

Short Notes

Impact of Adapted Digital Tools in the Taken Care of Behavioural and Psychological Symptoms of Dementia in Elderly Aged of 60 Years and over Living at Home: A Systematic Review

Gilles Kehoua^{1,2*}, Benjamin Calvet³, Marie-Laure Laroche^{1,2,4}, Michel Druet-Cabanac^{1,2}, Philippe Nubupko³ and Achille Tchalla^{1,2}

¹University Hospital Clinical Gerontology Unit, University of Limoges, France

²Faculty of Medicine of Limoges, University of Limoges, France

³Institute of Epidemiology and Tropical Neurology, University of Limoges, France

⁴Center for Pharmacovigilance, Pharmacoepidemiology and Drug Information Limoges, University of Limoges, France

*Corresponding author

Gilles Kehoua, University Hospital Clinical Gerontology Unit, University of Limoges, 2 Avenue Martin-Luther King, Limoges, France, Tel: 33 5 55 05 86 26.

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Abstract

Objective: To carry out a systematic review of the literature to evaluate the impact of adapted digital tools in elderly aged of 60 years and over, living at home with neurocognitive disorders associated with behavioural and psychological symptoms of dementia (BPSD).

Methods: PubMed, ScienceDirect, Cochrane Library, Scopus and The New England Journal of Medicine databases were searched carried out from 13/02/1996 to 13/02/2023. Randomized clinical trial, randomized trial and quasi-experimental study were selected, and relevant data were extracted for qualitative synthesis. The studies were conducted on a sample of elderly aged 60 years and over living at home. Taken care of behavioural and psychological symptoms of dementia was made by adapted digital tools.

Results: Of the 6,642 of records identified, 367 reports were eligible, of which 4 met the criteria for inclusion in the review. Of the 12 behavioural domains, the neuropsychiatric symptoms identified were depression and anxiety as BPSD. Actiwatch Spectrum PRO, WeCareAdvisor™ and telephone-delivered cognitive behavioral therapy were identified as digital tools. Only diseases in the affective domain, including depression and anxiety, were taken care, using the batteries of comprehensive and systematic neuropsychiatric tests. There is very little data on the utilization of adapted digital tools among elderly aged of 60 years and over with BPSD at home.

Conclusions: These digital tools have been effective. They have reduced anxiety and depression symptoms and improved the quality of life of elderly aged of 60 years and over with BPSD. Methodological weaknesses, including small sample sizes, could lead to very cautious interpretation of the results of these studies. In future work, it would be useful to integrate an economic model concerning the adapted digital tools.

ABBREVIATIONS

OMS: world health organization; YLD: Years Lost Due to Disability; DSM-5: Diagnostic and Statistical Manual of mental disorders (5th edition); DSM-IV: Diagnostic and Statistical Manual of Mental Disorders — (4th edition); BPSD: Behavioural and Psychological Symptoms of Dementia; NPI: Neuropsychiatric Inventory; PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PICO: Population, Intervention, Comparison and Outcomes; NEJM: The New England Journal of Medicine; RCT: Randomized Controlled Trials; IG: Intervention

Group ; CG: control group ; CBT: Cognitive Behavioral Therapy; USA: United States of America ; KG: Kehoua Gilles ; AT: Achille Tchalla ; MDC: Michel Druet-Cabanac ; MLL: Marie-Laure Laroche ; PN: Philippe Nubupko; BC: Benjamin Calvet

INTRODUCTION

A demographic transition is underway in the world. According to the World Health Organization (WHO), the absolute number of elderly aged of 60 was 901 million in 2015. This proportion is expected to increase to 1.4 billion in 2030, to 2.1 billion in

2050 and could reach 3.2 billion in 2100 [1]. As people age, they are more likely to be affected by multi-morbidities including dementia...[1].

According to the Global Status Report on Public Health Action Against Dementia, an estimated 55.2 million elderly worldwide had dementia in 2019. This number could increase to around 78 million in 2023, reaching approximately 139 million in 2050. Among elderly aged of 60 years and over, dementia is among the top 10 factors responsible for years lost due to disability (YLD) [2]. The DSM-5, published in 2013, now introduces major neurocognitive disorders (now replacing the term dementia, used in the DSM-IV) are chronic neuropsychiatric diseases [3]. Major neurocognitive disorders are characterized by cognitive decline, significant enough to affect autonomy in the activities of daily living, in at least one of the following domains: complex attention, executive functions, learning and memory, language, perceptual-motor ability and social cognition. Major neurocognitive disorders (Alzheimer's disease and related syndromes) are associated with disorders known as behavioural disorders, psychiatric symptoms or neuropsychiatric symptoms or behavioural and psychological symptoms of dementia (BPSD) [4,5].

BPSD are directly related to the pathological process, and are defined as primary manifestations of a cerebral dysfunction. They appear specifically following an attack on a system or circuit, such as the limbic system or the cortico-subcortical circuits [6]. They are observable at all the phases of these different neurocognitive disorders, with a variable clinical expression (some being more frequently found at the beginning of the evolution of the disease, even before the first cognitive symptoms, others being later) [7]. They are grouped into coherent symptom subgroups, "hyperactivity" domain (including agitation, disinhibition, irritability, aberrant motor behaviours, and euphoria), "psychosis" domain (including delusions, hallucinations, and sleep disturbance), "affective" domain (including depression and anxiety), and "apathy" domain (including apathy and appetite disorders) [8,9]. The increase in the number and severity of BPSD is associated with a risk of loss of autonomy, burden on caregivers and resulting in an impact on quality of life, hospitalizations and institutionalization [10,11]. They are the 3rd risk factor for hospitalization after cardiovascular diseases and fractures. They are also the cause of increased health care costs and depressive symptoms in caregivers [12,13]. Semi-structured interviews with the patient and/or caregiver allow for the proper assessment of BPSD, using a battery of comprehensive and systematic neuropsychiatric tests such as the Neuropsychiatric Inventory (NPI) [14]. NPI is the most frequently used, evaluating the 12 behavioural domains (ranging from delusions and hallucinations to sleep and appetite disorders).

In this systematic review, we were interested in the use of adapted digital tools or gerontechnologies in the non-drug management of BPSD. Gerontechnology is a rapidly expanding field, combining geriatrics and information and communication technologies [15,16]. Many different assistive technologies are used in the following domains: prevention and safety, health

monitoring, assistance with tasks, stimulation and socialization, and support for patients and caregivers (improving their quality of life) [17-20].

Our objective is to carry out a systematic review of the literature to evaluate the impact of adapted digital tools in elderly aged of 60 years and over, living at home with neurocognitive disorders associated with BPSD.

MATERIALS AND METHODS

We used the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline for reporting: The PRISMA 2020 statement: an updated guideline for reporting systematic reviews [21].

We used the PICO tool focusing on the Population, Intervention, Comparison and Outcomes [22]. The population of interest identified was those elderly aged 60 years and over living at home. Intervention strategies used adapted digital tools in the non-drug management of BPSD, compared to usual care. Batteries of comprehensive and systematic neuropsychiatric tests were identified in each study.

Research strategies

The terms associated with the PICO elements were used. The research strategy was developed by a team composed of 2 colleagues (BC and PN) with expertise in the research area of psychiatry of the elderly, 2 colleagues (GK and AT) with expertise in the research area of geriatrics and adapted digital tools, and 2 colleagues (MLL and MDC) with expertise in conducting systematic reviews (methodology).

The keywords were: « behavioural and psychological symptoms of dementia » OR « behavioural disorders » OR « psychiatric symptoms » OR « neuro-psychiatric symptoms » OR « psychiatric disorders » AND « dementia » OR « major neurocognitive disorders » AND « digital health » OR « e-health » OR « ehealth » OR « telecommunications » OR « mobile application » OR « new technologies » OR « gerontechnology » OR « digital tools » OR « telemedicine » AND « elderly » OR « aged » OR « aging » OR « older people » OR « older adult » OR « old-age » AND « community-dwelling » OR « home » OR « residence » OR « house » OR « housing » AND « intervention strategy » OR « eHealth intervention » OR « eHealth interventions ». The research strategy was carried out from 13/02/1996 to 13/02/2023 on the databases: PubMed, ScienceDirect, Cochrane Library, Scopus and The New England Journal of Medicine (NEJM).

The year 1996 was chosen, because on that date, the International Psychogeriatric Association proposed the denomination BPSD, grouping together the disorders of perception, thought content, mood or behaviour observed mainly in patients with Alzheimer's disease or a similar diseases [23].

Inclusion criteria

The included studies must meet the following criteria:

elderly aged of 60 years and over living at home, with BPSD, identification of an interventional strategy using, adapted digital tools in the non-drug management of BPSD and the use of Batteries of comprehensive and systematic neuropsychiatric tests. Original articles published in French and English (the languages spoken and understood by the authors), randomized controlled trials (RCT), quasi-experimental studies and cohort studies were included. These studies were chosen to avoid bias, based on their levels of scientific proof in the literature. A grade A recommendation was based on scientific proof established by studies with a high level of proof (or level 1). In contrast, a grade B recommendation was based on a scientific presumption provided by studies of intermediate level of proof (or level 2). Only grade C recommendation studies (or levels 3 and 4) based on lower level of proof studies were excluded [24].

Non-inclusion criteria

Elderly aged of under of 60 years and not living at home were excluded. Studies without assessments of BPSD or clear and precise intervention strategies or adapted digital tools were excluded. Grade C recommendation studies (or levels 3 and 4) based on lower level of proof studies were excluded.

Study selection

The first phase was to identify the articles to be included for a complete review. Firstly, the author (KG) was saved and stored all records in Rayyan [25], where duplicates were first automatically excluded. Then, five authors analyzed the titles and abstracts (AT, MLL, MDC, BC and PN). Finally, each author indicated if an article should be included or excluded using the criteria defined above. In case of discrepancies, the authors worked together to reach a consensus on the list of articles. The second phase allowed the authors to read the articles in their entirety and independently to validate their inclusion. If, after complete reading, the article met any of the non-inclusion criteria, it was immediately excluded and deleted, and then the reason for this exclusion was noted. If it happened that several articles covered the same intervention, we selected the most relevant according to the study objectives, inclusion and non-inclusion criteria, and was generally the most recent. For systematic reviews and included articles, we manually went through the reference list.

Data extraction

KG proposed a list of categories containing variables extracted from studies to all authors (AT, MLL, MDC, BC and PN). For each study, we extracted: First author, year of publication, country, objectives, design, sample sizes of intervention (IG) and control groups (CG), types of interventions in the IG and CG groups, adapted digital tools, outcome measures and results.

Quality Assessment Tool

We will use Health Evidence™ as a quality assessment grid for studies included in the review. An overall assessment of the methodological quality of studies will be determined based on

the results obtained for each question. The final score is on 10. To calculate it, add up all the check marks in the Yes column and indicate the total of the column under Yes; and proceed in the same way for the No column. Studies with a score of 8 or higher in the Yes column will be considered rigorous. Studies with a score between 5 and 7 in the Yes column will be considered average. Studies with a score of 4 or less in the Yes column will be considered low [26]. Studies of low methodological quality or considered low were excluded.

Four authors (GK, BC, AT and PN) independently assessed each article. Disagreements on score levels were discussed and validated. Studies of low methodological quality were excluded. The distribution of study quality assessment was presented in Table 1.

RESULTS

Studies selection

Figure 1 describes the selection process for the studies screened. Using our search strategy, we included 6,642 of records identified through database searching on PubMed (n = 2,738), Cochrane Library (n = 3), Science Direct (n = 2,416), Scopus (n = 541), and NEJM (n = 944). After removing duplicates, 1,186 records were identified for screening. Excluding reports that did not meet the inclusion criteria, 367 reports were eligible, of which 4 met the criteria for inclusion in the review.

Studies characteristics

The studies were published between 13/02/1996 and 13/02/2023. They were conducted in 3 countries, one in Korea [27], and three [28-30], in United States of America (USA). On the four studies, two was randomized clinical trial (RCT) [28,30], one quasi-experimental study [27], and one randomized trial [29]. Two of these studies were published in 2017, one in 2015 and another in 2023. Their sample sizes ranged from 44 for the minimum to 141 for the maximum, and a majority of females. Regarding the quality score, two studies were considered rigorous [28,30], and two others considered average [27,29]. The most identified BPSD were depression and anxiety. Of these neuropsychiatric symptoms, each study had formulated different objectives. IG had benefited from various strategies depending on the objectives of each study. In contrast, the CG had received standard care. Soyun et al., had formulated as objective to develop and evaluate a nurse-led intervention using mHealth technology and the ecological momentary assessment to alleviate depressed moods in older adults living alone in the community [27]. Gretchen et al., had formulated as objective to examine the effects of telephone-delivered cognitive behavioral therapy (CBT) compared with telephone-delivered nondirective supportive therapy (NST-T) in rural older adults with Generalized anxiety disorder (GAD) [28]. Gitlin et al., had formulated as objective to assess acceptability, usability of WeCareAdvisor™ and immediate impact on caregiver confidence managing and upset with behavioral symptoms, and secondarily, frequency of behavioural occurrences [29]. DiNapoli et al., had formulated as objective to examine the effects

Table 1: Overall characteristics of identified and included studies (n = 4).

First author, year of publication, country	Design	Sample sizes of IG and CG	IG and CG	Quality rating with Health Evidence™
(27), Seoul, Korea.	Quasi-experimental study.	n = 44 (IG = 21 and CG = 23). Aged 65 and above. Recruited between 1 october 2018 and 1 october 2019. 63,8% females.	The intervention consisted of weekly sessions, which included (1) standardised mHealth device training, (2) a nurse-led mHealth programme, and (3) art activities. The control group received care as usual.	7
(28), North Carolina, USA.	RCT.	n = 141 (CBT = 70 and NST-T = 70). Adults aged 60 years and older. Recruited between January 27, 2011, and October 22, 2013. 81,6% females.	Telephone-delivered CBT consisted of as many as 11 sessions (9 were required) focused on recognition of anxiety symptoms, relaxation, cognitive restructuring, the use of coping statements, problem solving, worry control, behavioral activation, exposure therapy, and relapse prevention, with optional chapters on sleep and pain. Telephone-delivered NST consisted of 10 sessions focused on providing a supportive atmosphere in which participants could share and discuss their feelings and did not provide any direct suggestions for coping.	8
(29), USA.	Randomized trial.	n = 57 families and persons with dementia.	Eligible caregivers are randomized to the treatment group which receives the WeCareAdvisor™ immediately, or to the wait-list control group, which receives the tool one month later after the follow-up interview.	7
(30), Alabama, USA.	RCT.	n = 134. CBT (75.67 ± 6.94 years and 88.6% females) and minimal support control (MSC) (74.66 ± 7.91 years and 76.6% females).	The intervention consisted of 16 60-minute sessions of in-home CBT, with the opportunity to extend treatment to 20 sessions if needed. MSC : The participants in this condition received brief weekly telephone calls from research assistants for three months.	9

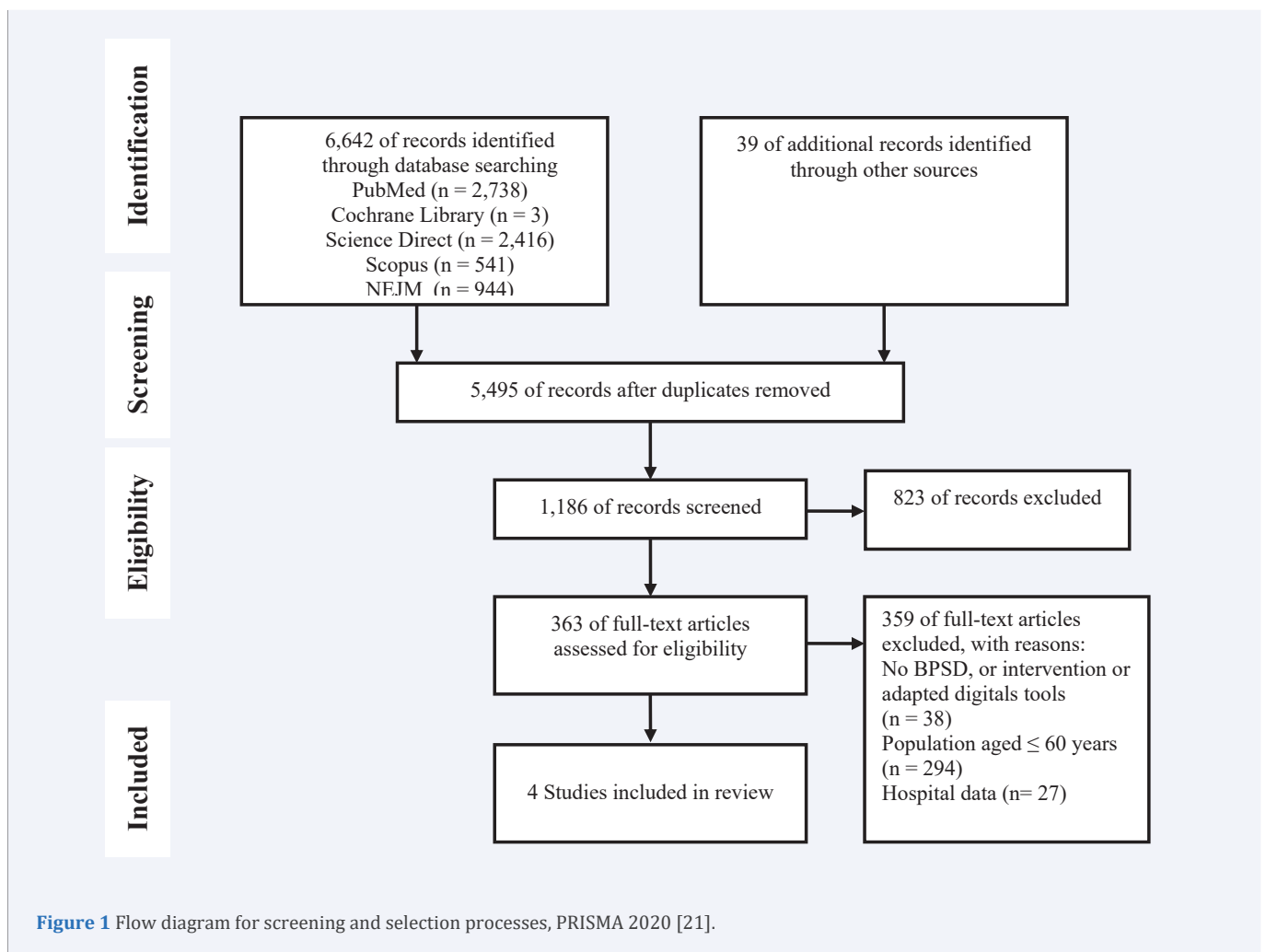


Figure 1 Flow diagram for screening and selection processes, PRISMA 2020 [21].

of home-delivered CBT for depression on anxiety symptoms in an ethnically diverse, low resource, and medically frail sample of rural, older adults [30] (Table 1).

Adapted digital tools

Several adapted digital tools have been developed in the context of interventional strategies in elderly aged with BPSD at home. Interventional strategies had used, telephone-delivered cognitive behavioral therapy (CBT) by two studies [28,30], Actiwatch Spectrum PRO by one study [27], and WeCareAdvisor™ by one study [29]. Hong et al., had used Actiwatch Spectrum PRO; Philips Respironics. Participants were instructed to wear an actiwatch on the wrist of their non-dominant hand for 2 weeks. Each participant received structured instructions for using the device. The ecological momentary assessment consisted of a self-report of depressive mood; participants used the watch button to report their current state of depression via a 10-point Likert scale (1 = very depressed, 10 = not depressed) [27]. Brenes et al., had used Telephone-Delivered CBT. Participants randomized to CBT-T received 9 to 11 weekly 50-minute telephone therapy sessions that corresponded with the CBT workbook. Each workbook chapter included CBT techniques that have demonstrated efficacy in treating adults and older adults with GAD. Chapters addressed recognition of anxiety symptoms, relaxation, cognitive restructuring, the use of coping statements, problem solving, worry control, behavioral activation, exposure therapy, and relapse prevention (with optional chapters on sleep and pain). Participants randomized to NST-T received 10 weekly 50-minute therapy sessions. Telephone-directed nondirective supportive therapy was based on the Borkovec et al., protocol and provided a high-quality therapeutic relationship with a warm, genuine, and accepting atmosphere through the use of supportive and reflective communications; it did not provide advice, suggestions, or coping methods [28]. Gitlin et al., had used WeCareAdvisor™. The latter was designed as an easy-to-use, evidence-informed web-based platform. The heart of WeCareAdvisor™ is an algorithm for identifying behaviors and potential contributors from which a customized treatment plan is generated. It provides families knowledge about dementia, daily tips, and a systematic approach to describe behaviors, investigate modifiable contributors, create treatment plans (WeCareAdvisor™ Prescription) consisting of management tips tailored to symptom presentation, and evaluate effectiveness. WeCareAdvisor™ is being tested in a randomized trial to assess acceptability, usability and immediate impact on caregiver confidence managing and upset with behavioral symptoms, and secondarily, frequency of behavioral occurrences [29]. DiNapoli et al., had used Telephone-Delivered CBT. Five Master of Social Work clinical social workers without prior CBT experience administered the therapy based on the treatment manual of Thompson, Gallagher-Thompson, and Dick. Minimal support control (MSC) or usual care: The participants in this condition received brief weekly telephone calls from research assistants for three months. These calls served both as a means to monitor participants for deteriorating mental health status and as an incentive for continued participation with the project [30] (Table 2).

Batteries of comprehensive and systematic neuropsychiatric tests

Tests identified in the studies were the following: Ecological momentary assessment (EMA) [31,32], Korean versions of the Hamilton Depression Rating Scale (K-HDRS) [33,34], The Korean version of the Geriatric Depression Scale-short form [35], cited in the works of Hong [27]; Hamilton Anxiety Rating Scale (HAMA) [36,37]; Worry was assessed with the Penn State Worry Questionnaire-Abbreviated (PSWQ-A) [38,39]; The GAD Scale 7 Item [40], is a self-reported measure of DSM-IV symptoms of GAD ; The Beck Depression Inventory (BDI) [41], is a 21-item measure of depressive symptoms cited in the works of Grerchen [28]; Mini-Mental Status Examination (MMSE) [42]; Caregiver assessment of function (CAFU) [43]; NPI-Q (revised version to separate agitation and aggression and add frequency) [44]; Upset/distress with behaviors (NPI-Q); Zarit burden scale [45]; CES-D [46]; Family with technology from CREATE center scale [47]; Relationship closeness scale [48]; Negative communication scale [49]; Perceived Change Scale [50]; Caregiver readiness to change scale [51]; NIH REACH stress thermometer [52]; Investigator developed [53]; Technology Acceptance Model (TAM) [54]; Usability scale (SUS) [55], cited in the works of Gitlin [29], and Quality of Life Inventory (QoLI) [56]; Global Severity Index (GSI) of the Symptoms Checklist-90-Revised (SCL-90-R) [57]; MMSE [42]; Cognitive Therapy Scale (CTS) [58], cited in the works of DiNapoli [30] (Table 2).

DISCUSSION & CONCLUSION

The objective of this article was to carry out a systematic review of the literature to evaluate the impact of adapted digital tools in elderly aged of 60 years and over, living at home with neurocognitive disorders associated with BPSD. At the end of the selection process, we included four studies, all classified as moderate to rigorous quality. Of the 12 behavioural domains, the neuropsychiatric symptoms identified were depression and anxiety as BPSD. These two diseases were taken care by different digital tools and using different Batteries of comprehensive and systematic neuropsychiatric tests from one study to another. NPI [14], the most widely used tool for assessing BPSD, was not used in any of the studies. To date, without omission on our part, we have not identified any studies using adapted digital tools in elderly aged 60 years and over with BPSD living at home. In contrast, the two diseases identified in this article could be explained by their high frequencies in major neurocognitive disorders. Regarding these high frequencies, several studies have confirmed this. A multidisciplinary and multiprofessional working group set up by the Haute Autorité de Santé (French National Authority for Health) has produced a report on good practice recommendations for Alzheimer's disease and related disorders: management of disruptive behavioural problems [59]. The frequencies of BPSD in the three European cohorts studied are high. The first cohort is that of Aalten et al. with a sample of 199 participants, an MMSE between 15 and 28, depression and anxiety estimated respectively at 57.6% and 39.2% [60]. The second cohort is that of Benoit et al. with a sample of 255

Table 2: Adapted digital tools, Outcome measures and Results (n = 4).

First author, year of publication, country	Adapted digital tools	Outcome measures	Results
(27), Seoul, Korea.	Actiwatch Spectrum PRO; Philips Respironics.	Depression measures : EMA (31), (32), K-HDRS (33,34), The Korean version of the Geriatric Depression Scale-short form (35).	Compared with the control group (n=23), the intervention group (n=21) showed a decreased depression score ($t = 4.041, p = 0.027$). There was no statistical difference between the intervention and control groups based on traditional scales and the ecological momentary assessment. The data from the ecological momentary assessment captures clear fluctuating patterns across the days during the study, which traditional scales could not measure.
(28), North Carolina, USA	Telephone-delivered CBT.	HAMA (36,37), PSWQ-A (38,39), The GAD Scale 7 Item (40) is a self-reported measure of DSM-IV symptoms of GAD BDI (41).	At 4 months' follow-up, there was a significantly greater decline in worry severity among participants in the telephone-delivered CBT group (difference in improvement, $-4.07; 95\%CI, -6.26$ to $-1.87; p = 0.004$) but no significant differences in general anxiety symptoms (difference in improvement, $-1.52; 95\%CI, -4.07$ to $1.03; P = 0.24$). At 4 months' follow-up, there was a significantly greater decline in GAD symptoms (difference in improvement, $-2.36; 95\%CI, -4.00$ to $-0.72; p = 0.005$) and depressive symptoms (difference in improvement, $-3.23; 95\%CI, -5.97$ to $-0.50; p = 0.02$) among participants in the telephone-delivered CBT group.
(29), USA.	WeCareAdvisor™.	MMSE (42)], CAFU (43), NPI-Q (44), Upset/distress with behaviors (NPI-Q), Zarit burden scale (45), CES-D (46), Family with technology from CREATE center scale (47), Relationship closeness scale (48), Negative communication scale (49), Perceived Change Scale (50), Caregiver readiness to change scale (51), NIH REACH stress thermometer (52), Investigator developed (53), TAM (54), Usability scale (SUS) (55).	<i>Caregivers</i> : Aged = 65.49 (± 14.11 years); 75.4% Females; Relationship to person with dementia (non-spouse = 52.63%); Upset with behaviors = 2.10 (± 0.83); Depression 12.66 (± 8.11); CES-D score $\geq 16 = 32.1\%$; Willingness to pay for WeCareAdvisor™ (- one-time fee "US \$" = 38.52 (± 68.34); - monthly fee "US \$" = 7.85 (± 12.08) / <i>Person with dementia</i> : Aged = 79.88 (± 20.15 years); 63.2% Females; MMSE = 16.49 (± 8.31); Number of behaviors = 7.26 (± 3.11); Functional dependence = 10.02 (± 4.20). Identifying effective approaches to manage behavioral symptoms, national priority in dementia care to improve quality of life for persons with dementia and caregivers.
(30), Alabama, USA.	Telephone-delivered CBT.	QoLI (56), SCL-90-R (57), MMSE (42), CTS (58).	Compared to a minimal support control (MSC) condition, CBT for depression resulted in significantly greater improvements in symptoms of anxiety and phobic anxiety from pre-treatment to post-treatment. Pre-treatment sample characteristics : <i>Comorbidity</i> : In-Home CBT (3.00 \pm 2.55) vs MSC (3.25 \pm 2.49) avec $p = 0.61$; <i>MMSE</i> : In-Home CBT (25.16 \pm 3.49) vs MSC (24.69 \pm 3.53) avec $p = 0.44$; <i>SCL-90-R</i> In-Home CBT (58.63 \pm 8.27) vs MSC (60.73 \pm 7.92) avec 0.14 / Outcome measures at Time 1 and Time 2 by condition: <i>Anxiety</i> : In-Home CBT group (Time 1 : 55.47 \pm 9.84) vs MSC group (Time 1 : 57.29 \pm 10.12) and In-Home CBT group (Time 2 : 49.71 \pm 9.85) vs MSC group (Time 2 : 54.98 \pm 10.79) / <i>Phobic Anxiety</i> : In-Home CBT group (Time 1 : 55.61 \pm 9.33) vs MSC group (Time 1 : 56.43 \pm 9.93) and In-Home CBT group (Time 2 : 50.54 \pm 8.91) vs MSC group (Time 2 : 55.34 \pm 10.58).

participants, an MMSE between 11 and 20, depression and anxiety estimated respectively at 42.7% and 46.3% [61]. The the third cohort is that of Byrne et al., with a sample of 1,170 participants, average MMSE 20,5, depression and anxiety estimated respectively at 47.7% and 39.1% [62]. In a recent study on the prevalence of BPSD in Community-Dwelling Dementia Patients, researchers did a subgroup analysis of the prevalence of BPSD and also by type of dementia. It was found that, the pooled estimated prevalence of BPSD characteristics were as follows : depression (39%, 95% CI: 29–51%) and anxiety (38%, 95% CI: 27–50%) in Alzheimer's Disease patients; depression (32%, 95% CI: 22–45%) and anxiety (18%, 95% CI: 10–29%) in vascular dementia patients; depression (49%, 95% CI: 42–55%) and anxiety (56%, 95% CI: 49–62%) in dementia with Lewy bodies patients then depression (36%, 95% CI: 29–43%) and anxiety (51%, 95% CI: 44–58%) [63]. What is known about depression and anxiety. Depression is the third leading cause of morbidity in the world and the leading cause in developed countries. It is the most frequent psychiatric disorder of the

elderly with a progressive increase with advancing age. Under-diagnosed, depression is a multi-faceted and disabling disease on a physical, psychological and social level. It decreases the quality of life, worsens the prognosis of other chronic diseases, and increases mortality in the elderly. Among the different facets or masks of depression are: pseudo-dementia, melancholic, hostile, anxious, delusional, conative, somatic [5]. In the included studies, depression was not characterized as a mask. It was classic. As with depression, anxiety disorder is under-diagnosed and under-appreciated. In the population aged of 65 years and over, the presence of an anxiety disorder would be significantly associated with certain factors, such as female gender, low level of education and living alone [64]. Other risk factors for developing an anxiety disorder in later life have been identified: having a severe chronic illness, having a physical disability that limits daily activities, having experienced traumatic life events and having certain personality criteria [65]. Anxiety can also be a premonitory symptom of the onset or worsening of an organic disease or iatrogenic process, which should be investigated. In general,

the digital tools were well appreciated and accepted by the elderly at home and their families, with ease of utilization after training. They have improved the quality of life. Methodological weaknesses have not been sufficiently discussed. have not been clearly enough elucidated. In the future, it would be desirable to carry out such a study in the general population, combining ethnological, anthropological and economic approaches on the impact of digital tools in keeping elderly aged of 60 years and over BPSD at home. These digital tools have been effective. They have reduced anxiety and depression symptoms and improved the quality of life of elderly aged of 60 years and over with BPSD. Methodological weaknesses, including small sample sizes, could lead to very cautious interpretation of the results of these studies. In future work, it would be useful to integrate an economic model concerning the adapted digital tools.

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