

AMBIENT ACTIVITY TECHNOLOGY: A Journey to Engagement

A Research Evaluation:

The impact of ABBY, a personalized activity technology, on people living with dementia in long-term care **2017**

Challenge at Hand

The trend is clear: our population is getting older and dementia diagnoses are on the rise. Seniors with cognitive impairments are the core population in long-term care. Of those with dementia in this setting, nearly half exhibit aggressive or agitated behaviour.

> Caring for people living with dementia requires a compassionate understanding of the disease and specialized strategies for providing care. Indeed, the quality of life for residents with moderate to severe levels of dementia depends largely on the quality of care offered by front-line providers, including activationists, personal support workers, and family members.

> > How can technology be integrated into the environment to support care providers?

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Executive Summary

Engagement in meaningful activities is central to the well-being of residents with dementia living in long-term care (LTC). With poor staff-to-resident ratios in homes, there is limited time and resources for one-on-one person-centred care. Innovative technologies can create opportunities to provide meaningful and personalized experiences for residents living with dementia, without requiring additional time from staff. This research report evaluates the impact of a non-pharmacological ambient technology, called ABBY, on outcomes related to well-being among residents, staff and family members in LTC.

The ABBY technology was installed in six Ontario LTC homes. Pretest and posttest measurements were collected over a span of six to eight months.

Results revealed significant benefits:

- Reduced responsive behaviour, such as agitation and aggression
- Improved quality of life for residents
- Reduced emotional exhaustion for staff

This report provides evidence-based support that technologies, such as ABBY, can promote independent engagement in meaningful activity for people with dementia, reduce responsive behaviours (e.g., wandering and screaming), and alleviate staff burnout often reported in LTC homes.

Innovative technology-based solutions have the potential to greatly assist staff in managing behaviours with personalized activities that are easy to access and available for use at any time.

Living with Dementia

Dementia is a broad category of neurodegenerative brain diseases that cause a gradual reduction in ability, ultimately limiting a person's capacity to complete activities of daily living. Some key symptoms include memory loss, disorientation to time and space, problem solving difficulties, and communication challenges (National Institute on Aging, 2011).



According to the World Health Organization (2017), close to 50 million people worldwide currently have dementia and this is number is expected to reach close to 132 million by 2050.



As there is presently no cure for dementia, care-giving focus gravitates toward interventions that maintain, provide, and promote quality of life and well-being for those who live with dementia.

Dementia in Long-Term Care

Of residents living in LTC, approximately 62% have dementia (Canadian Institute for Health Information, 2017).



While there has been an increase in activities and programming based on occupational therapy, recreational therapy, music therapy, and physiotherapy, such programs can cover only a fraction of the day for people with dementia. The fact is that many people with dementia living in LTC homes will spend most of the day either in their rooms or in passive activities, such as sitting and watching others and/or TV (Donovan et al., 2014).

Boredom and lack of meaningful, engaging activities in dementia care environments may be associated with increases in responsive behaviours, such as screaming and wandering (Volicer et al., 2006).

aberrant motor behaviour (pacing, wandering) **Responsive Behaviours** 2991ession (hitting) Also referred to as behavioural and psychological symptoms of dementia, or BPSDs. These include: agitation anxiety depression (crying) irritability apathy repetitive verbalizations delusions and hallucinations Approximately

of residents living in LTC express some type of aggressive behaviour, including verbal or physical abuse, socially inappropriate or disruptive behaviour, and resistance to care.

A common treatment for responsive behaviours is antipsychotic medications, which were received by





25.8% of LTC residents.

The adverse health effects associated with antipsychotic drug treatment includes abnormal gait, increased risk of stroke, reduced cognitive performance, and even an increased risk of death (Cerejeira et al., 2012).

Caregiver Burden

Manifestations of responsive behaviour associated with moderate to severe levels of dementia, such as wandering, hitting and verbal abuse, have been consistently related to caregiver burden in LTC environments. The need to attend to agitated behaviour is immediate, can occur at any time (24-hours a day/7-days a week), and always takes priority. It is time and resource consuming, stressful, disruptive to the environment, and potentially hazardous for caregivers.

Given understaffing and increased workloads, the amount of dedicated, around-the-clock, attention and individualized care that can be offered in LTC is limited.

The staff-to-resident ratio in Canadian LTC environments is 1:9 (Singer et al., 2015).

Responsive behaviours have been shown to be more likely to occur when residents are depressed, anxious, less socially active, or have communication difficulties (Draper et al., 2000).

This suggests that unmet needs, leading to loneliness or sadness, which often cannot effectively be expressed by residents, are not being adequately addressed.

Person - Centred Care

The focus is on what remains – not the losses associated with the disease.



Person-centered care (PCC) is a holistic approach to caring that considers the needs of the whole person across multiple domains, including biological, physical, social and psychological, regardless of functional capacity (Ducak et al., 2016).

Montessori for Dementia

Montessori for dementia may be thought of as a special kind of PCC tailored specifically for this population of individuals. This approach creates meaningful and engaging experiences by focusing on the sensory motor capabilities that remain after other abilities, such as explicit memory and executive functioning, have largely been lost.

Montessori principles include:

- Promoting self-confidence and independence
- Focusing on the person's functional capacity and interests
- Clearly defining task expectations using cues and priming (e.g., 'match the shapes')
- Providing constructive and corrective feedback on performance that promote self-correcting behaviour
- Breaking tasks down into steps that progress from simple to complex

In dementia care, Montessori-based activities often encourage the use of skills and abilities based on the individual's past, such as putting flowers in a vase or driving a car. The focus is not on completing the task perfectly, but on being engaged with the act, to promote a sense of accomplishment (*Ducak et al., 2016*).

Ambient Activity to Manage Responsive Behaviours

Introducing ABBY

ABBY, developed by Ambient Activity Technologies (AAT), is a non-pharmaceutical, activity-based intervention utilizing PCC principles to manage responsive behaviours in people living with dementia.

ABBY *augments* the care environment by providing, *ambient* activity experiences that are easy to access, understand, and use. ABBY is available to residents in the care environment on a 24/7 basis.

ABBY integrates technology, including interactive touch-screen monitors, sensors, and programming logic, with familiar, tactile, *manipulative activity experiences*, such as turning a wheel, flipping a switch, or petting a cat. These *tangibles* provide a variety of opportunities for stimulation to the resident (e.g. sight, sound, touch, physical activity).

Wearable ID beacons identify a resident to ABBY, so when interacting with ABBY's activity interfaces, the resident can access individualized media content. This personalized content provides physical, cognitive, and social stimulation to engage the strengths of the resident's existing functioning, past interests, and current needs.

The goals of ABBY are to:

- Encourage meaningful engagement through access to appropriate and personalized experiences, memories, and activities
- Reinforce familiarity and personal identity
- Promote physical activity
- Enhance confidence and promote independence
- Offer a flexible platform that can adapt to the dynamic challenges of individuals living with dementia

ABBY provides residents with an effective trigger for their remaining memories, helping people attain a state of calm, which is key to managing agitated behaviour.





The Research

Measuring the effect of ABBY on residents, staff and family members/visitors

ABBY was installed in six LTC homes in Ontario, including five experimental LTC sites and one control LTC site. The purpose of the research was to evaluate the role that ABBY played in helping to manage responsive behaviours and improve outcomes related to well-being. The research, conducted by the University of Toronto, took place over a ten-month period (from February to November 2017). Ethics approval for this study was obtained from the University of Toronto Ethics Review Board.

We were interested in measuring different outcomes for residents, staff, and family members/visitors. For residents, several outcomes related to well-being were evaluated, including agitation, aggression, depression, activities of daily living, quality of life, and cognition. For staff, evaluated outcomes included strain, burnout, approaches to dementia care, and workplace satisfaction. For family members, outcomes included visitor satisfaction.

In the five experimental sites, ABBY displayed personalized content to the residents based on their interests, hobbies, and family life. In the control site, the content presented (e.g., pictures, music) was of general interest.

In this report, we focus on the data and results from the five experimental LTC sites that presented personalized content to residents.

Participants

All participants signed a consent form prior to participating in the research. At the five experimental test locations, we recruited residents, LTC staff and visitors.

Residents (n = 27)

Average age = 82.04 (SD = 8.96) Age range = 67 - 97 years Gender: Females (n = 21); Males (n = 6)



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Staff (n = 58 completed pretest) Note: not all respondents completed all demographic questions

Gender: Females (n = 53); Males (n = 2) Employee status: Full-time (n = 41), part-time (n = 14), casual (n = 3) Position: Nursing (n = 18), PSW (n = 21), Recreational Therapy (n = 8), Dietary Services (n = 1), Program and Support (n = 3)

Visitors (n = 18) Relationship of visitor to resident



Design and Implementation

The research followed a pretest-posttest design. Specifically, the research design included one pretest phase, followed by the installation of ABBY on the wall. A one-month wait period preceded each of the three posttest sessions. The research protocol required a six- to eight-month time commitment from the LTC home, including two months for recruitment, obtaining consent, and the collection of personalized profile content prior to the pretest session.



Notes:

- Readers who want to do their own Bonferroni adjustment of the alpha level to avoid inflation of family-wise alpha may do so by dividing .05 by N, where N is the number of tests carried out in the subsection. They can then use the resulting adjusted alpha level as the criterion in judging the significance of p-values obtained in tests within that section.
- 2. The errors bars in the bar graphs represent standard error of the mean values.
- 3. We are taking p < .05 to be statistically significant and p-values between .05 and .10 to be trending.
- 4. Unless otherwise specified, "post" or "posttest" refers to an average calculated across three posttest sessions.

Results: Residents



CMAI: Agitation Scale



Agitation

There was a significant reduction in physically non-aggressive agitated behaviours (pretest M = 2.45, SD = 0.89; posttest M = 2.00, SD = 0.69), verbally non-aggressive behaviours (pretest M = 2.63, SD = 1.91; posttest M = 2.24, SD = 1.54), and verbally aggressive behaviours (pretest M = 1.97, SD = 1.04; posttest M = 1.45, SD = 0.54), all ps < .05.

The change in physically aggressive behaviours was showing a trending reduction from pretest to posttest, p = .076. This effect, however, was not significant (pretest M = 1.47, SD = 0.81; posttest M = 1.28, SD = 0.35).



Behavioural Pathology

There was a significant reduction in paranoid and delusional ideation (pretest M = 0.27, SD = 0.39; posttest M = 0.11, SD = 0.17), activity disturbances (pretest M = 0.67, SD = 0.42; posttest M = 0.46, SD = 0.42), aggressiveness (pretest M = 0.96, SD = 0.73; posttest M = 0.71, SD = 0.74), as well as anxieties and phobias (pretest M = 0.36, SD = 0.46; posttest M = 0.21, SD = 0.29), all ps < .03.

The change in diurnal rhythm disturbances was a trending decrease from pretest to posttest (p = .06), but the difference was not significant (pretest M = 0.78, SD = 0.97; posttest M = 0.56, SD = 0.81). There were no significant changes in hallucinations or affective disturbances from pretest to posttest.



The results demonstrated no significant change in depressive symptomology from pretest to posttest. Last, trending - but not significant - differences were found for ability to perform activities of daily living (pretest M = 8.15, SD = 3.92; posttest M = 7.07, SD = 4.08), and cognitive status (pretest M = 6.41, SD = 6.74; posttest M = 7.76, SD = 7.05), ps = .08.

After 3-months of using ABBY, residents with dementia demonstrated



Significant reduction in agitated behaviours, including physically non-aggressive (e.g., exit seeking, pacing), verbally non-aggressive (e.g., repetitive sentences or questions), and verbally aggressive behaviours (e.g., screaming)



Significantly reduced paranoia & delusions, activity disturbances, aggressiveness, anxieties & phobias



Results: Staff

Pre vs. Post 1 only (n = 29)

Given limitations in the number of staff who completed all phases of the study (pretest plus three posttests), the analyses for staff was done separately for each posttest phase. The staff findings presented below outline the differences in outcomes from pretest compared to posttest 1 only.



The results revealed a trending reduction in frustrated empathy (pretest M = 2.08, SD = 0.46; posttest1 M = 1.92, SD = 0.36), balancing emotional involvement (pretest M = 2.42, SD = 0.52; posttest1 M = 2.31, SD = 0.55), and lack of recognition (pretest M = 2.31, SD = 0.49; posttest1 M = 2.11, SD = 0.51), .06 < ps < .10. There were, however, no significant changes in difficulties understanding or balancing competing needs.



There was a significant reduction in emotional exhaustion (pretest M = 17.31, SD = 10.77; posttest M = 14.10, SD = 12.53), p = .03. There was no significant change from pretest to posttest 1 in depersonalization or personal accomplishments.



Results demonstrated no significant change in approaches to dementia care from pretest to posttest1.



Results demonstrated no significant change in workplace satisfaction from pretest to posttest1.

Results: Family Members/Visitors

Note - the number of family member/visitor respondents represented in the pie charts below were summed across the three posttest sessions

How often did you use ABBY during your visit?



Several of the family members who used ABBY noted that using the unit with their loved one improved the quality of their visit and made it a better experience.

How satisfied were you with your visits following the introduction of ABBY?



How worthwhile were your visits following the introduction of ABBY?



Discussion

The research findings demonstrate clear evidence that using ABBY has beneficial effects on well-being and reduces the expression of responsive behaviours in individuals living with dementia in LTC environments. Furthermore, after one-month of usage, staff show a reduction in burnout. Finally, the results suggest ABBY can be a value-add for family members during visits with their loved ones in LTC homes.

More specifically, after three months of using ABBY, there was a significant reduction in physically and verbally non-aggressive agitated behaviours, as well as verbally aggressive agitation in residents. Other responsive behaviours were also shown to decrease in residents following three months of ABBY usage, including reductions in paranoid and delusional ideation, activity disturbances, aggressiveness, as well as anxieties and phobias.

Evidence also suggests that using ABBY contributes to overall well-being. In particular, residents' quality of life improved significantly over the course of the study. These findings support previous work (e.g., Draper et al., 2000; Volicer et al., 2006) by suggesting that meaningful and engaging activities (e.g., as provided by ABBY) reduces boredom and creates stimulating experiences for residents in dementia care environments, resulting in reduced responsive behaviour, such as screaming and wandering.

The research also demonstrates benefits from the perspective of LTC staff and family members/visitors. In staff, one-month of ABBY use was associated with a decrease in emotional exhaustion. This suggests that the decreased responsive behaviours found in residents may be contributing to reduced workplace burnout in staff. Furthermore, several family members who used ABBY while visiting their loved ones in LTC noted that using this technology improved their overall experience and the quality their interactions.

ABBY offers an easy-to-access tool for staff and family members to use and engage with residents to help facilitate meaningful exchanges and alleviate responsive behaviours.

Conclusion

The research evidence presented here demonstrates that ABBY has been effectively designed to:

- Promote engagement in meaningful activity for people with dementia
- Reduce responsive behaviours (e.g., wandering and screaming) and alleviate staff burnout often reported in LTC

Non-pharmacological technologically-based solutions have the potential to greatly assist staff in managing behaviours by offering around-the-clock opportunities for residents to engage in personalized activities that are physically and mentally stimulating.



We are poised for a revolution in dementia care. Innovative technologies are needed to help manage responsive behaviours and improve quality of life, by enhancing the care environment. Although one-on-one interactions with caregivers trained in PCC approaches and behaviour management techniques might be desirable, high levels of personalized engagement is not a viable long-term solution, given resource constraints. Ambient technologies, such as ABBY, offer a practical and easy-to-access solution that facilitates engaging and personalized interactions at any time without significantly increasing caregiver burden.

User Comments

"Squeeeeee! My mum actually smiled and was quite engaged turning the dials and flipping the switches. She was even wiggling her shoulders and bobbing her arms in time to some of the music." - Resident Family Member

"I suggested mum keep turning the dials to see what else came up and she did and then there was all her photos that slowly flashed through as [her favourite] song 'You Are My Sunshine' played. I wanted to cry actually as we talked about the photos and who was in them." - Resident Family Member

"One of the greatest things I've ever seen in a home. Very beneficial to our residents" - LTC Staff

"[ABBY] is working great, the staff and families have tremendous things to say about [it]. Residents have really taken to [ABBY]. Some residents can even tell exactly which button does what!"- LTC Staff

"One of our residents who [has a] personalized profile has been able to name each individual in her photographs, it's quite remarkable!"- LTC Staff

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Our team is dedicated to improving dementia care through the design and use of ambient activities that are readily accessible in the environment and available for anytime use. By reducing the impact of responsive behaviours, through appropriately designed ambient technologies, we can improve the quality of life and health of individuals living with dementia, as well as LTC staff and family members/visitors.

Think you can help? We would love to hear from you. www.ambientactivity.com

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