Master thesis

The experiences of people with dementia with 'FindMyApps'

First evaluation of a tablet-based selection tool to help people with dementia find apps for self-management and meaningful activities

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Enschede, June 2018

UNIVERSITY OF TWENTE.

Abstract

Background: A growing number of people have dementia, a progressive condition that has several consequences for the individuals who suffer from it. People with dementia (PwDs) could be supported with their condition by promoting their self-management abilities and engagement in meaningful activities and social participation. Tablet computers (tablets) with applications (apps) have the potential to deliver this sort of intervention. Research suggests that with the support from their informal caregivers, PwDs could be taught how to use tablets and apps. However, not all apps that are available are useful for PwDs and apps must therefore be carefully selected. For this reason the FindMyApps tool has been developed, a tool to help PwDs select usable apps for self-management and meaningful activities that match their individual needs, wishes, and abilities.

Objectives: This study aimed to gain insight into the opinion of PwDs about the FindMyAppsTool. It was also investigated to what extent using the FindMyApps tool resulted in improvements on 'self-management abilities' and 'participation in daily and social activities', as well as 'perceived self-efficacy', 'perceived autonomy', and 'quality of life' in PwDs.

Methods: A mixed methods design was used and pilot randomized controlled trial (RCT) was carried out. 20 PwDs were randomly assigned to either the experimental group, receiving the FindMyApps intervention, or the control group, receiving a list with potentially useful websites. PwDs completed both baseline and post-test measurements at three months. Measurements consisted of a semi-structured interview and a usability questionnaire, as well as questionnaires for the outcome measures.

Results: PwDs perceived the FindMyApps tool and its components generally as useful and easy to use. Most PwDs stated that it had helped them to find apps in the domains of self-management and meaningful activities that matched their needs and interests, which they also used regularly. Some PwDs reported that working with the FindMyApps tool often and perseverance helped them to learn how to use the FindMyApps tool, though almost all PwDs needed support from their informal caregivers. PwDs reported that the appreciated the support and that it was sufficient. Some PwDs reported that due to using the FindMyApps tool, their interest in the tablet increased and their world became bigger. No differences in the outcome measures between pre- and post-test were found.

Conclusions: FindMyApps seems to be a valuable tool for PwDs to support their self-management abilities and participation in meaningful activities. Though no differences were found on the outcome measures, the use of tablets and apps can be beneficial for PwDs and positively impact their lives. However, some PwDs may find it difficult to participate in research. Therefore, suggestions for improving the tool as well as suggestions for future research are given, so that the effectiveness of the FindMyApps tool can be investigated.

Samenvatting

Achtergrond: Steeds meer mensen krijgen dementie, een ziekte die het leven van de mensen behoorlijk aantast. Deze mensen kunnen ondersteund worden in het omgaan met hun ziekte door hun zelfmanagement te vergroten, door ze deel te laten nemen aan zinvolle activiteiten en door hun sociale participatie te stimuleren. Tabletcomputers (tablets) met daarop applicaties (apps) hebben het potentieel om dit te doen. Onderzoek heeft aangetoond dat mensen met dementie het gebruik van tablets en apps kunnen leren met behulp van hun mantelzorgers. Maar niet alle apps die bestaan zijn bruikbaar voor deze mensen en daarom moeten apps zorgvuldig geselecteerd worden. Om die reden is de FindMyApps tool ontwikkeld, een hulpmiddel voor mensen met dementie dat bruikbare apps voor zelfmanagement en zinvolle dagbesteding selecteert op basis van hun individuele behoeften, wensen en mogelijkheden.

Doelstelling: Er is onderzocht wat de meningen van mensen met dementie zijn over de FindMyApps tool en of het gebruik ervan samengaat met verbeteringen in zowel 'zelfmanagementvaardigheden' en 'deelname aan dagelijkse en sociale activiteiten' als 'waargenomen zelfeffectiviteit', 'waargenomen autonomie' en 'kwaliteit van leven'.

Methode: Er is gebruikgemaakt van een mixed methods design en een pilot gerandomiseerd gecontroleerd onderzoek werd uitgevoerd. 20 mensen met dementie werden willekeurig ingedeeld in de experimentele of de controlegroep. De experimentele groep kreeg de FindMyApps interventie en de controlegroep een lijst met potentieel bruikbare apps. Meetmomenten vonden plaats aan het begin van het onderzoek en na drie maanden en bestonden zowel uit een semigestructureerd interview en een vragenlijst over de bruikbaarheid als vragenlijsten voor de uitkomstmaten.

Resultaten: Over het algemeen vonden mensen met dementie de FindMyApps tool en zijn componenten bruikbaar en gebruiksvriendelijk. De meesten van hen gaven aan dat ze apps voor zelfmanagement en dagbesteding gevonden hadden die passen bij hun behoeften en interesses en dat ze deze regelmatig gebruikten. Sommigen noemden dat regelmatig gebruik van de FindMyApps tool en volharding de leerbaarheid bevorderde, desondanks hadden ze bijna allemaal ondersteuning nodig bij het gebruik van de tool en de tablet. De ondersteuning werd echter als positief en voldoende ervaren. Daarnaast gaven de deelnemers aan dat hun interesse in de tablet vergroot is en de wereld voor hen een stuk groter was geworden. Ondanks deze genoemde positieve effecten zijn er geen verschillen op de uitkomstmaten gevonden.

Conclusie: Het lijkt erop dat FindMyApps een waardevolle tool kan zijn voor mensen met dementie dat hun zelfmanagementvaardigheden en deelname aan zinvolle dagbesteding kan ondersteunen. Ook al werden er geen verschillen op de uitkomstmaten gevonden blijkt het gebruik van tablets en apps een positieve impact op het dagelijkse leven van hen te hebben. Desondanks kunnen mensen met dementie het moeilijk vinden om aan klinisch onderzoek deel te nemen. Er worden daarom aanbevelingen voor verbeteringen gegeven, zodat de effecten van FindMyApps in een RCT onderzocht kunnen worden.

Preface

The preface is not shown in this version of the thesis.

Table of Contents

1. Introduction

As the global population is aging, the number of people living with dementia is growing rapidly as well. According to the *World Alzheimer Report* (Prince et al., 2015), it is estimated that there are 46.8 million people living with dementia worldwide. This number is expected to double every 20 years and will affect approximately 131 million people by 2050, making it a global challenge that people are facing today and in the future (Prince et al., 2015). Dementia is a collective term describing various chronical neurodegenerative conditions which impair a person's cognitive functioning in areas such as memory, thinking, judgement, orientation, language, and comprehension (World Health Organization, 2017). People with dementia also experience changes in personality and behaviour (McLaughlin et al., 2010). There are several forms of dementia, with Alzheimer's disease being the most common form accounting for approximately 60% of the cases. Other common forms are vascular dementia, mixed Alzheimer's/vascular dementia and dementia with Lewy bodies (Brunnström, Gustafson, Passant, & Englund, 2009; Rizzi, Rosset, & Roriz-Cruz, 2014).

Dementia has a large impact on individuals and their social environment. Patients will become less able to perform everyday tasks (e.g. preparing a meal or taking a bath) independently and successfully as the disease progresses. This in turn will make them increasingly dependent on the care of family members (i.e. an informal caregiver) or formal care providers (Brodaty & Donkin, 2009; Mountain, 2013). Informal caregivers often feel burdened by the care they provide (Chiao, Wu, & Hsiao, 2015). An increased burden on informal caregivers can have a variety of consequences, not only for informal caregivers themselves, but also for people with dementia. For example, people with dementia have a higher risk of being admitted to a long-term care facility due to the increased burden of informal caregivers (Afram et al., 2014), though the majority of people with dementia states to want to live at home as long as possible (van der Roest et al., 2009). Living at home also has a positive impact on the sense of identity of people with dementia and on their feeling of autonomy and independence (Wiles, Leibing, Guberman, Reeve, & Allen, 2012).

Self-management offers a way of supporting people with dementia in coping with their loss of abilities and wish to stay independent (Quinn, Toms, Anderson, & Clare, 2016a). Barlow, Wright, Sheasby, Turner and Hainsworth (2002) describe self-management as *"an individual's ability to manage the symptoms, treatment, physical and psychological consequences, and life style changes inherent to living with a chronic condition"* (p. 178). In the context of dementia, this refers to the ability of dealing with and adapting to the consequences that dementia poses for people with dementia, and maintaining a good quality of life (Dröes, van der Roest, van Mierlo, & Meiland, 2011; Dröes, van Mierlo, van der Roest, & Meiland, 2010). However, especially in the early stages of dementia people often report a lack of support to successfully self-manage their condition (Martin, Turner, Wallace, & Choudhry, 2012). People with dementia could therefore benefit from self-management interventions. Indeed, Barlow et al. (2002) found that self-management interventions can have a positive impact on

patient's use of self-management behaviours and positively impact their sense of self-efficacy and well-being. Studies by Logsdon et al. (2010) and Quinn et al. (2016b) also have shown that self-management interventions can be beneficiary for people with dementia, as they can enhance their quality of life, feeling of autonomy, and sense of self-efficacy.

Engaging in meaningful activities is another possibility for people with dementia to cope with their decreased capabilities. According to Phinney, Chaudhury and O'Connor (2007), meaningful activities are the *"spectrum of occupations a person performs in his or her everyday life that are perceived as significant to the person"* (p. 385), and can include leisure activities, household chores, and activities that provide social engagement. People with dementia will consider activities as meaningful when they provide them with a sense of pleasure, a sense of belonging and connection with others, and a sense of autonomy (Vernooij-Dassen, 2007). However, people with dementia living in the community often report a lack of satisfying and enjoyable daytime and social activities in their lives (Han, Radel, McDowd, & Sabata, 2016; van der Roest et al., 2009). Stimulating engagement in meaningful activities can increase well-being and quality of life in people with dementia, and decrease a feeling of social isolation that many people with dementia report (Eakman, Carlson, & Clark, 2010; Nyman & Szymczynska, 2016). Engagement in meaningful activities can also have a positive impact on their sense of autonomy and independence (Phinney et al., 2007). By increasing a sense of autonomy and independence in people with dementia, meaningful activities may also make them less dependent on their informal caregivers and, thus, may increase the well-being of the informal caregivers as well. Thus, engaging in meaningful activities and thereby using remaining abilities provides several benefits for people with dementia as well as their social environment.

Technology such as eHealth has the potential to support people with dementia to self-manage their condition and engage in meaningful activities (Cahill, Macijauskiene, Nygård, Faulkner, & Hagen, 2007; Peeters, Wiegers, & Frielel, 2013). eHealth can be defined as the *"deployment of information communication technology, especially internet-based technology, to support or improve health and health care"* (Krijgsman & Klein Wolterink, 2012, p. 2). Touchscreen devices such as tablet computers (tablets) and their applications (apps) could provide a good interface for eHealth interventions for people with dementia. Many apps for self-management and engagement in daily and social activities already exist (Marceglia, Bonacina, Zaccaria, Pagliari, & Pinciroli, 2012), and tablets are also relatively user-friendly (Kerkhof, Graff, Bergsma, de Vocht, & Dröes, 2016). Upton, Jones, Jutlla, and Brooker (2011) found that many people with dementia find tablets easier to use than traditional computers. Tablets may also be an effective solution for people with dementia, because they make less demand of hand-eye coordination compared with a desktop computer using a mouse and cursor (Wandke, Sengpiel, & Sönsken, 2012). A tablet with apps might therefore be a useful tool to support people with dementia in self-management and engagement in meaningful activities (Smith & Mountain, 2012; Upton et al., 2011).

Recent studies are supporting the potential and value of tablets for people with dementia. In a study by Groenewoud et al. (2017), people with dementia reported that playing games on a tablet enhanced their self-esteem and feelings of achievement. They also experienced a sense of connection and belonging, and enjoyed "having something to do". Leng, Yeo, George, and Barr (2014) found that the use of tablets can have a positive influence on the well-being of people with dementia, and a study by Kong (2015) suggests that tablets and apps have the potential to cognitively stimulate people with dementia. Furthermore, the use of tablets can increase interpersonal interactions and relationships with other people, support intergenerational communication, and increase quality of life in people with dementia (Upton et al. (2011).

Despite these positive outcomes, people with dementia may not always be able to use a tablet independently and may therefore need support to learn how to use the tablet and apps (Dröes, Bentvelzen, Meiland, & Craig, 2010; Meiland et al., 2012). Research suggests that with a training or support from another person people with dementia are able to use touchscreen devices such as tablets. For example, in a study by Lim, Wallace, Luzcz, and Reynolds (2013) approximately half of the participants with early-stage dementia were able to use a tablet for leisure activities independently after having received support in the beginning of the study. In their case study, Astell, Malone, Williams, Hwang, and Ellis (2014) report that the participant with dementia could successfully adopt the use of a touchscreen device because of the high level of training and support he had received. The support that people with dementia may need could be provided by informal caregivers or volunteers. Including informal caregivers to support people with dementia with using a tablet and apps can also have a positive influence on their relationship, as it provides an engaging conversation and joint activity (Astell et al., 2010; Tyack, Camic, Heron, & Hulbert, 2017).

A tablet with apps can thus be a useful tool to support self-management and engagement in meaningful activities for people with dementia, but only a small part of existing apps seem to be usable for people with dementia (Groenewoud et al., 2017). This makes careful selection of usable apps necessary (Hitch, Swan, Pattison, & Stefaniak, 2017; Lim et al., 2013). Selecting apps in the vast quantity of apps available for touchscreen devices can also be challenging (Joddrell et al., 2016), and as needs, wishes, and abilities can be different for each person with dementia, an individual-based approach is necessary to select usable apps for people with dementia (Groenewoud et al., 2017; Lim et al., 2013).

1.1 FindMyApps

To support the use of apps in people with dementia, the tablet intervention FindMyApps has been developed. This intervention consists of the FindMyApps training and the FindMyApps tool, and is aimed at enhancing the self-management abilities and engagement in meaningful activities and participation in daily and social life in persons with dementia (Kerkhof, Graff, Bergsma, de Vocht, & Dröes, 2016).

The FindMyApps training is an individual training given to informal caregivers or volunteers at the start of the intervention. As research suggests that people with dementia may need support with the use of touchscreen devices such as tablets, informal caregivers or volunteers will learn in the training how to use the FindMyApps tool and tablet, so that they in turn can support the person with dementia with the use of the FindMyApps tool and tablet. The training is based on the errorless learning method (Terrace, 1963). The aim of this method is to prevent or reduce incorrect responses when learning (new) skills or information, so that the limited cognitive capacity of people with dementia is directed towards the acquisition of the correct steps of a task. This method has been successfully applied to (re)teach people with mild to moderate dementia tasks (de Werd, Boelen, Olde Rikkert, & Kessels, 2013).

The FindMyApps tool is a person-centred selection tool aimed at helping persons with dementia to find usable apps in the domains of self-management and meaningful activities that match their needs, wishes, and abilities. The tool was developed in a user-participatory design process to ensure that the intervention meets the needs of the persons with dementia. This process means that persons with dementia were involved in all steps of the development and design of the FindMyApps tool (Kerkhof et al., 2018). For instance, in a focus group study it was established what the persons with dementia find important regarding self-management and meaningful activities, as well as what their needs, wishes, and abilities regarding the use of apps are (Kerkhof et al., 2017). The FindMyApps tool consists of a library of dementia-friendly apps, which are matched to the individual needs, wishes, and abilities of the user based on personal preferences. The tool is to be used by persons with dementia with the support of their informal caregivers.

1.2 Theoretical framework

It is important that a new technological intervention is evaluated and accepted by the people it has been developed for, so that the intervention will be adopted and can eventually be implemented (Wilkowska, Gaul, & Ziefle, 2010). In this study, the Technology Acceptance Model (TAM; Davis, 1989) and the concepts of 'learnability' and 'perceived effects' will serve as the framework to evaluate the FindMyApps tool.

The TAM by Davis (1989) is a frequently used and widely accepted model to predict the acceptability and adoption of a technological intervention by its end-users (King & He, 2006). The TAM consists of two primary factors that are important for the acceptance and adoption of a technological intervention: perceived usefulness and perceived ease of use. Figure 1 gives an overview of the TAM.
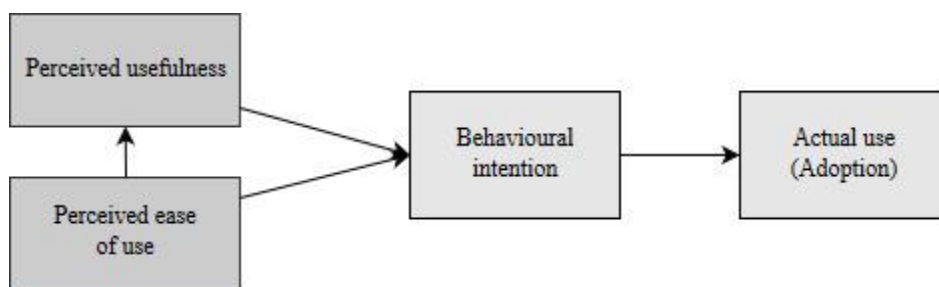
Figure 1. Theory Acceptance Model (TAM). Adapted from "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models," by F. Davis, R. Bagozzi, and P. Warshaw, 1989, *Management Science*, *35*(8), p. 984. Copyright by INFORMS.

Based on the original definition by Davis (1989, p. 320), 'perceived usefulness' in this study refers to "*the degree to which a person believes that using a particular system would fulfil his or her needs,*" (p. 320). 'Perceived ease of use' is defined as *"the degree to which a person believes that using a particular system would be free of effort"* (Davis, 1989, p. 320). These two factors lead to the user's behavioural intention to use the technology, which eventually leads to actual use. Actual use or the 'adoption' of the technological intervention is another important aspect. Based on the definition by IGI Global (2018), 'adoption' in this study is defined as *"the utilization and implementation of a technological intervention."*

The other two concepts used in this study are 'learnability' and 'perceived effects'. With more technological interventions that are being developed and a wide diversity in technology that is being used for these interventions, it is important that a person masters the technology. It has been suggested that in people with dementia acceptance and adoption of a technological intervention is also affected by learnability (Jiancaro, Jaglal, & Mihailidism 2017). 'Learnability' is defined as *"how easily users can learn to use the system"* (Blandford & Buchanan, 2003). At last, it is assumed that a technological intervention has an effect on the users is has been designed for. In this study, 'perceived effect' is defined as *"any effect of the service [or of an event or initiative] on an individual or group,"* (Streatfield & Markless, 2009, p. 134).

1.3 Aim of the study

A first version of the FindMyApps tool has been developed. To ensure its acceptance and eventual adoption, it is important that the end-users (i.e. persons with dementia) evaluate the tool to make sure that it matches their requirements and to be able to develop the tool further. Therefore, the FindMyApps tool will be evaluated in this study by persons with dementia, so that it can be improved before the start of a randomized controlled trial (Kerkhof et al., 2016). As the persons with dementia only receive the FindMyApps tool in this study and not the FindMyApps training, the focus will lie on the experiences of the persons with the use of the tool. The experiences of informal caregivers with the FindMyApps intervention including the training have been described by Veijer (2018). This study has several aims. First of all, this study aims to investigate how persons with dementia perceive the usefulness, ease of use, and learnability of the FindMyApps tool. Second of all, it aims to gain insights

into how persons with dementia adopt the FindMyApps tool, as well as what effects the persons with dementia describe regarding the use of the tool. It is expected that using the FindMyApps tool will lead to improved self-management abilities and daily and social participation resulting in more self-efficacy, autonomy, and quality of life. The last aim of this study is therefore to investigate to what extent the primary outcome measures 'self-management abilities' and 'participation in daily and social activities', and the secondary outcome measures 'perceived self-efficacy', 'perceived autonomy', and 'quality of life' are improved in the persons with dementia at the end of the study. The study aims lead to the following research questions:

1. What is the opinion of persons with dementia regarding the usefulness, ease of use, and learnability of the FindMyApps tool?
2. How do persons with dementia adopt the FindMyApps tool?
3. What effects do persons with dementia report after having used the FindMyApps tool?
4. To what extent is using the FindMyApps tool associated with improvements in the primary outcomes (1) self-management abilities, and (2) participation in daily and social activities in persons with dementia?
5. To what extent is using the FindMyApps tool associated with improvements in the secondary outcomes (1) perceived self-efficacy, (2) perceived autonomy, and (3) quality of life in persons with dementia?

2. Methods

2.1 Research design

This mixed methods study was conducted as a pilot RCT comprising semi-structured interviews and a usability questionnaire, as well as different questionnaires for the outcome measures. Measurements took place at baseline and after three months for the questionnaires, and after three months for the interviews and the usability questionnaire. Persons with dementia (PwDs) and their informal caregivers were randomly assigned to either the experimental group, receiving the FindMyApps intervention, or the control group, receiving a general training in the use of tablets and some links to websites with apps. Randomization was stratified by the living situation of informal caregivers.

2.2 Participants and procedure

PwDs and informal caregivers were recruited by means of convenience sampling (Salkind, 2010). An advertisement was put on the website of the Dutch Alzheimer's Association and a case manager, different day care institutions, meeting centres, and Alzheimer's Cafés in the Eastern Netherlands were approached. Inclusion criteria for PwDs were: (1) mild to moderate dementia as defined by the Global Deterioration Scale (GDS; Reisberg, Ferris, de Leon, & Crook, 1982), with or without a confirmed diagnosis, (2) living in the community, and (3) availability of an informal caregiver or volunteer to provide support. Exclusion criteria were: (1) involvement in another research study, and (2) severe visual and/or physical impairment. PwDs who did not own a tablet could borrow one from Saxion University of Applied Sciences for the duration of the study.

PwDs and informal caregivers who stated their interest received a flyer with extra information on the study. After having had time to consider the information, they were called to answer any additional questions. Eligibility was checked with participants who confirmed that they would like to participate. During the call, *demographics* were assessed, as well as the dementia-related variables *stage of dementia* and *awareness of cognitive deficits* with the GDS respectively Guidelines for the Rating of Awareness Deficits (GRAD; Verhey, Rozendaal, Ponds, & Jolles, 1993).

In total, 20 PwDs decided to take part in the study. They were randomly assigned to the experimental ($n = 10$) and control group ($n = 10$). During the study, three PwDs (30%) in the experimental and six PwDs (60%) in the control group dropped out, resulting in 11 PwDs who completed the study. Nine PwDs were supported by their informal caregivers and one PwD in each group was supported by a volunteer. Reasons for dropout included: lack of motivation to use tablet regularly ($n = 4$,), both PwDs and informal caregiver had no tablet experience ($n = 2$), not having tablet experience caused emotional stress ($n = 1$), institutionalization ($n = 1$), and death ($n = 1$). Of the PwDs who had dropped out, five had never and three had only once before used a tablet.

Written informed consent was obtained from PwDs in person at the start of the study. Trained nursing students from Saxion University of Applied Sciences conducted the assessments of the

outcome measures at baseline and after three months. After the baseline assessments, the informal caregivers received the trainings from the researcher, after which PwDs and informal caregivers were asked to start with the intervention. During the three-month intervention period, follow-up phone calls with informal caregivers took place every two weeks to enquire how it went and to increase adherence. In addition, PwDs and informal caregivers could consult a help desk if they had questions or needed support. After the post-test of the outcome measures, the interviews and usability questionnaires were conducted. The interviews were conducted with six of the seven PwDs. One PwD was not interviewed, because he had neither used the FindMyApps tool nor the tablet. The interviews took 30 to 45 minutes and were tape-recorded with the permission of the PwDs. To make PwDs feel comfortable during the interviews and to encourage responses, the interviews were scheduled at a time convenient for the PwDs and took place at their homes. Nevertheless, data collection was complex due to the condition of the PwDs. One PwD felt overwhelmed by the questions and found it difficult to make decisions on his own, and another PwD had difficulty expressing himself. They were therefore accompanied by their informal caregivers (i.e. spouses) during the interview. Some PwDs showed forgetfulness and/or limited concentration. Sometimes a PwD did not understand a question and, partly because of that, gave contradictory information and/or information that did not relate to the question. In such cases, the question was asked again or refined, so that it was more comprehensible for the PwD. However, due to the issues described answers did not always seem logical and/or were phrased in a complex manner, which sometimes complicated data analysis. Also, in some interviews questions were skipped, because they were evaluated as too complex for the PwD, which resulted in some answers missing. Overall, it is important that the complexity of data collection is kept in mind when reviewing the findings of the interviews in chapter 3.

2.3 The intervention

2.3.1 Experimental group

The experimental group received the FindMyApps intervention consisting of (1) a training for informal caregivers, and (2) the FindMyApps tool, a person-centred selection tool aimed at finding usable apps for people with dementia.

The training

The training teaches informal caregivers how to use the tablet and FindMyApps tool, and how to support the PwDs in using the tablet and FindMyApps tool. Informal caregivers were asked to apply the errorless learning method when supporting the PwDs. The method was explained at the beginning of the training. First, a task has to be broken down into small steps. Each step has to be demonstrated and copied by the person with dementia. If the person makes a mistake, he or she has to be corrected so that the error is not implicitly consolidated into memory. This has to be done for all steps until the

person with dementia has learned to do the complete task. To give an example of how to apply the errorless learning method in practice, informal caregivers were taught the functions of the tablet and the FindMyApps tool in accordance with the method (i.e. breaking a task down into steps). The functions of the tablet consisted of features such as: turning the tablet on and off, opening and closing apps, and returning to the home screen. For the FindMyApps tool, every component was explained. Both explanations were done with a step-by-step guide with pictures of the tablet features and of the FindMyApps tool. The explanations were demonstrated by the researcher and then tried out by the informal caregivers. In addition, they downloaded an app from the FindMyApps tool that matched the PwDs' interest. At last, they received tips that could help them to support the PwDs such as using a stylus and giving positive feedback. The informal caregivers received a written manual with the information given in the training, as well as laminated papers with the steps of the errorless learning method and the FindMyApps tool. The trainings lasted two to three hours.

The FindMyApps tool

The main part of the intervention is the FindMyApps tool, a web application installed on tablets. It consists of a library of dementia-friendly apps in the domains of self-management and meaningful activities. Usable apps are selected by matching the features of apps to the needs, wishes, and abilities of people with dementia, the so-called user profile.

The apps in the FindMyApps tool have been selected by two researchers (GK and MV) according to criteria for dementia-friendly apps (Joddrell et al., 2016; Kerkhof et al., 2017). These criteria relate to (1) interaction, (2) feedback, (3) aesthetic design, (4) app design, (5) customization, (6) obstacles, and (7) age appropriateness. Each app could score a maximum of 30 points; apps that scored more than 20 points were added into the library. In total, 180 apps were selected. These apps were divided into three main categories (i.e. 'in and around the house', 'contacts', and 'leisure'), 13 subcategories, and 40 further subcategories (see Appendix A for an overview of all categories and examples of apps).

The FindMyApps tool consists of six components: (1) a page with personal settings, (2) a page with categories, (3) a page with an overview of apps in each category, (4) a page with description of an app, (5) a page 'Mijn Apps' [My Apps], and (6) an explanation button (Kerkhof et al., 2018). Screenshots of all six components can be found in Appendix B. Figure 2 provides an overview of the flow of the FindMyApps tool.

Figure 2. Flow of the FindMyApps tool, including setting the user profile in the personal settings (a), division into main categories (b) and subcategories (c), overview of apps in a category (d), and description of an app (e).

On the page *personal settings* (Figure 2a), a user profile is set for the PwDs by answering six questions relating to personal preferences regarding apps with a yes/no button. The user profile is set by informal caregivers in the training. The preferences are: large font size; less text, many pictures; only in Dutch; real photos; simple to operate; and instructions offered. After this, the home page of the FindMyApps tool with the main *categories* (Figure 2b) opens. From here, sub-categories (Figure 2c), can be chosen to find usable apps. When a sub-category is selected, the page with an *overview of apps in each category* (Figure 2d) opens. Each app is presented with a short information sentence, the cost of the app is shown, and an overall score is presented for each app. This score indicates the match of the app with the personal preferences; a higher score indicates a better match. By clicking on the button 'information & download', the page with a *description of an app* (Figure 2e) is opened. More specific information and screenshots of the app are presented and six separate scores show the match of the app with all six personal preferences. A button to access the Apple Store or Google Play Store to download the app is provided. The page *'Mijn Apps'* provides an overview of all apps that someone has shown interest in arranged by subcategories. At last, all components show the *explanation button*, which gives support on how to use the particular page.

2.3.2 Control group

In the control group, informal caregivers received a tablet training similar to the training of the experimental group but without the errorless learning method, and a list with websites containing potentially usable apps for the PwDs. The training started with an explanation and demonstration of the tablet functions. Informal caregivers then received the list consisting of seven Dutch-language and five English-language websites. They were asked to open one of the websites and download an app that matched the PwDs' interest as practice. At last, informal caregivers received the same tips as in the experimental group. After the training, the informal caregivers received a written manual with the information from the training, as well as laminated versions of the links to the websites and the tips. The trainings lasted approximately one to two hours.

2.4 Instruments

2.4.1 Demographics and dementia-related variables

The *demographics* were assessed with a demographics questionnaire. Questions related to age, sex, living situation, education, and prior use of smartphone and tablet.

The *stage of dementia* was determined with the GDS (Reisberg et al., 1982), a seven-stage rating scale. Stage 1 relates to no cognitive decline, and stages 2 to 7 relate to, respectively, very mild, mild, moderate, moderately severe, severe, and very severe cognitive decline. Classification into the GDS stage is done with the Brief Cognitive Rating Scale (BCRS; Reisberg & Ferris, 1988), a test that measures five domains of cognition: concentration, recent memory, past memory, orientation, and functioning and self-care. The score of each domain is based on the seven GDS stages. By calculating the mean score of all five domains, the stage of dementia is determined. The GDS was found to have good inter-rater reliability (Foster, Sclan, Welkowitz, Boksay, & Seeland, 1988).

Awareness of cognitive deficits was assessed with the Guidelines for the Rating of Awareness Deficits (GRAD), which defines impaired awareness as the absence of knowledge of cognitive deficits (Verhey et al., 1993). The scale consists of four questions which focus on the general (cognitive) complaints and memory problems. An overall score for awareness is given ranging from 1 (*severely impaired*) to 4 (*intact*); a higher score indicates better awareness of one's cognitive deficits. The GRAD was found to have good inter-rater reliability (Verhey et al., 1993).

2.4.2 Assessment of usefulness, ease of use, learnability, adoption, and impact

Semi-structured interviews and a usability questionnaire were used to assess the usefulness, ease of use, and learnability. With the interviews, PwDs were also asked about the adoption and potential effects of the FindMyApps tool. Based on literature, the interview scheme was developed and divided into five themes: (1) perceived usefulness, (2) perceived ease of use, (3) learnability, (4) adoption, and

(5) perceived effects (see Appendix B for the complete interview scheme). Its development was partly based on a previous usability study by Meiland et al. (2012)

To assess the *perceived usefulness*, PwDs were asked for their opinion on the general usefulness of the FindMyApps tool and the usefulness of the six components (i.e. personal settings, categories, overview of apps in each category, description of app, 'Mijn Apps', and explanation button). To assess the general usefulness, open-ended questions were used such as 'In what ways does FindMyApps help you?', as well as one structured question to assess the overall usefulness. The usefulness of the components was assessed with open-ended questions such as 'Did you miss anything on the page 'Mijn Apps?', and structured questions such as 'How useful is the page 'Mijn Apps' for you: not useful, useful or very useful?'

The *perceived ease of use* was assessed by asking PwDs for their opinion on the general ease of use (i.e. user-friendliness and difficulty) of the FindMyApps tool and the ease of use of the six components. To assess the general ease of use, open-ended questions were used such as 'What do you think of the user-friendliness of FindMyApps?' and 'What did you find difficult in the use of FindMyApps?', as well as one structured question to assess the overall ease of use. The ease of use of the six components was assessed with structured questions such as 'How did operating the page 'Mijn Apps' go for you: difficult, a little difficult or easy?'

To assess *learnability*, PwDs were asked for their opinion on learning how to use the FindMyApps tool and tablet. For this purpose structured questions were used such as 'How did you experience learning to use FindMyApps: difficult, a little difficult or easy?' In addition, PwDs were asked (1) how they had perceived the support from their informal caregivers or volunteers, which was aimed at helping them to learn to use the FindMyApps tool and tablet, and (2) in what areas they needed support. Open-ended questions were used, for example 'How did you experience the support?' and 'What did you need support with?', as well as one structured question that assessed the sufficiency of the support, rated on a 5-point Likert-like scale (1 = *strongly disagree*, 5 = *strongly agree*).

The *adoption* was assessed by asking PwDs what apps they had used and where they had found those apps. Open-ended questions were used such as 'What apps did you download?', as well as structured questions such as 'How many usable apps did you find? (*0*, *1-2*, *3-4*, *>5*) and 'How often did you use these apps?' (*several times per day*, *one time per day*, *a few times per week*, *a few times per month*).

To assess the *perceived effects*, PwDs were asked to what extent they had used the FindMyApps tool and tablet in their daily lives and if that use had any influence on their lives. Open-ended questions were used such as 'To what extent is FindMyApps part of your daily life?' and 'In what ways has your life changed since you have been using FindMyApps?'

At last, PwDs were asked to rate their *overall satisfaction* with the FindMyApps tool on a scale from 1 to 10. Also, they were asked if they had any suggestions to improve the FindMyApps tool. During the interviews, PwDs were encouraged to elaborate on their opinions and experiences.

Besides these qualitative assessments, also a quantitative instrument was used: the Usefulness, Satisfaction, and Ease of Use (USE) questionnaire (Lund, 2011). The USE questionnaire consists of 30 items which measure four dimensions of usability: usefulness, ease of use, ease of learning, and satisfaction. Items are rated on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*); a higher scores indicates better usability. Scores are presented at item level and as mean scores for the subscales.

2.4.3 Outcome measures

The primary outcomes were (1) self-management abilities and (2) participation in daily and social activities. The secondary outcomes were (1) perceived self-efficacy, (2) perceived autonomy, and (3) quality of life.

Primary outcome measures

The *self-management abilities* were assessed with the revised 30-item Self-Management Ability Scale (SMAS-30; Steverink, 2009). It consists of six subscales: Taking Initiative, Self-efficacy, Investing, Positive Perspective, Multifunctionality, and Variety. Each subscale consists of five items scored on a 5-point or 6-point Likert-type scale. A 5-point scale is used for 'Self-efficacy' (1 = *I certainly do not think so*, 5 = *I certainly think so*) and 'Positive Perspective' (1 = *No!*, 5 = *Yes!*), and a 6-point scale is used for 'Taking Initiative', 'Investing', and 'Mutlifunctionality' (1 = *never*, 6 = *very often*), and 'Variety' (1 = *none*, 6 = *more than six*). Item scores are transformed into scores ranging from 0 to 20. Mean subscale scores range from 0 to 100, as does the total score, which is the mean score of the six subscales. A higher score indicates more self-management abilities. Steverink (2009) found acceptable internal consistency for the subscales and good internal consistency for the total scale.

The *participation in daily and social activities* was assessed with two instruments: the Pleasant Activities List (PAL; Roozen et al., 2008) and one item of the Adult Social Care Outcomes Toolkit (ASCOT; Netten et al., 2012). The PAL was used to assess the frequency and enjoyability of daily and social activities. In this study, the PAL was shortened from its original 139 item to 31 items divided into two subscales: Social Activities (SA), such as visiting family, and Domestic Activities (DA), such as gardening. Shortening was done for two reasons: the length of the original version was thought to be not feasible for the PwDs and a focus on social and domestic activities was more in line with this study. Items relate to the frequency of engagement and the subjective enjoyability, which are scored on a 5-point Likert-type scale ranging from 1 (*not at all*) to 5 (*very much*). A higher score indicates that activities are done more often and enjoyed more. The PAL was found to have acceptable to good internal consistency for both subscales (Roozen, Evans, Wiersema, & Meyers, 2009).

One item of the ASCOT was used to assess the current *participation in social activities*. Responses on this item are given on a scale ranging from 1 ('*I have as much social contact as I want with people I like*') to 4 ('*I have little social contact with people and feel socially isolated*'). A higher

score indicates less social participation. Construct validity and test-retest reliability of the Dutch ASCOT used in this study were found to be good (van Leeuwen et al., 2015).

Secondary outcome measures

The *perceived self-efficacy*, i.e. the optimistic self-beliefs to cope with different demands in life, was evaluated with the Dutch version of the 10-item General Self-Efficacy Scale (D-GSE; Teeuw, Schwarzer & Jerusalem, 1994). Responses are structured on a 4-point scale ranging from 1 (*not at all true*) to 4 (*exactly true*). A total score ranging between 10 and 40 is obtained by summing the responses on all ten items; a higher score indicates more self-efficacy. Scholz, Doña, Sud, and Schwarzer (2002) found good internal consistency for the D-GSE.

The *perceived autonomy* was assessed with the 12-item Experienced Autonomy List (EAL; Meiland & Dröes, 2006). The EAL is composed of seven items from the Mastery Scale (Pearlin & Schooler, 1978) and five items adapted from the WHOQOL-100 (The WHOQOL Group, 1998). Responses are scored on a 5-point Likert scale ranging from 1 (*totally disagree*) to 5 (*totally agree*). Responses to negatively worded items are reverse-coded and summed for a maximum total score of 60. A higher score indicates more perceived autonomy. Both the Mastery Scale and the WHOQOL-100 have shown good validity and reliability in Dutch populations (Kempen et al., 2005; Masthoff, Trompenaars, van Heck, Hodiamont, & de Vries, 2005), though the psychometric properties of the EAL have not been investigated yet (Meiland, Dröes, & Sävenstedt, 2010).

The *quality of life* was determined with the Dementia Quality of Life scale (DQoL; Brod, Stewart, Sands, & Walton, 1999). It consists of 29 items that are focused on five domains: self-esteem, positive affect, negative affect, feelings of belonging, and sense of aesthetics. All items are rated on a 5-point Likert-type scale. Responses on 'sense of aesthetics' relate to enjoyment and range from 1 (*not at all*) to 5 (*a lot*). Responses on the four other subscales relate to frequency and range from 1 (*never*) to 5 (*very often*). Scores for the subscales are calculated by computing the mean score. In addition, the DQoL contains one global item to assess overall quality of life on a scale from 1 (*bad*) to 5 (*excellent*). A higher score on both the subscales and the global item indicates a higher quality of life. The DQoL was found to have good reliability and construct validity (Adler & Resnick, 2010; Brod et al., 1999).

2.5 Data analysis

The interviews were analysed by means of thematic analysis, a frequently used method to identify, analyse, and report patterns in qualitative data (Braun & Clarke, 2006). The interviews were transcribed verbatim and the transcripts were read multiple times to get familiar with the data. The transcripts were then analysed using a deductive approach, meaning that relevant fragments were coded into predefined categories (Elo & Kyngäs, 2008). These fragments consisted of meaningful words, phrases and quotes focusing on the aim of the study. The themes *perceived usefulness*, *perceived ease of use*, *learnability*, *adoption*, and *effect* were used as categories. Two sub-categories

were used to make a distinction within the categories: *positive* and *negative*. Three researchers (GK, MV, YK) individually identified those categories and sub-categories within the first two transcripts and marked relevant fragments with separate colours. The researchers met to discuss the first coding scheme. Any disagreements in coding were discussed until consensus was found and the coding scheme was revised accordingly. The remaining transcripts were then analysed by two researchers (GK, MV) in the same manner. Inter-rater reliability was assessed using percentage agreement which was 70 percent. The final coding scheme was checked by the third researcher (YK) and any further disagreements were discussed between the three researchers until consensus was found. Afterwards, inductive analysis – meaning that codes derived from the narrative instead of predefined categories (Elo & Kyngäs, 2008) – was used. Each fragment was given a code, but a fragment could also consist of more than one code. This coding was done by one researcher (GK). After the codes had been established, they were reviewed and some were adjusted or merged. The codes together with the relevant quotes or words were then put into the coding scheme with the categories and sub-categories. Subsequently, for each code the number of PwDs that had given that code was counted.

Data concerning *demographics* of both PwDs and informal caregivers, as well as the *dementia-related variables* were summarized with descriptive statistics. Baseline differences between the experimental and control group regarding these outcomes were assessed with nonparametric tests, because of the small sample size and non-normal distribution of the data (Gibbons, 1993). Mann-Whitney U test was used for ordinal and continuous variables, and Pearson chi-square test for categorical variables. If the assumptions of the Pearson chi-square test were not met, Fisher's exact test or Likelihood ratio test were used instead (McHugh, 2013). Descriptive statistics were also used to summarize the outcomes of (1) the structured questions of the semi-structured interview, (2) the USE questionnaire, and (3) the primary and secondary outcome measures. Description of primary and secondary outcome measures was done for all PwDs who completed both baseline and post-test measurements. Due to the small sample size, no further statistical analysis regarding primary and secondary outcomes was performed. In one case a value was missing in the post-test measurement of the SMAS-30. In accordance with the manual of this scale, the value was replaced by the mean of the subscale (Steverink, 2009). A value of $p < .05$ was taken to denote significant differences. Data were analysed using IBM SPSS Statistics 24.0.

2.6 Ethical considerations

Ethical approval was obtained from the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences of the University of Twente (no. 17784), and the Medical Ethics Committee of the VU University Medical Center in Amsterdam. Before obtaining written consent at baseline, PwDs and informal caregivers were reminded that their participation was voluntary and that they were free to withdraw from the study without consequences. Owing to the memory difficulties of the PwDs, continuous consent was monitored during the study (e.g. during telephone calls every two weeks) and

again checked before the start of the post-test measurements and interviews (Murphy, Jordan, Hunter, Cooney, & Casey, 2015). In doing so, it was also checked whether the information and explanations given by the researcher were understandable to the PwDs. Measures were taken to assure the confidentiality and anonymity of PwDs' responses, i.e. PwDs' names were replaced by a numbered code and quotes were adapted so that they did not provide private information of PwDs.

3. Results

3.1 Description of study group

In total, 11 PwDs from both groups completed baseline and post-test measurements. Their characteristics along with the characteristics of their informal caregivers are presented in Table 2.

Table 2
Characteristics of the PwDs and Their Informal Caregivers in Experimental and Control Group at Baseline (N = 11)

Characteristics	Experimental group (*n* = 7)	Control group (*n* = 4)	*p*
PwDs			
Gender, *n* (%)			.491
Female	1 (14)	2 (50)	
Male	6 (86)	2 (50)	
Age–*Md* (IQR), [min-max]	69 (30), [50-87]	75.5 (8), [72-81]	.450
Type of diagnosis, *n* (%)			.343
Alzheimer's disease	3 (43)	1 (25)	
Vascular dementia	2 (29)	-	
Other	1 (14)	1 (25)	
Not diagnosed	1 (14)	2 (50)	
Stage of dementia, GDS–*M* (*SD*), [min-max]	2.8 (.3), [2.5-3.4]	3.0 (.4), [2.5-3.4]	.291
Awareness of cognitive deficits, GRAD, *n* (%)			.754
Intact	4 (57)	2 (50)	
Mildly impaired	2 (29)	1 (25)	
Moderately impaired	1 (14)	1 (25)	
Living situation, *n* (%)			1.000
Alone	1 (14)	1 (25)	
With spouse or partner	6 (86)	3 (75)	
Education level, *n* (%)			.225
Lower education	1 (14)	2 (50)	
Secondary education	2 (29)	1 (25)	
Higher education	4 (57)	1 (25)	
Use of smartphone, *n* (%)			.397
Every day	3 (43)	3 (75)	
Once before	1 (14)	-	
No experience	3 (43)	1 (25)	
Use of tablet, *n* (%)			.672
Every day	4 (57)	2 (50)	
Once before	1 (14)	-	
No experience	2 (29)	2 (50)	
Informal caregivers			
Gender, *n* (%)			1.000
Female	7 (100)	4 (100)	
Age–*Md* (IQR), [min-max]	68 (20), [47-79]	61 (28), [40-71]	.774
Relationship with PwD, *n* (%)			.491
Spouse or partner	6 (86)	2 (50)	
Child	1 (14)	2 (50)	

Note. Differences between experimental and control group were tested using the Pearson chi-square test for categorical variables and the Mann-Whitney *U* test for ordinal and continuous variables. PwDs = persons with dementia GDS = Global Deterioration Scale; GRAD = Guidelines Rating of Awareness in Dementia.

PwDs in both groups were mainly male (73%), with a median age of 73 years (IQR = 13). The majority had Alzheimer's disease or vascular dementia (55%). The GDS scores ranged between 2.5 and 3.4 indicating very mild to mild cognitive decline. The majority of PwDs were aware of their cognitive deficits (55%). Most PwDs lived with their spouse or partner (82%) and more than half of

the PwDs had experience with using a smartphone (57%) or tablet (57%). All informal caregivers were female, with a median age of 68 years (IQR = 20). The majority was a spouse or partner (73%). No significant differences between experimental and control group at baseline were found.

3.3 Evaluation of the FindMyApps tool

Semi-structured interviews took place with six PwDs from the experimental group, as one of the PwDs in this group had not used the FindMyApps tool. Generally, the PwDs were satisfied with the FindMyApps tool and rated it with a 6.7 (*SD* = .61) on a scale of 1 to 10. They enjoyed working with the program and thought that it was nice and interesting, as illustrated by the following quote: *"It's a nice activity once you know how it works. It's interesting,"* (PwD07). One PwD noted that working with the program was instructive to her and that she had liked working with something new. Though PwDs were generally positive about the FindMyApps tool, one PwD stated that *"not everything [was] good,"* (PwD05), without specifying this further. Another PwD said that he thought the program was a good starting point, though he also thought it needed some improvement: *"It's working and there are some [apps] in it. Now it's a matter of giving it some structure."* (PwD19).

Five of the PwDs also reported that they had enjoyed participating in the study. One PwD said he appreciated that he started using the tablet more because of his participation, while another PwD stated that he found it important that this kind of research was being done for people with dementia:

> *There's always something new coming, something we might not comprehend, but it's nonetheless coming. [And] there's already a gap between people who don't want anything to do with it and, you know, I'm right in the middle of it. That group is getting bigger and bigger and that shouldn't happen. So, a way has to be found in which older people can still participate, as far as that's possible for them.* (PwD13)

In addition, PwDs' satisfaction with the FindMyApps tool was assessed with the USE questionnaire (see Table 14, Appendix C). Five PwDs gave an indication of their satisfaction. In general, PwDs were satisfied with the FindMyApps tool (*M* = 5.0, *SD* = .6). All PwDs thought that the FindMyApps tool was fun to use, and they would generally recommend it to a friend. Fewer PwDs thought that the FindMyApps tool works the way they want it to work, and one PwD did not think that he needs to have the FindMyApps tool.

3.3.1 Perceived usefulness

In the interviews, PwDs described the usefulness of both the FindMyApps tool and tablet, therefore, the usefulness of both the tool and tablet are described (see Table 3). Of the six PwDs who were interviewed, five stated that they found the FindMyApps tool useful. One PwD did not find it useful, though he did not give a reason as to why this was the case. PwDs who found it useful stated several

reasons for this: (1) apps match with their personal needs and interests, (2) it enables tablet learning, (3) it helps to find apps, and (4) it enables to explore what kind of apps are being offered in general. One PwD gave two reasons that made the FindMyApps tool less useful for him: the amount of categories on the home page was not sufficient for him, and part of the content of the FindMyApps tool did not match with his personal interests. Regarding the tablet, PwDs gave several reasons why they thought that it was useful to them: (1) it helps to find information, (2) it offers pleasure and satisfaction, (3) it provides memory training, (4) it increases social contact, and (5) it enhances self-management. One PwD also stated that the tablet gave him new ideas and inspired him. One of the PwDs stated that he did not find the tablet useful because he preferred another device like his laptop.

Table 3

Perceived Usefulness of the FindMyApps Tool and Tablet (n = 6)

Device	Categories and subcategories	Total *n*	Example quotes
FindMyApps tool	Reasons it is perceived as useful		
	Apps match with personal needs and interests	4	"There are [apps] in there … that are very useful, you know, in my case for dementia." (PwD13)
	Enables tablet learning	3	"I don't know how to say in what ways it's helping. To gain some understanding of [the tablet] I think." (PwD07)
	Helps to find apps	3	"I think [it's useful] to a certain extent. Because, you know, it's a good starting point to find something." (PwD17)
	Enables exploring which apps are being offered	1	"To gain some insight into what you can do and to explore what you want. That's possible because of those [categories]." (PwD19)
	Reasons it is perceived as less useful		
	Amount of categories on home page is not sufficient	1	"Because if you use it a lot, then I think three [main categories] are not enough." (PwD19)
	Part of the content of FindMyApps tool does not match with personal interests	1	"I took a quick look at 'reminiscence', but that wasn't a good match I thought." (PwD19)
Tablet	Reasons it is perceived as useful		
	Helps to find information	4	"Well, you can get to know something. If you hear something, then you can look it up. Like sometimes, you only hear half of a news report on the radio. Then you type it out and you look it up and then you think 'Oh right'." (PwD14)
	Offers pleasure and satisfaction	3	"Nice. Interesting. It's quite nice [to play with it]." (PwD07)
	Provides memory training	2	"[The tablet] helps me with my memory." (PwD13)
	Increases social contact	2	"Yes, more contacts. . . . Like with my family in [foreign country]. I stay in touch with them through the app. Nephews I haven't seen in years send me a message and ask 'How are you?' and things like that. That's nice." (PwD14)
	Enhances self-management	2	"Ideally, it helps you to stay independent for longer." (PwD17)
	Gives inspiration	1	"Sometimes I see new things … then I say to myself 'That's interesting,' and then I look it up, and a new idea comes into my mind. You know, it inspires me." (PwD13)
	Reasons it is perceived as less useful		
	Other device is preferred to tablet	1	"Well, I own a laptop, I'm used to that. I like to write with it, writing with the tablet can be annoying, with that keyboard … Everything I have to write I write with my laptop, because I like to think and type at the same time." (PwD13)

Note. Total *n* corresponds to number of PwDs.

PwDs were asked quantitatively to rate the usefulness of the different components of the FindMyApps tool (see Table 4). All PwDs found the detailed description of an app useful. Generally, PwDs also thought that the overview of apps in each category, the page 'Mijn Apps', and the division into categories was useful. The personal settings were also mainly perceived as useful, though two PwDs had not used this component. Two PwDs did not find the explanation button useful. One PwD said that he found it unnecessary, while another PwD stated that she did not need to find out how it works if she was stuck: *"I just turn it off and then it's fine. I don't worry about that sort of thing,"* (PwD14).

Table 4
Perceived Usefulness of the Different Components of the FindMyApps Tool (n = 6)

	Not useful	Useful	Very useful
Variable	*n* (%)	*n* (%)	*n* (%)
Detailed description of an app[a]	-	4 (80)	1 (20)
Overview of apps in each category	1 (17)	4 (67)	1 (17)
Page 'Mijn Apps'	1 (17)	5 (83)	-
Division into categories	1 (17)	5 (83)	-
Personal settings[a]	1 (25)	3 (75)	-
Explanation button	2 (33)	4 (67)	-

[a] = one missing value; [b] = two PwDs did not use the personal settings

Finally, all six PwDs rated the usefulness of the FindMyApps tool by means of the USE questionnaire (see Table 15, Appendix C). The usefulness of the FindMyApps tool was generally rated positively, with a mean score of 5.0 (*SD* = 1.0). This score affirmed what PwDs stated in the interviews, that is, they generally perceived the FindMyApps tool as useful. PwDs generally thought that the FindMyApps tool gave them more control over the activities in their lives and that it made the things they wanted to accomplish easier to get done. Though PwDs were positive about the usefulness of the FindMyApps tool, two PwDs did not think that it made them more productive.

3.3.2 Perceived ease of use

In the interviews, PwDs were asked what they thought of the general ease of use of the FindMyApps tool by means of one structured question. Four PwDs stated that it was easy to use, while the remaining two PwDs did not give a response. PwDs then described their opinion on the ease of use of the FindMyApps tool, but also the ease of use of the tablet. Table 5 summarizes their opinions regarding the ease of use of both the tool and tablet. Three reasons were stated why the FindMyApps tool was easy to use: (1) colours are clear, (2) icons are clear and recognizable, and (3) mistakes are easily reversible. In general, PwDs stated more reasons why the FindMyApps tool was difficult to use. The most frequently stated reasons were that the icons of the main categories were not clear and recognizable and that activating the touchscreen was difficult. Regarding the ease of use of the tablet, one PwD said he found it easy to use, because he could quickly find information with it. More reasons were given as to why the tablet was difficult to use. Those reasons are: (1) app cannot be adapted to personal wishes, (2) using app is difficult, and (3) finding the right app on the tablet requires a lot of step.

Table 5

Perceived Ease of Use of the FindMyApps Tool and Tablet (n = 6)

Device	Subthemes	Total n	Example quotes
FindMyApps tool	User-friendly		
	Colours are clear	4	"I've never paid attention to it. I think it's fine, not a problem." (PwD14)
	Icons are clear and recognizable	2	"Icons are fine. They're recognizable." (PwD05)
	Mistakes are easily reversible	1	"Sometimes I make a mistake if I click on something. I think that happens to most people, but then I just go back." (PwD13)
	Not user-friendly		
	Icons of main categories are not clear and recognizable	3	"That clock doesn't make me think about leisure time. It's about time, but leisure time is more about things that you do than time itself" (PwD19)
	Activating touchscreen is difficult	3	"The first time was difficult, it didn't work then … I probably didn't tap hard enough." (PwD07)
	Relationship between categories and apps in those categories is unclear	1	"I still think that people are set on the wrong track if they look at those icons. Like 'in and around the house', that's much broader than just in and around the house. And 'safety' and 'health' is also much broader, and 'housekeeping' like we used to have doesn't exist anymore. That has become much broader than that. If you take a look around [FindMyApps tool], then you'll see those apps and you'll know what I mean." (PwD13)
	Apps cannot be opened through page 'Mijn Apps'	1	"Well, I'm trying to go further … because if I find something interesting, I want to go further." (PwD17)
	Screenshots of apps cannot be enlarged	1	"I can't read this anymore. . . . If that happens I would just close the app and try to find it some other way. . . . It would be easier if you could enlarge them." (PwD17)
	Page 'Mijn Apps' does not show apps downloaded elsewhere	1	"If you eventually make some decisions [regarding apps], then it's a shame that you have to look in two places, because this could be a nice division." (PwD13)
Tablet	User-friendly		
	Finding information quickly	1	"In the past, I had to look everything up in books and this works much quicker. Of course you'll need some sort of guideline, but it's so much quicker." (PwD13)
	Not user-friendly		
	App cannot be adapted to personal wishes	1	"Because some apps cannot be extended yet. Let me give you an example. You want to create a route and then you want to extend that route so that it's longer, and that's not easy to do with a set route." (PwD13)
	Using app is difficult	1	"Solitaire [was] difficult." (PwD05)
	Finding the right app on tablet requires a lot of steps	1	"Finding a specific app is sometimes difficult. When that happens you have to take the appropriate measures to turn [the app] off. You could go all the way back to the beginning, but you could also just go back to where you started from, and that can take some effort." (PwD13)

Note. Total *n* corresponds to number of PwDs.

In addition, PwDs were asked to quantitatively rate the ease of use of operating the different components of the FindMyApps tool, as well as the readability of the text and operation of the touchscreen (see Table 6). All six PwDs rated the readability of the text as easy. Overall, PwDs also thought that operating the different components was easy to do. Three components were rated as a little difficult by one respectively two PwDs. Operating the page with the description of an app and operating the page 'Mijn Apps' was a little difficult for one PwD. He gave the following remark about

operating the page 'Mijn Apps': *"You have to make sure that you tab on the right spot."* (PwD07). Operating the touchscreen was a little difficult for two PwDs. One of the PwDs stated that using a stylus made it easier for him, while the other PwD said that the difficulty was due to his dry fingers: *"Yes, sometimes it doesn't respond, but that's because of my dry fingers … If that happens I just hold them quickly under water."* (PwD13).

Table 6
Perceived Ease of Use of Operating the FindMyApps Tool and its Different Components (n = 6)

	Difficult	A little difficult	Easy
Variable	*n* (%)	*n* (%)	*n* (%)
Adjusting personal settings[a]	-	-	5 (100)
Navigating through categories	-	-	6 (100)
Operating overview of apps in each category	-	-	6 (100)
Operating explanation button	-	-	6 (100)
Readability of text	-	-	6 (100)
Operating page with description of an app	-	1 (17)	5 (83)
Operating page 'Mijn Apps'[b]	-	1 (20)	4 (80)
Operation of touchscreen	-	2 (33)	4 (67)

[a] = one PwD had not adjusted the personal settings; [b] = one PwD had not operated the page 'Mijn Apps'

At last, all six PwDs rated the ease of use of the FindMyApps tool with the USE questionnaire (see Table 16, Appendix C). With a mean score of 5.4 (*SD* = .6), the PwDs generally perceived the FindMyApps tool as easy to use. The PwDs thought that it was user friendly and generally agreed that it was simple to use. They could also use it without written instructions. Two PwDs did not think that they could recover easily from mistakes they had made in the FindMyApps tool and one PwD did not think that he could use the FindMyApps tool successfully every time.

3.3.3 Learnability

In the interviews, the PwDs were asked on their opinion regarding the learnability of the FindMyApps tool. The answers the PwDs gave suggest that they did not always differentiate between the learnability of the FindMyApps tool and the learnability of the tablet. It was therefore not clear if their opinion related to the FindMyApps tool or the tablet. The PwDs reported factors that promoted learnability and reasons why they also needed support from their informal caregivers and volunteers at times (see Table 7). The PwDs most frequently stated (1) doing it often and (2) perseverance as factors that promoted learnability. One PwD also said that getting used to the FindMyApps tool made it easier for him. Some of the PwDs also stated reasons why they needed support when using the FindMyApps tool and tablet. The most stated reason was 'not knowing how something works', followed by 'age' and 'memory problems'.

Table 7
Learnability of FindMyApps Tool and Tablet (n = 6)

Subthemes	Total *n*	Example quotes
Factors promoting learnability		
Doing it often	2	"It's a matter of establishing a routine. That routine is gone and you have to relearn it bit by bit." (PwD19)
Perseverance	2	"I just keep on [working] with it until I succeed." (PwD07)
Getting used to it	1	"In the beginning I thought it was difficult because it was quite an adjustment … and I had to get used to that. Now I'm used to it, so I know which app I need to get and where I can find it." (PwD13)
Reasons support is needed		
Not knowing how something works	3	"My wife helps me because I ask her: 'How does this work, how does that work?'" (PwD07)
Age	1	"That's partly because of my age [that using it can be difficult]." (PwD13)
Memory problems	1	"I'm getting better and better at it but remembering everything is the problem." (PwD07)

Note. Total *n* corresponds to number of PwDs.

Furthermore, PwDs were asked quantitatively to indicate (1) the difficulty of learning how to use the FindMyApps tool and tablet, and (2) the difficulty of using the FindMyApps tool and tablet independently (i.e. without support from their informal caregivers or volunteers). Their answers are represented in Table 8. Overall, PwDs found learning to use the FindMyApps tool and using it independently more difficult compared to the tablet. Half of the PwDs thought that learning how to use the FindMyApps tool was a little difficult (*n* = 2) or difficult (*n* = 1), while only one PwD thought learning to use the tablet was a little difficult. The majority of PwDs (*n* = 4) thought that using the FindMyApps tool independently was a little difficult, compared to two PwDs who thought the same about the tablet. In general, PwDs often needed support when using the FindMyApps tool, as illustrated by a PwD's comment: *"It couldn't do it by myself, someone had to be around,"* (PwD07).

Table 8
Difficulty of Learning to Use FindMyApps Tool and Tablet, and Using FindMyApps Tool and Tablet Independently (n = 6)

Variable	Difficult n (%)	A little difficult n (%)	Easy n (%)
Learning how to use FindMyApps tool	1 (17)	2 (33)	3 (50)
Learning how to use tablet	-	1 (17)	5 (83)
Using FindMyApps tool independently	-	4 (68)	2 (33)
Using tablet independently	-	2 (33)	4 (68)

Finally, the ease of learning was assessed with the USE questionnaire (see Table 17, Appendix C). Five PwDs gave an indication of the ease of learning. They generally perceived the FindMyApps tool as easy to learn (*M* = 5.4, *SD* = .5). All PwDs stated that they could easily remember how to use the FindMyApps tool and that they quickly became skilful with it. In general, PwDs also stated that they learned to use the FindMyApps tool quickly.

In addition, the PwDs were asked how they had perceived the support from their informal caregivers and volunteers with the use of the FindMyApps tool and tablet. One of the six PwDs stated that he did not need support from his informal caregiver and he could therefore not give an opinion regarding the support. Overall, the remaining five PwDs were satisfied with the support they had received. They thought that it was nice and pleasant, and that they had learned a lot because of it. One PwD stated: *"Great. I enjoyed it, it never felt forced or anything. Time flew by,"* (PwD17). The PwDs were also asked to quantitatively rate the sufficiency of the support (see Table 9). All PwDs stated that the support from their informal caregiver or volunteer had been sufficient.

Table 9
Perceived Sufficiency Regarding Support Provided by Informal Caregivers and Volunteers (n = 5)

	Agree	Strongly agree
Variable	*n* (%)	*n* (%)
The support provided by my informal caregiver or volunteer was sufficient.	2 (40)	3 (60)

3.3.4 Adoption

The PwDs in both experimental and control group reported how many apps they had downloaded and where they had downloaded them, how often they had used those apps, and what type of support those apps had provided for them, see Table 10 for an overview. In the experimental group, most apps were found in the FindMyApps tool; five of the six PwDs found more than three apps in the FindMyApps tool compared to two PwDs who found more than three apps elsewhere (e.g. App Store or Google Play Store). One PwD however stated that he did not download any apps from the FindMyApps tool. In the control group, three of the four PwDs found apps on the websites and elsewhere, though more apps were downloaded from the websites.

In the experimental group, the PwDs used apps found in the FindMyApps tool generally more often than apps found elsewhere. Two PwDs used the apps found in the FindMyApps tool several times per day and three PwDs used them a few times per week, while one of the PwDs used apps found elsewhere only a few times per month. In the control group, PwDs used apps that were found elsewhere generally more frequently than apps found on the websites, namely one time per day to a few times per week.

In the experimental group, all of the PwDs stated that the apps found in the FindMyApps tool supported them in pursuing meaningful activities and four reported they supported them in self-management. Two PwDs also said that the apps found in the FindMyApps tool supported them in other ways, namely to find information, as illustrated by the following quote: *"It helps with my curiosity ... If I want to know something,"* (PwD17). Apps found elsewhere supported the PwDs mainly in engaging in meaningful activities. In the control group, apps that that were found on the websites supported the PwDs mainly in self-management and engagement in meaningful activities, and apps found elsewhere mainly in engaging in meaningful activities.

Table 10
Overview of Number and Usage of Apps and Type of Support They Provided for Experimental and Control Group (N = 10)

| | Experimental group (*n* = 6) | | Control group (*n* = 4) | |
| | In FindMyApps | Elsewhere | On websites | Elsewhere |
Variables	*n* (%)	*n* (%)	*n* (%)	*n* (%)
Number of apps				
0	1 (17)	1 (17)	1 (25)	1 (25)
1-2	-	-	-	1 (25)
3-4	2 (33)	2 (33)	2 (50)	1 (25)
>5	3 (50)	3 (50)	1 (25)	1 (25)
Usage[a]				
Several times per day	2 (40)	2 (33)	-	-
One time per day	-	-	1 (33)	2 (50)
A few times per week	3 (60)	1 (17)	1 (33)	1 (25)
A few times per month	-	1 (17)	1 (33)	-
Type of support[b]				
Self-management	4	3	2	2
Meaningful activities	5	4	2	3
Other	2	-	1	-

Note. PwDs who did not download any apps were not taken into account in the description of 'usage' and 'type of support'.
[a] = one missing value in experimental group for apps found elsewhere; [b] = PwDs could name more than one type of support, therefore the numbers do not add always up to the number of PwDs.

3.3.5 Perceived impact

Some of the PwDs also made remarks regarding the impact that using the FindMyApps tool and the tablet had on them and their daily lives (see Table 11). The most frequently made remarks regarding the impact were that (1) they are using the tablet daily or weekly, (2) their interest in the tablet has increased, (3) their world has become bigger, and (4) they are keeping up with the times.

Table 11
Perceived Impact of Using the FindMyApps Tool and Tablet (n = 6)

Themes	Total *n*	Example quotes
Using tablet daily or weekly	5	"Not every day, but a few times per week." (PwD07)
Interest in tablet has increased	2	"I like it. You know, I didn't do much with it before, and I like that I've been using it more now." (PwD19)
World has become bigger	2	"Yes, I think [that my life has changed]. It hasn't changed a lot, but I do think that it changes you. You know more, you hear more, and you see more, and your social environment is different. When I look at my sister, well, her world is very small. And a tablet can make it bigger." (PwD14)
Keeping up with the times	2	"You know, I grew up with pen and paper. But you can't live without it nowadays." (PwD17)
Using tablet has become part of life	1	"Just like getting the newspaper out of the mailbox or turning on the TV. It's part of life now. . . . I do it automatically." (PwD14)
Has become more digital	1	"Well, I've become more digital. . . . Before, I would have always used a paper map." (PwD13)
Bought a tablet for himself	1	"My wife bought a new one. Yes, it's a shame [that the iPad has to be handed in again]. Then we don't have a tablet at all. But I've just gotten a new one, that makes me very happy." (PwD07)

Note. Total *n* corresponds to number of PwDs.

3.4 Suggestions for improvement of the FindMyApps tool

The PwDs gave several suggestions to improve the usefulness and ease of use of the FindMyApps tool. With regard to the usefulness, one PwD made suggestions to improve the categories and the page 'Mijn Apps'. First, having more main categories in the FindMyApps tool would be an improvement:

"I would imagine that three [categories] are not enough ... You could have 10 or 12 on this screen, then it's still well-arranged and you have much more information than with just three [categories] on one page," (PwD19). Second, the PwD stated that the page 'Mijn Apps' could be improved by providing the possibility to add apps or even websites to a subcategory on the page and thereby using it as a sort of map for all relevant apps that a person thinks might fit in that subcategory: *"If you have other apps or websites ..., that you can add those [to the subcategories]. Here's an app from 'fitness & gym' for example, but I would also like to add a running app [to fitness & gym],"* (PwD19).

With regard to the ease of use, the PwDs made several suggestions regarding the personal settings, the categories, the screenshots of apps in the description of apps, and the page 'Mijn Apps'. First, one question asked in the personal settings could be improved by making it more precise. As one PwD noted, the question 'Do you want little text and a lot of pictures?' consists of two questions. He suggested: *"If you want to be more precise, then you should make two questions out of it,"* (PwD19). Second, according to one PwD the categories in the FindMyApps tool could be improved. He gave two suggestions for improvement. First, he suggested that making main categories out of some of the subcategories would make these categories more specific and stand out more:

> *I think dividing the apps into separate groups, like history, sports, games, and politics, you could put those into separate [categories]. That it becomes clearer, like for example: 'that's what I want to read, because I've seen that in the newspaper, and I want to read more about it.'* (PwD13)

Second, he suggested to add a table of contents to the categories to make it clearer which subcategories and apps are behind a category: *"Maybe you have to give a table first showing the apps that are being offered and which app belongs to which [category]. For example [the category] 'agenda', which [apps] are in there, what you can do with them,"* (PwD13). Third, the screenshots in the description of an app could be improved according to one PwD. This could be done by making them either bigger or enlargeable: *"You can't enlarge them? This doesn't add anything then, you can't read it. It would be better to have pictures that were readable. Of course, [enlarging them] would also be a possibility,"* (PwD19). Finally, two PwDs made suggestions regarding the page 'Mijn Apps'. According to one PwD, the page could be improved by making the apps clickable, which would open an app directly from this page. Another PwD suggested that adding some sort of cluster or hierarchical structure to the categories on this page would make it clearer, especially if there are a lot of categories:

> *Let's say you have 15 categories, which would be a lot, then you could add some sort of pedigree or tree with three or four [categories] under it and you could click on them. If people would use [FindMyApps tool] a lot, then having [that] would be handy.* (PwD19)

3.5 Results of the outcome measures

Six PwDs in the experimental and four PwDs in the control group provided both baseline and post-test data for the outcome measures. One PwD of the experimental group did not complete the post-test measures, because the amount of questions was too stressful for him and he found it difficult to decide on answers. He was therefore excluded from the description of the outcome measures. In Table 12, the results of the primary and secondary outcome measures at baseline and post-test for the experimental and control group are presented. No apparent differences were found on the outcome measures between baseline and post-test and between experimental and control group. Testing differences statistically was also not possible because the amount of PwDs in both groups was too small .

Table 12
Baseline (T0) and Post-test (T1) Descriptives of Primary and Secondary Outcome Measures by Treatment Group

Outcome measures	Experimental group ($n = 6$)		Control group ($n = 4$)	
	T0	T1	T0	T1
Primary outcome measures				
Self-management abilities				
SMAS-30 – M (SD), [min-max]				
Taking initiative	58.0 (17.0), [36-76]	57.3 (9.4), [48-68]	47.0 (17.1), [24-60]	51.0 (21.8), [20-68]
Self-efficacy	75.0 (15.8), [50-95]	79.2 (12.0), [70-100]	78.8 (9.5), [65-85]	82.5 (8.7), [70-90]
Investing	66.7 (11.2), [48-80]	61.3 (9.0), [52-72]	54.0 (18.0), [32-76]	59.0 (12.4), [48-76]
Positive perspective	71.3 (17.6), [50-88]	67.5 (15.1), [45-90]	62.5 (6.5), [55-70]	62.5 (17.1), [40-80]
Multifunctionality	48.0 (12.9), [32-68]	58.7 (9.4), [48-72]	46.0 (23.7), [24-72]	42.0 (21.0), [24-72]
Variety	68.7 (4.7), [60-72]	72.7 (12.0), [60-88]	60.0 (18.8), 36-80]	63.0 (6.8), [56-72]
Total	64.6 (10.5), [51.2-77.3]	66.1 (8.4), [57.2-81]	58.0 (11.7), [44.2-69.9]	60.0 (9.5), [48.2- 70.5]
Participation in daily and social activities				
PAL – M (SD), [min-max]				
Social activities – Frequency	2.6 (.5), [2.1-3.4]	2.3 (.4), [1.6-2.8]	2.4 (.6), [1.4-2.9]	1.9 (.4), [1.5-2.3]
Social activities – Enjoyability	3.3 (.6), [2.6-4.1]	3.3 (.4), [2.8-3.7]	3.4 (.6), [2.8-4.1]	3.1 (.3), [2.7-3.4]
Domestic activities – Frequency	2.9 (.4), [2.5-3.6]	2.7 (.4), [2.4-3.4]	2.7 (.8), [2.0-3.8]	2.1 (.7), [1.3-3.0]
Domestic activities – Enjoyability	3.6 (.4), [3.0-4.0]	3.6 (.4), [3.1-4.1]	3.0 (.6), [2.4-3.8]	2.9 (.4), [2.4-3.3]
Participation in social activities				
ASCOT[a] – M (SD), [min-max]	1.7 (.8), [1-3]	1.8 (.8), [1-3]	2.0 (1.2), [1-3]	2.0 (.8), [1-3]
Secondary outcome measures				
Perceived self-efficacy				
D-GSE – M (SD), [min-max]	30.7 (3.6), [26-36]	31.3 (6.4), [21-38]	30.8 (12.0), [14-40]	28.0 (8.0), [17-36]
Perceived autonomy				
EAL – M (SD), [min-max]	36.0 (5.1), [27-40]	36.5 (4.2), [33-44]	38.3 (7.5), [30-48]	40.3 (1.3), [39-42]
Quality of life				
DQoL – M (SD), [min-max]				
Self-esteem	3.8 (.7), [3.8-4.5]	3.8 (.4), [3.3-4.3]	3.9 (.6), [3.3-4.5]	3.8 (.4), [3.3-4.3]
Positive affect	3.9 (.9), [3.0-5.0]	3.8 (.4), [3.3-4.5]	4.0 (.6), [3.2-4.5]	3.8 (.5), [3.2-4.2]
Negative affect	2.2 (.6), [1.4-3.2]	2.0 (.5), [1.5-2.6]	2.3 (.2), [2.1-2.5]	2.0 (.1), [1.8-2.1]
Feeling of belonging	3.8 (.6), [3.8-4.7]	3.6 (.6), [2.7-4.3]	3.6 (.5), [3.0-4.0]	3.3 (.7), [2.7-4.0]
Sense of Aesthetics	3.5 (.7), [2.8-4.6]	3.5 (.6), 2.6-4.2]	4.0 (.8), [3.2-5.0]	3.8 (.3), [3.4-4.0]
General quality of life	3.2 (.8), [2-4]	3.5 (.5), [3-4]	3.3 (.5), [3-4]	3.3 (1.0), 2-4]

Note. SMAS-30 = Self-Management Ability Scale-30; PAL = Pleasant Activities List; ASCOT = Adult Social Care Outcomes Toolkit; D-GSE = Dutch General Self-Efficacy Scale; EAL = Experienced Autonomy List; DQoL = Dementia Quality of Life; [a] = lower scores are better.

4. Discussion

This mixed methods study aimed to get insights into the experiences and opinions of PwDs with the FindMyApps tool, a newly developed person-centred selection tool to help PwDs find usable apps in the domains of self-management and meaningful activities. We found that, in general, PwDs were positive about the tool and they enjoyed using it. PwDs also mentioned some positive effects that using the tool had on them, though no differences could be found on the outcome measures.

Generally, PwDs found the FindMyApps useful and easy to use. They mentioned that the tool helped them to find usable apps and that those apps matched with their personal needs and interests. This is an important finding, because it supports earlier studies that emphasize that apps for people with dementia have to match their needs and wishes to be usable for them (Groenwoud et al., 2017; Astell et al., 2016). Half of the PwDs also reported that using the apps of the FindMyApps tool has helped them to become more familiar with the tablet and to find out how it works. This is unexpected, because it suggests that the tool is not only useful to select usable apps, but that PwDs can also indirectly be stimulated to use the tablet more because of it. Lim et al. (2013) have reported similar findings. They have shown that PwDs can be stimulated to use a tablet regularly through a selection of potentially usable apps. Furthermore, PwDs in this study stated that they enjoyed using the tablet and that it was perceived as a pleasant activity. These findings confirm previous studies by Groenewoud et al. (2017) and Leng et al. (2014) who also found that PwDs enjoy the use of tablets because it gives them something to do.

Nevertheless, PwDs also gave critical remarks about the user-friendliness of the FindMyApps tool and the tablet. Half of the PwDs thought that activating the touchscreen in the FindMyApps tool was difficult. On the one hand, this could have been because the FindMyApps tool has been developed as a web application and not as a native app (Kerkhof et al., 2018), which might mean that a slow internet connection or a slow server may have caused these problems. On the other hand, research indicates that PwDs sometimes can have difficulties with tapping or swiping of the touchscreen (Groenewoud et al., 2017, Evans, Bray, & Evans, 2017). This could be because PwDs are not used to this kind of touchscreen technology. At last, PwDs reported that the component 'Mijn Apps' in the FindMyApps tool was less user-friendly, because apps were not clickable, and they suggested to improve this. It is therefore suggested to add this function to 'Mijn Apps', so that PwDs in the RCT experience this component as more user-friendly.

Regarding the learnability of the FindMyApps tool, PwDs reported that they could generally learn how to use the FindMyApps tool and also use it independently. Using the FindMyApps tool often and showing perseverance when using it helped some PwDs to learn the functions of the FindMyApps tool. However, almost all of the PwDs stated they needed support from their informal caregivers when using the FindMyApps tool, which is also suggested by research (Dröes, Bentvelzen et al., 2010; Meiland et al., 2012). All PwDs reported that the support was sufficient in helping them to

learn the FindMyApps tool and tablet. This is an important finding, as it suggests that the training based on the errorless learning method was indeed helpful for the PwDs. This is in line with studies that have shown that PwDs can be taught how to use everyday technologies such as a smartphone (Bier, Paquette, & Macoir, 2015) or a digital organiser (Imbeault et al., 2014) by means of the errorless learning method. However, studies that support the use of the errorless learning method to teach PwDs how to use tablet-based tools are still scarce, making our finding important as it shows that PwDs can also learn how to use tablet-based tools based on this method.

With regard to the adoption, most PwDs in the experimental group found more than three apps in the FindMyApps tool, and they used them on a daily or weekly basis. These are positive findings, as they indicate that PwDs still enjoy engaging in activities and that a tablet and apps can provide an opportunity for this. However, it must be noted that contrary to our expectations, PwDs in the control group found approximately as many apps through the websites as PwDs in the experimental group. This could be because the control group did not differ much from the experimental group regarding the intervention; the control group also received a training and websites as an indication where usable apps could be found. It is therefore recommended for future research that differences between experimental and control group be as small as possible, for example by using a control group that only receives a tablet but no training and websites.

Contrary to our expectations, no differences on the outcome measures were found. However, PwDs stated several positive effects that using the apps had on them. In line with the aim of the intervention, PwDs indeed stated that the apps supported them in self-managing their condition and that they provided them with enjoyable activities. Unexpectedly, PwDs also reported more profound effects. Some of them reported that because of this intervention they became more interested in the tablet, while others said that their world has become bigger because of the tablet. They feel more involved in what is happening in the world and the tablets help them to keep up with the times. These findings are supported by Tsai, Shillair, Cotton, Winstead, & Yost (2015), who found that elderly people often describe feeling more connected, current, and content because of the use of tablets. The perceived effects that PwDs described emphasize the potential tablets can have for people with dementia, as they can not only provide an activity, but also let them be a part of a world that increasingly relies on technology (Smith & Mountain, 2013).

Though all PwDs reported that they enjoyed using the tablet and found apps useful, it has to be noted that almost half of the PwDs who had been recruited surprisingly dropped out after the start of the study. The main reason was a lack of motivation to use the tablet. An explanation for this might be that almost all of these PwDs were inexperienced with the use of a tablet and did therefore not think that using the tablet would be of any additional value to them. This is contrary to findings by Lim et al. (2013) and Chiu et al. (2016) who found that the participants with dementia did not require experience with the use of tablets to enjoy using them and to find them a valuable activity. Our findings, however, suggest that besides motivation experience with tablets might also be an important factor for people

with dementia when they take part in a tablet-based intervention. This could be an important finding for clinical practice, because special attention might need to be paid to the level of experience that PwDs have to make sure that they can fully benefit from the intervention.

Implications for future RCT

Though this study has shown that FindMyApps is a promising intervention that can be valuable for PwDs, it has also shown that doing a traditional RCT with this target group may not always be simple. This became apparent through a number of things which lead to implications for the future RCT.

First, it was not easy to reach participants for this study and recruiting participants also took considerable time, approximately three to four months. We started the recruitment process by approaching a case manager and acquaintances in one day care institution and one meeting centre, but this approach was not very fruitful and resulted in only one fourth of the desired sample size ($N = 20$). We then expanded the recruitment process by approaching Alzheimer Cafés in the Eastern Netherlands. This was more effective and most participants were recruited this way. An explanation for this more effective recruitment strategy could be that a relatively large amount of people was approached at once and that the researchers introduced themselves personally, which could have made participants more enthused about the intervention. For the RCT it is therefore recommended that Alzheimer Cafés are approached at the beginning of the recruitment process, so that more potential participants can be reached.

Second, data collection with the interviews was difficult for some PwDs, because the interviews took too long or they did not know how to answer the questions and became stressed. This was encountered two times and both times the informal caregiver was asked to join the interview so that the PwD would feel more at ease. In doing so, the informal caregiver also supported their relative with answering the questions, for example by giving little hints or reminders that would help the PwD to answer the question. Having the informal caregivers with them was valuable for the PwDs and helped them to feel more comfortable, but also improved data collection by making missing values less likely to happen. It is therefore recommended for the RCT that informal caregivers are present during all interviews, so that PwDs do not feel stressed and are comforted by the presence of the informal caregiver.

Data collection with the questionnaires was also difficult for some PwDs because of the amount and length of the questionnaires that were used. To make data collection with the questionnaires more feasible for PwDs, it is recommended to adapt the protocol for data collection with the questionnaires by using instruments that are shorter in length. This is especially the case for the USE questionnaire where a lot of missing values were encountered. It is recommended to use a shortened version of the USE questionnaire as described by Lund (2001) which only consists of 17 items. Another practical recommendation for the RCT would be to use the SMAS-S (Cramm, Strating, de Vreede, Steverink, & Nieboer, 2012), a shorter version of the SMAS-30, which consists of 18

instead of 30 items. Making these adjustments could make the data collection for the PwDs more feasible and decrease the likelihood of missing values.

Furthermore, almost half of the PwDs who were recruited dropped out after the start of the study, mainly because they were not motivated enough to use the tablet. This could have been because it was only checked with the informal caregivers if the PwDs were motivated to participate in the study, not with the PwDs themselves. Informal caregivers might have hoped that their relatives would become motivated to use the tablet because of their participation in this study. It is therefore highly recommended for the RCT that researchers check the level of motivation regarding the tablet use with the PwDs themselves, so that dropout due to a lack of motivation can be eliminated or reduced.

At last, changes can be made to the FindMyApps tool before the RCT to make it more usable. The component 'Mijn Apps' was evaluated as less useful, because the apps that were shown were not clickable. The usefulness of this component could be improved by adding a link to the app itself or the App Store respectively Play Store. Besides that, the icons of the categories were not always clear to the PwDs and they did not understand what apps were behind that category. It is suggested to improve those icons by, for example, adding a short sentence that makes the category more clear.

Strengths and limitations

To our knowledge, FindMyApps is the first intervention that helps PwDs to find usable apps for self-management and meaningful activities that match their needs, wishes, and abilities. The results provide new insights into the potential of tablets for PwDs. A strength of this study is that PwDs were involved in the development of the FindMyApps tool. Such a user-participatory design process can enhance the usefulness, acceptance, and adoption of technological interventions and it may have empowering effects on PwDs (Span, Hettinga, Vernooij-Dassen, Eefsting, & Smits, 2013). This is contrary to a technology-driven approach, which can result in a lack of usefulness and acceptance of a technological intervention (Nijhof, van Gemert-Pijnen, Burns, & Seydel, 2013). Furthermore, we included the opinions and perspectives of PwDs in this study, which provided rich information and valuable insights on their experiences with the FindMyApps tool. The opinions of PwDs are often neglected in research, but they are essential in dementia-related research (Murphy et al., 2015). Another strength is the use of a mixed methods design comprising qualitative and quantitative measures, which helped to gain in-depth information on the experiences and opinions of PwDs. Researchers also took the time build a relationship with PwDs. By building a relationship and meeting in person, the researchers could purposively include PwDs in this study (Tyack & Camic, 2017).

On the other hand, there are also some limitations. First, the sample size was small. We approached several organizations to include as many respondents as possible, but relatively few PwDs decided to participate. The small sample size made statistical analyses of outcome measures not possible. We also aimed to include a heterogeneous group of PwDs to explore their experiences with the FindMyApps tool. In our sample however, the majority of PwDs had a higher level of education

and there were more men than women. This means that the results may not be generalizable to other PwDs. Second, in this study there was a relatively high dropout rate. We tried to increase adherence by having regular telephone contact with the PwDs and informal caregivers and by providing additional support through a help desk. Nevertheless, almost half of all PwDs dropped out after the start of the study. It may be that the opinions on the FindMyApps tool of PwDs who completed the study differ from PwDs who dropped out, for example the opinions of completers may be more positive than those of participants who dropped out. This has to be taken into account when reviewing the findings.

Practical implications

This study provided valuable information regarding the FindMyApps tool and the improvements that can be made to the tool. Also, some practical implications can be made. This research has shown that PwDs can participate in qualitative research and that they can provide valuable insights and input. PwDs are, however, often neglected in qualitative dementia research. Though interviewing PwDs may be more time-consuming than for example interviewing their informal caregivers, it is strongly recommended that researchers do not neglect the experiences of PwDs, because they can contribute valuable information which may in turn make interventions developed for them more effective.

For future research, it would also be interesting to investigate how the library of dementia-friendly apps of the FindMyApps tool can be automatically kept up-to-date, because new apps are constantly being developed and existing apps are being updated or taken off the market. In this study, looking for apps and based on criteria of dementia-friendly apps required time. Research suggests that app recommendation frameworks can be developed that check apps for specific criteria (Zhu, Liu, Zhang, & Gu, 2017). This could also be developed for the FindMyApps tool, so that apps do not have to be manually checked as in this study. This could save time and may therefore be more efficient.

At last, research suggests that a tool like FindMyApps might be valuable to other target groups (Bidargaddi et al., 2017; Kerkhof et al., 2018). For example, the tool might benefit people with moderate to severe dementia, PwDs who live in nursing homes or people with brain injuries. Further research into the requirements of those target groups regarding such a tool could be made.

Conclusion

The results of this study show that the FindMyApps tool is accepted by people with dementia and that it can be valuable in supporting their self-management abilities and participation in meaningful activities. It also highlights the potential that tablets and apps can have for people with dementia, as it provides them with an enjoyable activity that can also positively impact their lives. Though people with dementia contributed valuable insights in this study, it was also found that they can find it challenging to participate in traditional research like RCTs. Therefore, suggestions for improvement are given for both the FindMyApps tool as well as the future RCT, so that the effects of the FindMyApps tool on people with dementia can be fully investigated.

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Appendix A

Categories and app examples of the FindMyApps Tool

Table 13

Overview of Categories and Examples of Apps in the FindMyApps Tool

Category	Subcategory	Further subcategory	Examples of apps
In en om het huis	Agenda	Dagindeling	Clockaid Pictoplanner dementia-App
		Medicijn herinneringen	GGZ Friesland MedAlert Clockaid Pictoplanner
	Veiligheid & Gezondheid	Ontspannen	VGZ Mindfulness Coach Natuur geluiden gratis: Slaap, yoga en meditatie
		Hulpmiddelen	GreyMatters Dragon Dictation Beter Zien
		Gezondheid	Moet ik naar de dokter? Alzheimer Assistent Appotheek
	Huishouden	Schoonmaken	Slim Huishouden Hoe houd ik mijn kamer schoon?
		Klussen	Klussen voor beginners PRAXIS Bouwmarkt
		Tuinieren	Gaonzwijzer MijnTuin.org
		Eten & Drinken	MyTaste Recepten Groente- en Fruitkalender Allerhande Koken
		Boodschappen	Jumbo Reclamefolder ALDI Nederland
		Wonen	Wonen.nl Stek Woon & Lifestyle Magazine
Contacten	Contact op afstand		MiessAgenda dementia-App Skype
	Hulp bij praten		iPicto DigiTaal He Hajo
Vrije tijd	Bewegen	Wandelen & Fietsen	Blokje om Natuur Klompenpaden
		Fitness & Gym	ZIN van bewegen GoliveHealth FysiOtherappy
	Spellen	Bordspellen	Dammen Backgammon Free Schaken – Speel & Leer

Table 13 (continued)

Overview of Categories and Examples of Apps in the FindMyApps Tool

Category	Subcategory	Further subcategory	Examples of apps
		Sportspellen	Flick Kick Football Kickoff Hit Tennis 3
		Kaarten	Patience – Klassiek Solitaire Solitaire
		Puzzelen	Jigzo HD Sudoku 4 Plaatjes 1 Woord
		Woordspellen	Woordzoeker Ultieme Galgje (Dutch) Woord-Breker
		Overige spellen	Bubble Explode Candy Crush Saga Goed Fout – Algemene Kennis
	Er op uit	Cultuur	MuseumTV OverUIT Rijksmuseum
		Uit eten	Yelp IENS Dé online restaurantgids OverUIT
		Reizen	Maps: Navigatie en OV Google Earth 9292
	Natuur	Dieren	Dierengeluiden Tuinvogels Dierenzoeker
		Planten & Bomen	Flower Garden Free Platengids
		Het weer	Buienradar – weer Weeronline voor iPad Buienalarm
	Media	Radio & TV	Nederland.FM NPO TVgids.nl
		Films	Willem
		Nieuws	De Telegraaf Tubantia Nieuws Blauw Bloed
		Sociale Media	Facebook Instagram
	Herinneringen ophalen	Foto's & Filmpjes	My House of Memories MyHeritage Fotoscanner van Photomyne
		Muziek luisteren	Dementie en Herinneringen
		Notities en Dagboek	Moment Diary Geheim dagboek
	Hobbies	Muziek maken	Perfect Piano Bloom HD

Table 13 (continued)

Overview of Categories and Examples of Apps in the FindMyApps Tool

| Category	Subcategory	Further subcategory	Examples of apps
		Kunst	Kunst van de dag
			Google Arts & Culture
			MuseumTV
		Geschiedenis	Historiek – Geschiedenis
			Beroemde mensen – De quiz
			Wikipedia
		Handwerken	Yarnie
			Cross-Stitch World
		Lezen & Schrijven	iBooks
			LuisterBieb
			Onze Taal
		Fotografie	Cloudina Camera
			Foto Bewerker door Aviary
			Fotoscanner van Photomyne
	Diversen	Politiek	Nederland 2.0
			Informatie Rijksoverheid
			Politiek Portaal Publieksapplicatie
		Religie	Kerkdienst gemist
			Bijbel
			Bidden Onderweg

Appendix B
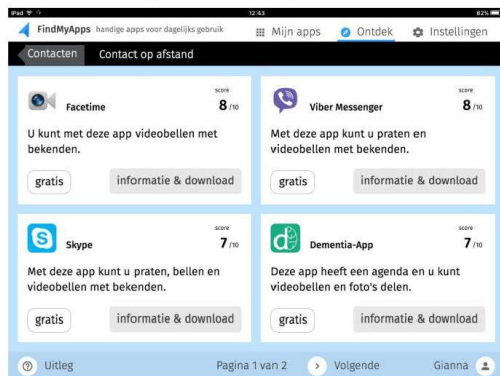
The components of the FindMyApps tool
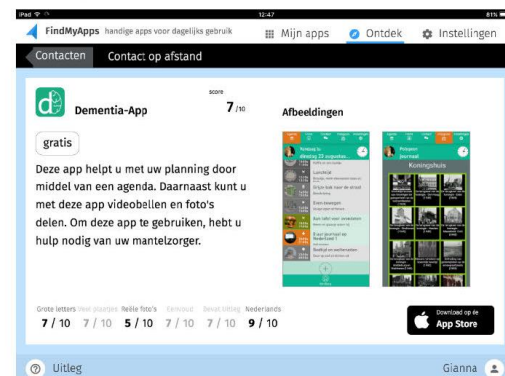
'Personal settings'

'Categories'
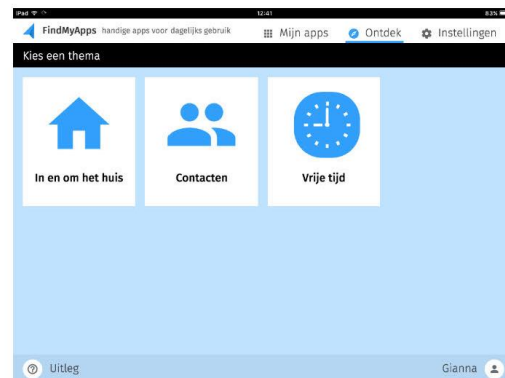
'Overview of apps in each category'

'Description of an app'

'Mijn Apps'
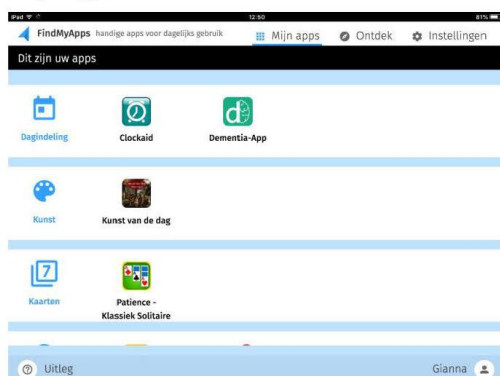
'Explanation button'
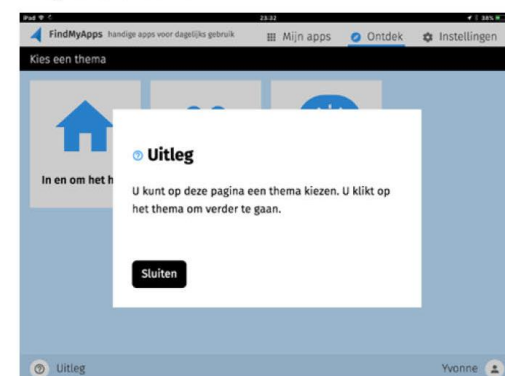
Appendix C

Interview scheme for the experimental group

Instructies: In de opmerkingen kolom kan aangegeven worden dat de persoon met dementie in het geheel geen mening heeft over een bepaald item in de vragenlijst (code 9 voor onbekend) of dat de vraag niet van toepassing is op de persoon met dementie (code 8). Daarnaast dient, in het geval van een negatief antwoord, de reden voor dit negatieve antwoord uitgevraagd te worden, dit kan eveneens in de opmerkingen kolom worden genoteerd.

(Suggestie: Voor de experimentele groep geldt dat de FindMyApps tool aanwezig is tijdens het interview. FindMyApps moet geraadpleegd kunnen worden wanneer naar zijn ontwerp en functies wordt gevraagd)

Interviewer: *In dit interview wordt uw mening gevraagd over de bruikbaarheid, de gebruiksvriendelijkheid, de leerbaarheid en het effect op het dagelijks leven van het gebruik van de tablet met de FindMyApps selectie tool. Ook willen we graag met u in gesprek over uw ervaringen met deelname aan dit onderzoek.*

We willen benadrukken dat we geïnteresseerd zijn in uw mening en ervaringen.

Naam interviewer Code PwD en mantelzorger: Datum:	..../........./............
Algemene observaties Duur van het interview? Andere context informatie die belangrijk is?	
(B) Bruikbaarheid & (G) Gebruiksvriendelijkheid FMA	**Opmerkingen en observaties** **(8 = niet van toepassing; 9 = onbekend/geen mening; bij negatief antwoord: waarom?)**
B1 Kunt u mij wat vertellen over uw ervaringen met FMA?	

			Niet nuttig	Nuttig	Heel nuttig	
B2		Is FindMyApps nuttig voor u?	Niet nuttig	Nuttig	Heel nuttig	
	-	Zo ja, waarom wel?				
	-	Zo niet, waarom niet?				
G1a		Vindt u FindMyApps gebruiksvriendelijk?				
	-	Zo ja, waarom wel? Welke onderdelen?				
	-	Zo niet, waarom niet?				
G1b		Hoe gaat het om FindMyApps te gebruiken?	Moeilijk	Een beetje moeilijk	Makkelijk	
B3		Waar helpt FindMyApps u bij?				
B4		Komt FMA tegemoet aan uw persoonlijke behoeftes?				
	-	Zo ja, waarom wel? Welke behoefte/op welk terrein?				
	-	Zo niet, waarom niet?				
B5	a)	Hoeveel bruikbare apps heeft u gevonden in FMA? *(Vragen wanneer twijfel bij MZ, dikgedrukt wel vragen)*	0	1-2	3-4	5 of meer
	b)	Welke apps waren dat?				
	c)	Hoe vaak heeft u deze apps gebruikt?	Meerdere keren per dag	1x per dag	Enkele keren per week	Enkele keren per maand
	d)	Waar hebben deze apps u bij ondersteund?	Omgaan met ziekte	Dagbesteding	Zelfredzaamheid	Anders — Namelijk:
B6	a)	Hoeveel bruikbare apps heeft u elders gevonden? *(Vragen wanneer twijfel bij MZ, dikgedrukt wel vragen)*	0	1-2	3-4	5 of meer
	b)	Waar gevonden?				

	c)	Welke apps waren dat?					
	d)	Hoe vaak hebt u deze apps gebruikt?	Meerdere keren per dag	1x per dag	Enkele keren per week	Enkele keren per maand	
	e)	Waar hebben deze apps u bij ondersteund?	Omgaan met ziekte	Dagbesteding	Zelfredzaamheid	Anders	Namelijk:
G2	a)	Waren de apps gevonden in FMA gebruiksvriendelijk? *(Vragen wanneer twijfel bij MZ, dikgedrukt wel vragen)*					
	b)	Welke wel/niet?					
	c)	Waren de apps elders gevonden gebruiksvriendelijk?					
	d)	Welke wel/niet?					
G3		Wat vindt u van u de grootte van FMA in het algemeen?	Te groot	Goed	Te klein		
G4		Wat vindt u van de kleuren in FMA?					
G5		Hoe beoordeelt u de grootte van de iconenknoppen in FMA?	Te groot	Goed	Te klein		
G6		Wat vindt u van de leesbaarheid van de tekst van FMA?	Moeilijk	Een beetje moeilijk	Makkelijk	Reden, waarom het niet leesbaar is: ……………………………… (tekst, grootte, cognitieve beperkingen?)	
G7		Wat vindt u van de iconen op FMA? (vindt ze (niet) leuk, herkent ze. Maak opmerkingen van de meest onduidelijke/ onherkenbaare iconen[1]).					
G8		Wat vindt u van het bedienen (de gevoeligheid) van de touchscreen op FMA?	Moeilijk	Een beetje moeilijk	Makkelijk		
B7a		Hoe nuttig vindt u de persoonlijke instellingen die u kunt doen in FMA?	Niet nuttig	Nuttig	Heel nuttig		
B7b		Heeft u instellingen gemist? Zo ja, welke?					

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[1] Het is i.v.m. tijd niet de bedoeling om alle iconen langs te lopen.

G9	Hoe ging het aanpassen van de persoonlijke instellingen?	Moeilijk	Een beetje moeilijk	Makkelijk	
B8a	Hoe nuttig is de indeling in categorieën in FMA voor u?	Niet nuttig	Nuttig	Heel nuttig	
B8b	Heeft u categorieën gemist? Zo ja, welke?				
G10	Hoe ging het om te navigeren van de ene naar de andere categorie?	Moeilijk	Een beetje moeilijk	Makkelijk	
B9a	Hoe nuttig is het overzicht met apps per categorie in FMA voor u?	Niet nuttig	Nuttig	Heel nuttig	
B9b	Heeft u iets gemist in het overzicht met apps per categorie? Zo ja, wat?				
G11	Hoe ging het om het overzicht met apps per categorie te bedienen?	Moeilijk	Een beetje moeilijk	Makkelijk	
B10a	Hoe nuttig is de beschrijving van een app in FMA voor u?	Niet nuttig	Nuttig	Heel nuttig	
B10b	Heeft u iets gemist in de beschrijving van een app? Zo ja, wat?				
G12	Hoe ging het om de pagina met beschrijving van een app te bedienen?	Moeilijk	Een beetje moeilijk	Makkelijk	
B11a	Hoe nuttig is de pagina 'Mijn Apps' in FMA voor u?	Niet nuttig	Nuttig	Heel nuttig	
B11b	Heeft u iets gemist op de pagina 'Mijn Apps'? Zo ja, wat?				
G13	Hoe ging het om de pagina 'Mijn Apps' te bedienen?	Moeilijk	Een beetje moeilijk	Makkelijk	
B12a	Hoe nuttig is de uitlegknop voor u?	Niet nuttig	Nuttig	Heel nuttig	
B12b	Heeft u informatie gemist op de uitlegknop? Zo ja, wat?				
G14	Hoe ging het om de uitlegknop te bedienen?	Moeilijk	Een beetje moeilijk	Makkelijk	

G15	Waar liep u tegenaan bij het gebruiken van FMA of wat heeft het gebruik van FMA belemmerd?						
G16	Welk rapportcijfer zou u FMA geven?						
G17	Heeft u suggesties hoe FMA te verbeteren?						
B13	Wat heeft u aan dit onderzoek gehad?						
(L)	**Leerbaarheid FMA**	**Opmerkingen en observaties** **(8 = niet van toepassing; 9 = onbekend/geen mening; bij negatief antwoord: waarom?)**					
L1	Hoe heeft u het ervaren om FMA te leren gebruiken?	Moeilijk	Een beetje moeilijk	Makkelijk	Waarom of wat?		
L2	Hoe gaat het om FMA zelfstandig te gebruiken?	Moeilijk	Een beetje moeilijk	Makkelijk	Waarom of wat?		
L3	Hoe heeft u het ervaren om de functies van de tablet te leren gebruiken?	Moeilijk	Een beetje moeilijk	Makkelijk	Waarom of wat?		
L4	Hoe gaat het om de tablet zelfstandig te gebruiken?	Moeilijk	Een beetje moeilijk	Makkelijk	Waarom of wat?		
L5	Waar had u precies ondersteuning bij nodig?						
L6	De geboden ondersteuning van uw MZ/VR was voldoende	Helemaal niet mee eens	Enigszins mee oneens	Niet mee eens/niet mee oneens	Enigszins Mee eens	Helemaal mee eens	
L7	Hoe heeft u de ondersteuning van uw MZ/VR ervaren?						
	a) Wat was fijn?						
	b) Wat was minder fijn?						
L8	Heeft u suggesties om het gebruiken van en leren omgaan met FMA te vergemakkelijken?						
L9	Heeft u suggesties om het gebruiken van en leren omgaan met de tablet te vergemakkelijken?						

(A)	**Adoptie FMA**	**Opmerkingen en observaties** **(8 = niet van toepassing; 9 = onbekend/geen mening; bij negatief antwoord: waarom?)**
A1	In hoeverre maakt het gebruik van apps onderdeel uit van uw dagelijkse activiteiten?	
A2	In hoeverre maakt FMA onderdeel uit van uw dagelijkse activiteiten?	
A3	Denkt u dat uw leven veranderd is, sinds u FMA gebruikt? Zo ja, kunt u enige voorbeelden geven? (omgaan met dementie, gelukkig zijn, meer/andere dagbesteding, zelfstandigheid)'	
(F)	**Feasibility meetinstrumenten & onderzoeksprotocol**	**Opmerkingen en observaties** **(8 = niet van toepassing; 9 = onbekend/geen mening; bij negatief antwoord: waarom?)**
F1	Wat vond u van de vragenlijsten die bij u zijn afgenomen?	
	a) Wat vond u goed?	
	b) Wat vond u minder goed?	
F2	Heeft u suggesties hoe de vragenlijsten en de afname ervan verbeterd kunnen worden?	
F3	Wat is uw indruk over het onderzoek in het algemeen?	

Appendix D

Results of the USE questionnaire per domain

Table 14
Satisfaction with the FindMyApps Tool Assessed with the USE Questionnaire (n = 5)

Variables	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
I am satisfied with FindMyApps.	-	-	-	1 (20)	1 (20)	3 (60)	-
I would recommend FindMyApps to a friend.	-	-	-	2 (40)	1 (20)	2 (40)	-
FindMyApps is fun to use.	-	-	-	-	4 (80)	-	1 (20)
FindMyApps works the way I want it to work.	-	-	1 (20)	1 (20)	1 (20)	2 (40)	-
FindMyApps is wonderful.	-	-	-	3 (60)	2 (40)	-	-
I feel I need to have FindMyApps.	-	1 (33)	-	-	1 (33)	1 (33)	-
FindMyApps is pleasant to use.	-	-	-	-	2 (67)	1 (33)	-
Overall Satisfaction – Mean (SD)				**5.0 (.6)**			

Table 15
Usefulness of the FindMyApps Tool Assessed with the USE Questionnaire (n = 6)

Variables	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
FindMyApps helps me be more effective.	-	1 (20)	-	-	3 (60)	1 (20)	-
FindMyApps helps me be more productive.	-	2 (40)	-	1 (20)	-	2 (40)	-
FindMyApps is useful.	-	-	-	-	1 (17)	5 (83)	-
FindMyApps gives me more control over the activities in my life.	-	1 (17)	-	-	2 (33)	3 (50)	-
FindMyApps makes the things I want to accomplish easier to get done.	-	1 (17)	-	1 (17)	2 (33)	1 (17)	1 (17)
It saves me times when I use FindMyApps.	-	-	-	1 (25)	1 (25)	2 (50)	-
FindMyApps meets my needs.	-	-	1 (25)	-	1 (25)	2 (50)	-
FindMyApps does everything I would expect it to do.	-	1 (25)	-	-	1 (25)	1 (25)	1 (25)
Overall Perceived Usefulness – Mean (SD)				**5.0 (1.0)**			

Table 16
Ease of Use of the FindMyApps Tool Assessed with the USE Questionnaire (n = 6)

Variables	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
FindMyApps is easy to use.	-	-	1 (17)	-	1 (17)	4 (67)	-
FindMyApps is simple to use.	-	-	1 (17)	-	-	5 (83)	-
FindMyApps is user friendly.	-	-	-	-	2 (33)	4 (67)	-
FindMyApps requires the fewest steps possible to accomplish what I want to do with it.	-	-	1 (17)	-	3 (50)	2 (33)	-
FindMyApps is flexible.	-	-	-	-	1 (33)	2 (67)	-
Using FindMyApps is effortless.	-	-	-	-	1 (25)	3 (75)	-
I can use FindMyApps without written instructions.	-	-	-	-	-	4 (100)	-
I don't notice any inconsistencies as I use FindMyApps.	-	-	-	1 (25)	1 (25)	2 (50)	-
Both occasional and regular users would like FindMyApps.	-	-	-	-	3 (100)	-	-
I can recover quickly and easily from mistakes I made in FindMyApps.	-	1 (25)	1 (25)	-	1 (25)	1 (25)	-
I can use FindMyApps successfully every time.	-	1 (25)	-	-	1 (25)	2 (50)	-
Overall Perceived Ease of Use – Mean (SD)				**5.4 (.6)**			

Table 17
Ease of Learning of the FindMyApps Tool Assessed with the USE questionnaire (n = 5)

Variables	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)
I learned to use FindMyApps quickly.	-	-	-	2 (40)	2 (40)	1 (20)	-
I easily remember how to use FindMyApps.	-	-	-	-	-	5 (100)	-
It is easy to learn to use FindMyApps.	-	-	-	1 (20)	1 (20)	3 (60)	-
I quickly became skillful with FindMyApps.	-	-	-	-	2 (67)	1 (33)	-
Overall Perceived Ease of Learning – Mean (SD)				**5.4 (.5)**			