966, p<.0005) Gaze by group interaction (F(2,40)=6.58, p<.001) Gaze by reminiscence type interaction (F(2,40)=33.99, p<.0005)
Brittain et al. 2010 (UK)	16 PWD + 3 carers. *	No- outside home (public spaces)	Everyday technology	Physical activity, reality orientation	*	Qualitative. Interviews	Therapeutic benefits of outside space but at the same time as a frightening space, usefulness of technology to foster PWD going outside. Technology as a tool to make friendlier the outside space
Meiland et al. 2007 (UK, NL, SWE)	3 groups. Amsterdam: 6 PWD (64.0) 6 C (58.5) Belfast: 6 PWD (72.7) 6 C (53.0) Lulea: 5 PWD (67.8) 5 C (61.4)	Yes	COGKNOW (CK Sensorised Home, CKHome Hub, CKWeb interface and CK Cognitive assistant)	Cognitive training, physical activity, reality orientation	Caregivers	Qualitative. Interviews and workshops.	It study provides feedback about the preference applications for users in the three countries of application.
Nijhof et al. 2013	10 PWD (69.0)	No-Nursing home	Chitchatters (television, radio, telephone and treasure box)	Leisure intervention	Activity facilitators	Mixed-method. OSBC (Behavioural observations), Interviews, MMSE.	The Chitchatter (CC) game as a facilitator of social behaviour compared with reminiscence program without technology (QG). Major occurrence of social behaviour with reminisce with technology. Occurrence of social behaviour: CC The mean of social behaviours are higher than non-social behaviours during CC intervention than in QG. Social verbal behaviour (CC Mean 5.09 SD 3.31-QG Mean 7.41 SD 4.03, p<.15) Non-social verbal behaviour (CC Mean 0.61 SD 0.93-QG Mean 0.32 SD 0.62, p<.33) Gender differences highlighted.
Riikonen et al. 2013 (FIN)	25 PWD (79.0) and carers	Yes	29 different devices (sensors, computers, telephone…)	Cognitive training, physical activity, reality orientation…	*	Qualitative. Interviews.	Importance of the social network to use technology. Need of guidance and continuous support in the use of technologies. Effect of attitude and personality on the use of technology. Effect of the disease stage on use of technology

Notes: *=Non-provided information; Adm.=Administrator of the ICT application; ANOVA=Analysis of Variance; C=Caregivers; CC=Chitchatters; CK=Cogknow; PWD=People with dementia; QG=Question game; TRAD=Traditional Reminiscence Sessions

Annex 1. Non-pharmacological interventions			
Therapy	**Cognitive**	**ADL**	**BPSD**
Cognitive training	+	+	+
Cognitive rehabilitation	+	+	+
Cognitive stimulation therapy	+	+	+
Snoezelen/multisensory stimulation	+	+	+
Reality orientation	+	+	+
Reminiscence therapy	+	−	+
Validation therapy	+	−	+
Physical activity	+	+	+
Light therapy	+	−	+
Music therapy	+	−	+
Aromatherapy	−	−	+
Animal-assisted therapy	−	−	+
Notes: ADL= activities of daily living; BPSD=behavioural and psychological symptoms of dementia			
Takeda et al. (2012)			