

## Research Report

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# A Novel Intervention for Management of Behavioral and Psychological Symptoms of Dementia in Nursing Home Communal Areas: Results of a Small-Scale Pilot Trial

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Received 25 October 2021

Accepted 1 November 2021

Pre-press 27 November 2021

Published 9 December 2021

### Abstract.

**Background:** Behavioral and psychological symptoms of dementia (BPSD) exhibited by persons with dementia (PwD) in nursing home communal areas are generally managed by segregation and/or pharmacological interventions.

**Objective:** This study trialed MindfulGarden (MG), a novel digital calming device, in a Canadian nursing home.

**Methods:** Participants were 15 PwD (mean age = 87.67; 5m,10f; mean MMSE = 11.64 ± 7.85). Each was observed by a research assistant (RA) for an average of 8–10 hours on two separate days. The RA followed them during time spent in communal areas of the nursing home including their unit's dining space, lounges, and corridors and spaces shared with other units (e.g., gym and gift shop) and documented any BPSD exhibited. Day-1 provided baseline data; on Day-2, residents were exposed to MG if nursing staff considered their BPSD were sufficiently intense or sustained to warrant intervention. Staff rated the impact as positive, neutral, or negative.

**Results:** On Day-1, 9 participants exhibited both aggressive and non-aggressive behaviors, 4 non-aggressive behaviors only, and 2 no BPSD. On Day-2, 7 exhibiting aggressive behaviors were exposed to MG. Staff reported MG as having distracting/calming effects and gave positive impact ratings to 6/13 exposures; there were no negative ratings. The most common aggressive BPSD on days of observation were pushing/shoving and screaming.

**Conclusion:** MG may have value as a “psychiatric crash cart” in de-escalating agitation and aggression in care home settings.

**Keywords:** Aggression, agitation, dementia, digital technology, feasibility studies, long-term care, nursing homes, pilot projects

## INTRODUCTION

Over half a million Canadians currently live with dementia, and the number is projected to double over the next ten years, making it one of the most common psychiatric disorders among the elderly residing in

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long term care facilities [1, 2]. Behavioral and psychological symptoms of dementia (BPSD) include a wide variety of “non-cognitive” neuropsychiatric symptoms which almost universally present during the course of dementia. BPSD include agitation, aggression, apathy, depression, repetitive activities and questioning, psychosis, sleep problems, night-time behaviors, and disinhibition [3]. These behaviors are associated with adverse outcomes, nursing home admission, and high levels of distress both in persons with dementia (PwD) and their caregivers [4]. These behaviors, especially when expressed as agitation and aggression, can pose risks to the safety of the PwD, other residents and staff when they occur in communal areas. More often than not, management consists of segregation, if encouragement and re-direction do not work [5]. Pharmacological interventions are also commonly employed. Given the undesirable side effects, there is a pressing need for non-pharmacological interventions that protect the safety and well-being of others while supporting the autonomy and dignity of the PwD who is acting out.

MindfulGarden (MG) is a novel digital device originally developed to de-escalate agitation in delirium patients in acute hospital settings [6]. It includes a mini-computer, TV screen (39” diagonal on a wheeled stand: height 54” from floor to top of screen), a high definition camera and a microphone to capture the viewer’s vocalizations and movements. This input drives a garden display of layered calming motion pictures (blossoming flowers and butterflies) that increase in number and velocity in response to increased intensity of voice and motion.

In this pilot study, we aimed to determine the effect of MG on BPSD occurring in communal areas of a nursing home in British Columbia, Canada. This study is part of a larger feasibility trial conducted there in 2018–2020. Other parts of the study examined MG as a tool for calming residents during morning and evening personal care [7] and during bathing [8].

## METHODS

### *Participants*

Fifteen PwD (mean age:  $87.67 \pm 7.26$ ; 5m, 10f) screened by the facility’s care staff for eligibility based on a diagnosis of dementia and exhibiting BPSD were included in the study. Of these, 5 were ambulatory, 3 used walkers, and 7 were wheelchair bound. The dementia type was Alzheimer’s disease

in 7, vascular dementia in 2, unspecified dementia in 2, and not indicated in the case of 4. Based on information in the residents’ medical records at the facility, the mean Mini-Mental State Examination (MMSE) was  $11.64 \pm 7.85$  and 11 were receiving anti-psychotic or anti-anxiety medications.

### *Instrument*

A 26-item agitated behavior checklist, developed for a previous study [9] and based on the Cohen-Mansfield Agitation Inventory [10] and the work of Gutman, MacFadgen, and Killam [11], was used to manually record BPSD. The checklist includes 4 categories of BPSD: non-aggressive physical, aggressive physical, non-aggressive verbal and aggressive verbal (see Table 1 for behaviors within each BPSD category).

### *Procedures*

As indicated above, this study is part of a larger pilot trial examining the calming effect of MG conducted in 2018–2020 at a 212 bed long-term care home in British Columbia, Canada. After ethical approval (by the Simon Fraser University Research Ethics Board), 30 PwD were eligible for inclusion, on the basis of previously exhibiting BPSD, of whom 25 were consented to participate by their Substitute Decision Maker. At the time this sub-study was conducted, 5 were deceased, consent had been withdrawn in the case of 3, 1 had been excluded due to severe visual impairment (could not see images on the screen), and 1 because he seldom left his room. The PI of the project met with the senior staff (RNs) and the heads of each of the 10 units (LPNs) that comprise the facility to describe the purpose and procedures of the study and trained the study research assistants (RAs).

Each PwD was observed by an RA on two separate days who followed them during time spent in communal areas of the nursing home [average 8–10 h of observation per PwD per day]. The communal areas where observation took place included the unit’s dining space, lounges, corridors, multipurpose room, patio/outside area, and the gym, gift shop, hair salon, faith room, and other spaces shared by all units.

For each resident observed, the RA was instructed to fill out a form that included spaces to indicate the time of day that the observation began and ended, any of the 26 BPSD shown in Table 1 that the resident exhibited, the time of day that the behavior began and ended, the location where the behavior occurred, the

Table 1  
BPSD categories and behaviors

	Non-aggressive	Aggressive
Physical	Restlessness	Biting
	Physical Resistance	Kicking
	Repetitive Mannerisms	Spitting
		Slapping
		Elbowing
		Scratching
		Pulling hair
		Throwing objects
		Pushing/shoving
		Hitting/punching
	Pinching/squeezing	
	Threatening gesturing	
Verbal	Muttering	Screaming
	Demanding	Name calling
	Strange noises	Verbal threats
	Verbal resistance	Cursing, directed at staff
	Repetitive words	Hostile, accusatory language
	Complaining/negativism	

staff's response to the behavior, its impact on others if any, and the resident's response to the removal of MG if exposed to it.

Day-1 provided a baseline of number and type of BPSD exhibited. On Day-2, if the RA observed any of the verbal or physical aggressive behaviors shown in Table 1, they consulted with the senior nursing staff on duty who had observed the resident's behavior and interaction with MG. If the nurse agreed that intervention was required (based on their routine threshold for BPSD management), the RA wheeled MG to the communal area and placed it within two feet of the PwD, turned on the device and directed the PwD's attention to the screen. The screen remained active for 10–20 min, after which MG was removed by the RA. Subsequently, the RA asked the consulted nurse "how would you rate the impact of exposure to MG on the resident? Was it a) positive (BPSD de-escalated), b) negative (BPSD increased in number or intensity), or c) neutral (BPSD continued, no change occurred)? To describe and justify their rating, they were asked 'why do you say so?'.

#### Data analysis

SPSS version 22 was used for statistical analysis using descriptive statistics (mean and standard deviation).

## RESULTS

The mean observation period on Day-1 was  $8.71 \pm 3.93$  h. Within a total of 130.68 h of observation on Day-1, 2 PwD did not exhibit any BPSD, 4

exhibited non-aggressive BPSD only and 9 exhibited both aggressive and nonaggressive BPSD. Among the 13 PwD showing one or more BPSD, the first appeared after  $2.27 \pm 1.97$  h of observation. The most common BPSD on Day-1 were repetitive mannerism ( $n = 8$ ), physical resistance and verbal resistance ( $n = 7$ , each) and restlessness ( $n = 5$ ). On Day-2, the mean observation time was  $10.10 \pm 2.78$  h. Within 151.45 h of observation, 4 PwD did not exhibit any BPSD, 3 exhibited non-aggressive BPSD only, and 8 exhibited both aggressive and nonaggressive BPSD; the first BPSD appeared after  $2.50 \pm 2.85$  h of observation. BPSD were considered sufficiently intense or sustained to warrant exposure to MG in the case of 7 PwD. As shown in Tables 2, 3 were exposed once (exposure rated as having neutral effect in each case), 2 were exposed twice (rated positive-positive; neutral-positive), and 2 were exposed 3 times (positive-positive-neutral; neutral-neutral-positive). The main explanation for positive ratings by the staff was distraction. Following exposure, the removal of MG was not difficult; all residents had a neutral response to its removal.

Table 3 presents two examples of participants exposed to MG, showing the full period of observation and the RA's notes. Finally, it should be noted that over the two days of observation the most common aggressive BPSD were screaming and pushing/shoving.

## DISCUSSION

This small-scale trial investigated the incidence and pattern of BPSD exhibited while PwD spent time

Table 2  
Participants exposed to MG ( $n=7$ ) showing BPSD exhibited Day-2, number of exposures, and staff MG impact rating and explanation

ID	BPSD	Number of times exposed to MG	Location of MG exposure	Impact Rating by the staff	Explanation by staff
2	RW, NC, CD, HA, SR, CN, VT, PS, TG, TO	1	TV area	Neutral	Behavior is the same as before MG was introduced. When MG was removed, resident showed no reaction.
4	VR, RL, CN, PR, HA, SL, TG, KC, NC	2	TV area - TV area	Positive-Positive	MG distracted the resident.
6	TO, RL, MU	1	Dining area	Neutral	The resident was indifferent when MG was removed.
7	PR, VR, SR, SN, MU	3	Dining area- Dining area- Dining area	Positive-Positive-Neutral	[1 <sup>st</sup> and 2 <sup>nd</sup> exposure to MG:] Distracted the resident. [3 <sup>rd</sup> exposure to MG]: Behavior still continued.
9	PR, RM, RL, PQ, PS, VR	2	Dining area – Entrance area between nursing station and kitchen	Neutral-Positive	Resident was restless [2 <sup>nd</sup> exposure:] The resident calmed down; Not pacing.
10	RL, SN, SR	1	Dining area	Neutral	Hard to tell, this resident does not communicate, they [BPSD] escalate and deescalate quickly.
11	RM, RL, CD, SR, MU	3	Dining area -Dining area- Dining area	Neutral-Neutral-Positive	[1 <sup>st</sup> and 2 <sup>nd</sup> exposure to MG:] It did not make any difference. [3 <sup>rd</sup> exposure]: First no reaction, then distracted a little

PR, physical resistance; RM, repetitive mannerisms; RL, restlessness; VR, verbal resistance; RW, repetitive words; SN, strange noises; MU, muttering; DE, demanding; CN, complaining/negativism; PS, pushing/shoving; SL, slapping; HP, hitting/punching; PQ, pinching/squeezing; PH, pulling hair; SC, scratching; BT, biting; SP, spitting; EL, elbowing; KC, kicking; TG, threatening gestures; TO, throwing objects; NC, name calling; VT, verbal threats; CD, cursing at care staff; HA, hostile accusatory language; SR, screaming.

Table 3  
Two examples of Day2 observations

ID#	Time BPSD exhibited	Location	BPSD types	MG implemented?	Impact	RA notes
4	11:08–11:10	gym	VR, RL, CN	–	–	–
	11:12–11:12	gym	PR	–	–	–
	16:45–16:45	dining area	HA	–	–	–
	17:05:17:06	dining area	HA, VR	–	–	The nurse said no to MG; “she would want her plate; try MG after dinner”
	18:19–18:30	TV area	SL, KC, TG	Yes	Positive	The resident got quite focused on MG, relaxed her down quite quickly.
19:17–19:29	TV area	TG, NC	Yes	Positive	The resident got into verbal fight with another resident about being safe; other resident had accusing finger in her face . . . MG was introduced, after a few minutes, calmed down.	
7	8:11–8:12	dining area	VR	–	–	Staff gave different pills.
	8:18–8:18	dining area	SR	–	–	–
	8:22–8:34	dining area	SN, MU, SR	Yes	Positive	The resident followed and counted butterflies, the nurse thought that it calmed her.
	12:20–12:21	dining area	VR	–	–	The staff stopped her a while, then tried again.
	16:25–16:42	dining area	SR	Yes	Positive	The resident following and counting butterflies, required medication, intermittent crying whenever butterflies disappeared.
	17:26–17:26	dining area	PR, VR	–	–	–
	17:38–17:38	dining area	SR	–	–	–
18:05–18:16	dining area	SR	Yes	Neutral	The resident kept repeating she wanted to go home, calmed down a little.	

PR, physical resistance; RM, repetitive mannerisms; RL, restlessness; VR, verbal resistance; RW, repetitive words; SN, strange noises; MU, muttering; DE, demanding; CN, complaining/negativism; PS, pushing/shoving; SL, slapping; HP, hitting/punching; PQ, pinching/squeezing; PH, pulling hair; SC, scratching; BT, biting; SP, spitting; EL, elbowing; KC, kicking; TG, threatening gestures; TO, throwing objects; NC, name calling; VT, verbal threats; CD, cursing at care staff; HA, hostile accusatory language; SR, screaming.

in communal areas of a nursing home and the calming effect of a novel digital technology. Most previous studies of BPSD in nursing homes have focused on resistance to care [12, 13]. BPSD exhibited in communal areas of a nursing home present different challenges. A systematic review of resident-resident aggression (RRA) showed that a history of aggressive behaviors is one of the main contributing factors and that RRA most commonly occur in communal spaces in nursing homes [14]. In our study, although eligibility to participate included a history of aggressive behavior, most participants were calm most of the time. The most common BPSD triggering intervention on Day-2 was screaming. A survey across 21 nursing homes in Australia showed that staff considered shouting, wandering and restlessness to have the highest importance considering incidence, frequency, and difficulty of management [15]. Another study showed that staff believed BPSD in one PwD can provoke agitation among others [16]. While our RAs did not report an increase in screaming on the part of other residents, an increase in agitation may well have occurred and should be systematically monitored in future studies.

Use of natural elements and positive images have shown some promising results in decreasing care refusals in PwD [12, 17]. As with the staff in our study, a recent study [18] indicated that Australian residential care staff believed “distraction” can be helpful in managing aggression in PwD. MG is a novel device providing both sensory stimulation and distraction. Working through primary stimuli (visual only in the case of the MG model we used) without relying on intellectual abilities or cognitive functions makes sensory stimulation an ideal approach for reaching persons with advanced dementia [19, 20]. The nature-like visualizations generated by MG share similarities with photographic sky compositions (e.g., SkyCeilings™) which have shown some positive results in preventing delirium among PwD in an emergency room setting [21]. One distinguishing difference between MG and other sensory stimulation interventions such as Snoezelen [22], is that MG uses the Unity game engine [23] to generate the underlying software algorithms that create the calming objects to distract PwD and alleviate BPSD.

Our study demonstrates that only an exposure of 10–20 min is required to redirect the resident’s attention and have a calming effect. MG is easy to operate and does not require extensive training to do so. It also does not involve modifications to the built environment.

Our study had some limitations, including the decision to introduce MG when the RA and the nursing staff considered the behavior to be sufficiently challenging to warrant intervention. The intervention threshold was subjective, relying upon staff’s self-definition of situations that, according to our instruction, would normally trigger segregation and/or medication administration in the home. We did not collect data on the training or years of practice of the nursing staff, all of whom were regular unionized employees of the nursing home. In this small pilot study, we also did not assess inter-rater reliability of impact assessment which was also subjective. More objective criteria/tools (e.g., changes in heart rate, blood pressure) can be implemented in future research to capture the calming effect of MG but this was beyond the scope of the present study.

### Conclusion

Use of MG in this study was analogous to that of a “psychiatric crash cart” [24], replacing the usual practice of segregation and/or medication administration, when agitation or aggression occurs in communal areas of nursing homes with the introduction of a digital device. Logistical issues to be explored in future studies include whether it is more effective to take the device to the resident or the resident to MG and whether the addition of sound would increase its ability to capture and sustain the attention of PwD and serve as a distractor and calming influence.

### ACKNOWLEDGMENTS

The authors have no acknowledgments to report.

### FUNDING

This work was supported by the Good Samaritan Delta View Care Centre through a grant from the Centre for Aging and Brain Health Innovation (CABHI); and a grant from the AGE-WELL Network of Centres of Excellence.

### CONFLICT OF INTEREST

Prior to the study, the first author (G.G) acted as an advisor for MindfulGarden but derived no financial or other tangible benefits from MindfulGarden Digital Health, Inc. or Switch United, the MindfulGarden developers.

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