

# Implementing the SimpleC Companion: Lessons Learned from In-Home Intervention Studies

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**Abstract.** This paper provides insights from our experiences that would guide the implementation of home- and community-based intervention studies, in particular field tests of technology in older adults with varying degrees of cognitive impairment and their informal (family) caregivers. Critical issues include recruitment in a vulnerable and frail population, intervention and protocol design, environmental and technology-specific barriers to implementation, and facilitators of success. Our experiences and recommendations should be relevant to a broad range of longitudinal field tests, particularly those with older adult populations.

**Keywords:** Assistive technology · Caregivers · Dementia · Seniors · Disease management · Caregiver burden · Recruitment · Retention · Applied research · Field test · mHealth · Healthcare technology

## 1 Introduction

The SimpleC Companion (‘Companion’) is a behavior and symptom management technology designed specifically for older adults, yet also suitable for younger individuals who have an assistive need. Assistive needs may be defined as behaviors, symptoms or routines that are suboptimal and can benefit from an intervention such as reminding, redirecting, calming or stimulation. Common Companion interventions, for example, include scheduled reminders to take medications, drink water, eat something (healthy), complete an exercise routine, or get ready for important events such as paying bills, doctors visits or activities of daily living (ADL, e.g., getting up, getting dressed, oral hygiene, toileting, bathing). These reminders are embedded in a salient sequence of audiovisual stimuli that typically include a combination of images, music and voice recordings of trusted individuals. The different media reinforce what the person should do or accomplish, for instance showing people exercising together in a

gym or class to prompt someone to exercise. Pleasing music and an introductory, personal message help the person gently orient, be reminded and motivated to take action. Similarly, many common behavior and mood symptoms, such as depression, apathy, agitation, and sleep difficulties can be mitigated by music and pictures that are positive and personally relevant and that calm, redirect or engage (e.g., a beautiful beach scene paired with the sound of rolling ocean waves to help induce sleep). The ‘shows’ play for a period of time (e.g., 30 min).

Companion interventions are based on individual needs, preferences, and routines, and are used by healthy older adults as well as persons with mild cognitive impairment or dementia. The interface is simple and intuitive in its design to accommodate users with limited computer literacy and/or impairments common in late life, such as altered vision, hearing, motor and cognitive function.

## 2 Intervention Goals and Overview

We set out to test the Companion technology and concept in a home- and community-based environment to prepare for serving the unique market of older adults or others with assistive needs living at home. Although the Companion has been a commercial product since 2009 and is used by more than 650 residents of retirement facilities across eight U.S. states, it was never tested in-home with individual families and persons in need of support. We were particularly interested in determining whether the physical environment of the home (multiple rooms, floors, and occupants) would be conducive to a wellness technology like the Companion; whether similar or different user needs existed in this market; and whether a mobile, tablet-based platform is preferable in this market. Specifically, we aimed to assess the usability of the Companion across different levels of cognitive impairment (none, mild, moderate), and its usefulness to care recipients and caregivers. Given this focus, several small samples of caregiving dyads were selected.

**Table 1.** Study characteristics

	A	B	C
Duration	3 weeks	12 weeks	3 weeks
Touch screen	stationary, 21"	stationary, 21"	tablet, 10"
N (dyads)	7	5	7

Within dyads, the care recipient (CR) was defined as the person for whom the Companion was personalized; the caregiver (CG) was defined as the spouse, partner or adult child taking prime responsibility for or interest in the wellness and/or care of the CR. In all three studies (A, B, C), dyads completed a telephone screen, a baseline assessment (in-home) and a life story and needs interview (in-home) prior to receiving their personal Companion. Once installed in the home, dyads used the Companion 3 or 12 weeks on a large, stationary touch screen or tablet (Table 1). During the intervention

period, participants were contacted regularly (weekly) to answer questions, address problems and accommodate user requests for changes, if any. Post-intervention, the CGs and CRs completed technology adoption questionnaires and a goal attainment scale, and were interviewed.

Protocols were reviewed and approved by an independent institutional review board (Sterling IRB, Atlanta, GA). All participants gave written informed consent or assent if unable to sign consent.

### 3 Recruitment

#### 3.1 The D-word: Dementia

Although there is a great need for studies that evaluate the usability, feasibility, and efficacy of technology-based interventions for persons with dementia (PWD) and mild cognitive impairment (PMCI), these individuals are often excluded from participation given their impairment and the ethical and methodological questions it raises: To what extent can they provide consent, answer questions and properly follow directions? By explicitly recruiting them into our studies and making accommodations to ensure our methods were ethical and would yield valid and valuable results, we were excited as a scientific team to approach PWD and PMCI and offer them a role and voice in our work. Implicitly, we expected dyads to be excited too and eager to participate, especially because we offered a solution and help free of charge. Instead, we met many a cold shoulder. As we quickly learned, dementia is surrounded by stigma, misconceptions, and uncertainty and may have legal ramifications, all of which are barriers to recruitment. Dementia is the D-word.

To many people, dementia implies ‘losing your mind’, your identity, your dignity and indeed that is often how the disease is portrayed even by professionals who know the syndrome well: It is scary and robs you of everything. What many fail to see or do not know, is that it may take years or decades before advanced impairment sets in and even then, there are vast individual differences in how the disease manifests itself and abilities are lost. Meantime, technology and other resources can help maintain or train functions so as to mitigate disease progress and relieve care recipients and caregivers alike. Early on however, that is not what people know or want to hear when they have received a diagnosis or are coming to terms with one. In essence, you as a researcher are a messenger and reminder of bad news, which nobody likes no matter how good your story or solution is. This makes it particularly difficult to recruit healthy and pre-symptomatic older adults, who fear the prospect of dementia and do not want to hear or think about it. Ironically, it is this demographic that may benefit most from early intervention. The implication is to carefully craft your message and materials. Focus on common problems and concerns, such as sleep, nutrition and exercise, in higher functioning individuals who still feel strong, capable and unimpaired. Once you caught their interest and eye, they may volunteer information that conveys the real need, and chances increase you discover other needs in a non-threatening manner. In lower functioning individuals, the same probes may be given with different details: in this group, the concern is not so much whether grocery shopping and cooking is completed

independently and regularly, but rather that prepared meals are consumed 3 times a day and the person is motivated to come to the table and participate in meals. Either way, both groups are struggling with nutrition, maintaining weight and healthy routines. This can be addressed respectfully and appropriately when you know your audience and the difficulties they or their families commonly face.

In the absence of a diagnosis, it may also not be clear that a problem is a problem. Consequently, people may not identify with your recruitment message and efforts even when it applies to them and they are good study candidates. We all forget to turn off the light sometimes and may have trouble remembering a face or name. When do we call it or recognize it as a problem? In the face of slow but gradual decline, it may be particularly difficult for older adults to decide that something is wrong and they or a loved-one need help. Not uncommonly, a crisis or adverse event is the wake-up call to seek guidance, advice or help. In our experience, many seniors are reluctant to discuss their needs or difficulties or will dismiss or ignore tell tale signs. Our own studies included several individuals who tested positive for MCI or dementia using a quick screening tool, without having an official diagnosis. This reality and grey area raises a host of ethical questions and should caution researchers to tread carefully: do not assume people know they have a problem or want to know. Researchers should also be creative and flexible in their approach: Develop several narratives (use cases) that allow different target users to self-identify, to recognize the potential merit of your technology or intervention, and to develop an interest in participating. We found that a focus on activities and concerns rather than on a diagnosis or disorder was more palatable to participants. Describe common struggles or omissions, such as paying bills on time and getting up a decent time every morning. Many older adults, especially when they are retired and/or have lost their life companion and live alone, struggle with these routines that have the potential to become a real threat to health and wellness. PWD face these struggles too, but by focusing on the activity and routines (or lack thereof) rather than the disease, everybody can self-identify in one way, shape or form, and join the conversation without risking stigmatization.

In the continuing care retirement communities (CCRCs) where we initially recruited amongst independently living residents who tend to be relatively healthy, we felt a reluctance to discuss assistive needs with us because admitting to such needs may alter the level of care a couple receives from the CCRC, increase their monthly costs, and possibly force both or one of the partners to move to a higher level of care, outside the home. Even when we explained that all data were and would be treated confidentially, and study participation was unlikely to have negative consequences, there was a palpable reluctance to discuss assistive needs. Researchers should attempt to understand the dynamics that are at play in the communities where they recruit, be it financial, social, legal, or otherwise, before they start recruiting. This will help avoid painful errors and save time in the end. Having community advocates or informants, preferably inside the target population, will help to get started and to develop narratives and support. Organize regular ‘wine & cheese’ events to build rapport, observe the dynamic and group, and identify individuals who may help your cause and those who will not. Engaging both groups of stakeholders (the Pros and the Cons) is vitally important as they each inform what makes or breaks a successful field trial. In one of our communities, for instance, the residents were unhappy about the rollout and cost of

Internet services. When we came in and prided ourselves on being ‘wireless’ and mobile, many residents scoffed and had a bad taste in their mouth fully beyond our control. Identifying the gems that will help your effort or the ways around local barriers is essential to a good, successful trial. Subsequently, focus groups can help identify themes and narratives further.

### **3.2 Two More D-S: Deficits and Decline**

Although a focus on dementia can make it extra difficult to recruit study participants, as discussed above, the notion of assistive technology (AT) itself implies something is ‘off’ and needs ‘correcting’. Whereas this may not be a problem for individuals with an obvious and/or relatively harmless impairment or disability, it can be an unpleasant surprise or raise concerns or suspicions in someone who is not aware of a problem or who does not perceive their behavior or functioning to be problematic. In many ways, our work as AT researchers and developers implicitly sends a message that the user is in need of support, which may be at odds with the user’s perception, belief system, and functional status. Throughout our studies with older adults living independently at home, we sensed a desire in users to focus on health, wellness and independence, as opposed to deficits and decline. This implies that our message and solutions should be positively phrased and framed. In a high-functioning but older user, for instance, a reminder may be referred to as a ‘Note to Self’, which sounds less dysfunctional and stereotypical of this age group. Instead of talking about problems, disease, and symptoms, one can inquire about ‘wellness concerns and needs’, which many of us have regardless of age and health status. In addition, our technology solutions and interventions should offer a range of self-improvement options so users can envision improvement and set personal goals, if need be in consultation with others including AT and clinical teams. Even in households where dementia or other disorders such as Parkinson’s disease were evident, caregivers and care recipients in our studies invariably wanted to improve functional status, not merely maintain it. In many instances this is feasible too and thus should be encouraged and supported using AT interventions. Our message and support should be realistic yet optimistic.

### **3.3 Gender Differences in Coping May Affect Sample Composition**

The older demographic we targeted in this research behaved very much along stereotypical gender lines where men tend to avoid discussing personal problems or experiences, whereas women will. The net result of this dynamic is that women tend to reach out for help more than men, which skews samples and data: Our caregivers tended to be female (71 % overall) and our care recipients male (53 %), which is at odds with the statistic that women are more likely to develop dementia, and that the majority of our participants were traditionally married couples. As such, we expected more female CR and more male CG. Although women may traditionally be more inclined to assume the caregiver role, for instance for parents, our observations do raise the issue that female CRs and male CGs are underrepresented in our studies and data,

and hence our product development and design. One way to avoid this is to recruit in a non-random fashion, which has its own set of limitations but may be worthwhile depending on the size of the sample and research aim(s).

### 3.4 Frailty and Distress

Older adults inherently are more likely to have (chronic) physical ailments and impairments such as limited eyesight, hearing, mobility and altered motor function. These add up to lesser or larger degrees of frailty, which should be factored into our research designs and approaches. In our studies, we screened (per self-report) for chronic conditions, vision, hearing, mobility and fine motor impairments, and capped their occurrence and extent in both caregivers and care recipients. However, that did not prevent samples from being frail or having major functional obstacles that stand in the way of successfully completing studies with participants once enrolled. At an average age of 72 for caregivers (range, 49–89 yrs) and 82 for care recipients (range, 60–90 yrs), visual impairments were common (CG: 82 %–CR: 94 %), walking difficulties were common (24 %–71 %), hearing difficulties were common (18 %–35 %) and fine motor problems were not uncommon (6 %–24 %). These rates are typical of the general population, which means that a good number of your older participants will wear or use assistive devices to compensate for functional loss, such as glasses, hearing aids and canes, all of which may affect the adoption and usability of your AT product or solution. In our case, for example, people must be able to hear and see our intervention shows, which are useless otherwise.

Frailty also affects the cadence of recruitment and completion of implementation studies, especially in research that involves repeat assessments and home visits. Each visit may take longer depending on frailty and the time between visits may be longer than expected or desired. We had to reschedule many appointments due to illness, adverse events (e.g., falls), and unexpected surgeries. This can create serious practical challenges and delays when assessments depend on more than one member of the research team who each have busy calendars. Additionally, frailty is a risk factor for attrition and loss to follow-up, which was significant in our sample despite screening precautions: In our first two studies (A, B), attrition approached or exceeded 50 % (1 in every 2 dyads that had been screened, evaluated and included), which is a huge loss of effort, resources and data. In response, we became much more vigilant and open about potential problems and red flags, such as distress and frailty, and more straightforward and strict in our decisions not to include particular dyads. In many instances, the study was simply not a good fit given the circumstances of interested dyads and the demands of the study. Even though we did not require participants to come our office and made home visits instead, participating in a study takes time and effort. Some dyads, we sensed or it was clear, would not be able to comply with those demands and expectations, and the study would be a burden on all rather than source of support and relief. In those circumstances, researchers should be open and honest with themselves and study candidates that participation is not a safe or the study a good fit, even when all formal recruitment criteria have been met.

In addition to frailty, families or households dealing with dementia quickly face considerable distress. Young caregivers, such as adult children, tend to work (fulltime) jobs and/or have children of their own, which creates a lot of pressure across the board. Caregiving in and of itself is also very distressing given the limitations it places on time and movement, and is a big source of distress in young and old family caregivers alike. Older caregivers, however, may have been taking care of their loved-one for years and experience physical and other limitations themselves, which adds to their frailty and exhaustion. In our studies we curtailed the level of distress experienced by caregivers, per self-report and formal measures, yet this did not prevent samples from being distressed, worn-out and desperate. Our caregivers on average scored in the bottom 25 to 50 % of the distress scales, and formally were deemed “mildly distressed”, yet many struggled with making themselves available to us, and frequently were in an unpredictable or low mood. Researchers in-field need to be aware of this and be able to show and experience compassion by being kind, cordial and patient time and time again. This is difficult and therefore, not a job for just anyone. Team leads should pay close attention to their ‘field officers’ and the (life) experience and personality they bring to the table.

## 4 Intervention and Protocol Design

### 4.1 Efficacy vs. Efficiency

In helping families manage chronic disease and challenging symptoms and behaviors in daily life, in particular dementia, individualized interventions are more effective than one-size fits all approaches [1]. Music, for instance, can mitigate agitation or apathy in PWD extremely well, but more so if it is tailored to the individual and pleases or moves him or her. Likewise, reminders for key routines or events depend on personal schedules. The SimpleC Companion, therefore, was expressly developed with personalization in mind. Not only are interventions tailored to match individual preferences and schedules, the scope and focus of interventions entirely depends on the specific area(s) of need or interest: Is it sleep, behavior, mood, an ADL, exercise or a combination that is in need of support? Accordingly, a ‘therapy menu’ is created and tailored to meet individual preferences, schedules, and needs. This individualized approach is associated with great adoption and efficacy in longitudinal studies of the Companion at home, proving the concept that AT can successfully deliver non-pharmacological interventions and help manage complex diseases, but the approach also depends on the input from key stakeholders.

For the Companion, we need information about the symptoms and needs, about preferences and routines. Although not difficult to provide in essence, the time it takes families or facilities to gather and relay this information can create a bottle-neck and barrier to implementation. Research protocols in general should weigh the need for personalization or information against the demands it places on the informant(s). This holds especially for longitudinal research in older, frail adults.

After several participating dyads recanted in rapid succession one month, we streamlined our protocol in several ways:

- We became bolder in our screening and recruitment decisions, as discussed;
- We limited the number of phone calls or emails about a particular piece of information we needed to two, thereby giving participants room and time to respond while putting the onus on them rather than us. Although unnerving at first, loosening the reins and putting responsibility in participants' hands, the strategy by and large worked really well and no dyad recanted since;
- We limited the number of home visits prior to installing the Companion to two, and limited the overall number of hours per visit to two. This put a clear boundary on our imposition and intrusion of peoples' homes and time, which is a good practice in general and forces research teams to make choices about what is essential vs. desirable.
- We developed ways, in part as a business, to work with limited information on individual needs, preferences and routines to deliver a 'minimum viable intervention'. This comes down to focusing on top priorities and using the information you do have wisely. For instance, whereas personal photos and videos are always more effective than generic in engaging people, it is still better to put together an album or video on a topic of interest using generic material than to have no album or video at all. Rarely if ever were participants disappointed in the initial result or therapy menu we offered them, and no adverse reactions ever occurred.
- Rather than trying to address all user requests and needs early on, we allowed ourselves to make changes after the initial install, thereby tweaking the intervention to tailor it further without necessarily changing its essence or goal. This removed a lot of stress to deliver upfront on both our end and the participants'.

## 5 Barriers to Implementation

### 5.1 Environmental Barriers

For AT solutions like ours that depend on the Internet to send and receive information to devices in the field, such as therapy updates and therapy usage information, the limited availability of Internet or spotty network reception in remote and rural areas can be a problem. In our sample of private homes, 1 in 4 households did not have a wireless internet connection, which we subsequently provided using a router or by establishing a cellular Internet connection through a provider with good local coverage. Research teams need to plan for the added cost of setting up and maintaining these connections as well as the optimal data plan.

Introducing a piece of technology to the home also raises the question where it will be placed, and whether existing furniture can accommodate it. If not, the research team may have to provide new furniture. In two of our studies that used a 21" touch screen as opposed to tablet to deliver interventions, we provided different types of side and coffee tables because existing ones were inadequate (e.g., flimsy, too low). Equipment placement and requirements depends on where and how the technology will be used, which may depend on user needs. If sleep is a concern, for instance, the device/intervention should be available in the bedroom. Needs sometimes compete (e.g., in addition to sleep, a person should hydrate and eat better which calls for the intervention to be available in



the living room), but mobile applications and technologies render such situations less and less problematic fortunately.

Not unique to our or AT studies, but a common barrier to study progress and completion are the holidays, especially towards the end of the year. Teams should plan on scheduling difficulties and changes, and associated delays. In one particularly memorable holiday experience, a caregiver asked us to remove the Companion from her living room, which ended the trial and the couple's access to the intervention despite the husband's enjoyment and benefit, because the wife needed the spot for the Christmas tree. One cannot argue with that...

Environmental barriers also include people's daily habits and routines and how they spend their time and where inside the house. We asked the question where and when people tend to relax while at home to gauge where something like the Companion would best be used for personal enjoyment and engagement. Other technologies, such as computers and television, compete for time and interest and are a common distractor and thus barrier to adoption and use of a new technology-based intervention. After mapping a typical day and week, couples may have to be advised on 'wellness scenarios' that include recommendations on how and when to use the (AT) intervention ideally.

Finally, we consider household dynamics an important barrier to implementation that must be considered and addressed. In some cases we decided not to include couples or dyads because their expectations were unrealistic, their problems and needs were excessive, or problems and needs could not be addressed by an intervention like ours. One wife was tired of picking up after her husband and wanted us to help with that (which we could), but also that he speak to her more openly and often after many years of marriage. We could not help with that. In a few other instances, couples disagreed on what the problem was and how to move forward. They had to be excluded from further participation for lack of common ground and focus. When dealing with human subjects, especially more than one, for extended periods of time and addressing personal needs and issues, researchers must be prepared to recognize and draw a line. Being open, honest, and realistic as a team early on about the risk:benefit ratio of study participation, helps.

## 5.2 Technology-Specific Barriers

Many older adults perceive new technology such as tablets as gadgets that serve entertainment, not daily function or wellness. This premise creates an instant disconnect between the AT developer and user that must be overcome through education (e.g., recruitment materials) using relevant yet simple everyday use case scenarios that resonate with many older users and that 'disarm' and spark curiosity.

Older adults may also give up more easily on trying a new technology or learning how to use it, thinking they are natural misfits when their actions are not immediately successful. This lack of confidence or 'self-efficacy' in using new technologies is reinforced by watching others, often younger generations, use new technologies effortlessly and constantly. Repeat training and positive reinforcement is essential in making older adults feel at ease with new technologies such as the Companion, even when the design interface is relatively simple and intuitive.

This generation is used to physical buttons and not necessarily familiar with the notion of touch screens. Consequently, many are intimidated by touch screen technologies. Not only are they afraid to break the surface, they are very reluctant to simply touch the screen, which may go back to the days when glass surfaces (television, cameras, windows) were not to be touched. When first introducing a touch screen-based technology to a user or audience, therefore, it helps to bring demo devices along so people can touch and play with it to get familiar and comfortable with the basic notion. Additionally, researchers should plan on explaining and practicing basic touch screen operations, such as touching (using one finger as opposed all five of one hand at the same time) swiping (in a straight as opposed to diagonal line), tapping (lifting one finger up and down relatively quickly but not too quickly, as opposed to holding a finger down on the screen or waiting too long between repeat touches), and enlarging or zooming if applicable. In many instances training and reinforcement of ‘good touch screen behavior’ is required, even in high-functioning, unimpaired older adults.

The good news is that in our experience many impaired older adults, including those with advanced dementia, quickly develop motor memory for these simple operations and can learn to navigate a touch screen technology and menu like the SimpleC Companion. We have several very impaired users who keep themselves busy and positively engaged for hours per day using the Companion. This, in turn, relieves caregivers, and gives them joy and peace of mind that something meaningful is going on while they are not there or cannot attend to their loved-one. The value of this cannot be overstated.

Conditions such as Parkinson’s disease may further keep older adults from using touch screen technologies effectively, and screening for such conditions and other, more common, physical impairments is advised, as already discussed.

One immediate implication of these barriers is that trials should allow sufficient time for older or unfamiliar users to warm up to the technology, its application, and its regular, daily use. Most of our “3-week” trials were extended to give people more time to use the technology as intended and to experience its usefulness properly. Fortunately, once people experience the benefit and/or joy, they are staunch adopters and advocates.

### **5.3 Facilitators of Success**

One overarching theme that was a challenge for all studies was attrition. In addition to some of the strategies already discussed, we recommend the following for successful recruitment and retention of a diverse, representative sample of community-dwelling older adults for (AT) field studies:

- Focus on symptoms and needs rather than specific diagnoses. People may not have a diagnosis and a diagnosis does not necessarily matter. What matters is the symptom and the everyday need or challenge it creates.
- Be aware that counting symptoms or disease burden using standardized measures may underestimate the level of impairment and caregiver burden. Frailty and

distress are much more than a simple addition of physical ailments and should be sampled through direct interaction with dyads.

- Consider the overall challenges faced by the specific dyad. Additional considerations include comorbidities, other family members to help out, jobs, social and financial support, and interpersonal dynamics.
- Minimize the added burden of study participation. No more than two visits prior to implementation.
- Have contingency plans for unexpected circumstances, such as a care recipient who does not want to participate or couples disagreeing at various points in time, to augment dyad participation and retention. Have options and narratives available to assessors in the field.
- Incorporate flexibility in the protocol design. Enable assessors to stop an assessment prematurely or exceed time restrictions if suitable and appropriate without jeopardizing the essence and goal of the intervention.
- Allow time for pilot testing the intervention in a representative environment with representative participants, to develop the right messages and identify advocates.
- Work with your local and state government representatives (e.g., local county senior services centers) to spread the word about your work, and to get invited to community events. The goal is to get in front of as many people as possible.
- Identify community outreach coordinators at local governments and universities to help recruit amongst minority populations.
- Capitalize on existing community networks for recruitment.
- Hire an ethnically-diverse research staff to maximize your connection with different constituents on all levels (language, customs, routines, ethics, etc.).
- Have a dedicated person for home-visits and office phone calls.
- Keep interactions with the team as consistent as possible so rapport can build and a relationship between the research team and the participants can develop.
- Develop a method to assess the characteristics of the home and peoples routines, especially for technology interventions.
- Select and train assessors/assessment team on how to put people at ease and reduce stress (e.g., entering the home, sensitivity training).
- Plan for a best case scenario timeline and add in a factor 1.5 to account for unforeseen circumstances that are likely to occur.
- Develop meaningful and intervention-specific outcome measures. Standardized outcome measures will underestimate the benefits and gains following an individualized intervention. Goal attainment scaling is an individualized outcome measure that assesses individual gain meaningfully. For various applications, see [2, 3].

## 6 Conclusions

Field studies are desperately needed and can have tremendous positive impact, but are also challenging. Our goal in this paper was to provide lessons learned from our experience but in a general enough way that others can implement the strategies that we found helpful. Over 50 % of participants are using the SimpleC Companion long after

their trial ended, demonstrating the criticality of the technology and concept for quality of life and well-being.

Although the experiences and recommendations provided herein were derived from experiences with our particular system, they have broader relevance to field studies with assistive technologies in general, as well as older adults and those with physical and/or cognitive limitations.

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