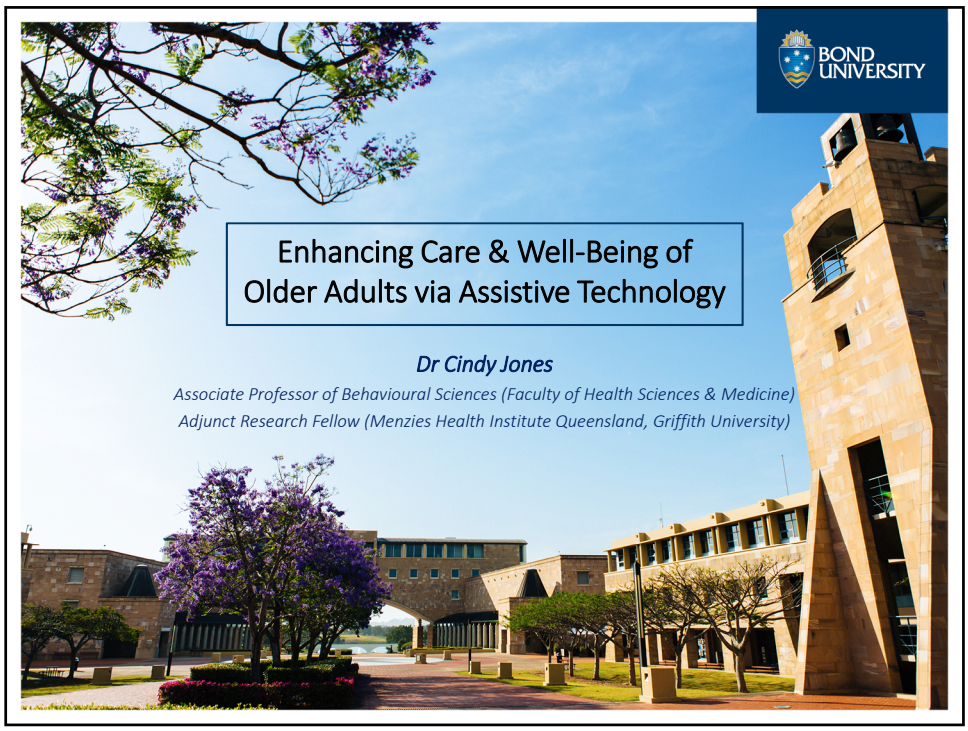
BOND UNIVERSITY
Enhancing Care & Well-Being of Older Adults via Assistive Technology
Dr Cindy Jones
Associate Professor of Behavioural Sciences (Faculty of Health Sciences & Medicine)
Adjunct Research Fellow (Menzies Health Institute Queensland, Griffith University)

1


BOND UNIVERSITY
Presentation Overview
Introduction to Bond University
Introduction to Menzies Health Institute Queensland
Definition of assistive technology
Type of assistive technology
Ageing research involving telepresence & social robots
Enablers & challenges to adoption & implementation
DreamPad feasibility study
Demonstration of DreamPad & SenseWear
Questions & Answers

2

BOND UNIVERSITY

- Opened in 1989 – Celebrated 30th Anniversary in 2019
- Australis first private not-for-profit university (offer 3 semester per year)
- No.1 Australian University for student experience

  Skills Development / Student Support / Teaching Quality / Learning Resources / Learner Engagement
- Ranked Best in…
  - Queensland for overall experience
  - Australia for student-teacher ratio (10:1) & student retention

3

MENZIES HEALTH INSTITUTE QUEENSLAND – GRIFFITH UNIVERSITY

- Menzies Foundation Partnership with Griffith University – Opens in 2015
- Undertakes research to improve health and wellbeing for individuals, families & communities
- 4 overarching programs: Disability and Rehabilitation, EPIC Health Systems, ***Healthcare Practice & Survivorship***, as well as Infectious Diseases and Immunology

4

What is Assistive Technology?

5

WHO Global Cooperation on Assistive Technology (GATE):

Assistive Technology:
"an umbrella term covering the systems and services related to the delivery of assistive products and services."

Assistive Product:
"any product (including devices, equipment, instruments, and software), either specially designed and produced or generally available, whose primary purpose is to maintain or improve an individual's functioning and independence and thereby promote their wellbeing"

https://www.who.int/en/news-room/fact-sheets/detail/assistive-technology

6

Australia National Disability Insurance Scheme (NDIS)

Assistive Technology:

"any device or system that allows individuals to perform tasks they would otherwise be unable to do or increases the ease and safety with which tasks can be performed"

https://www.ndis.gov.au/providers/essentials-providers-working-ndia/providing-assistive-technology

7

Australia National Aged Care Alliance (2018)
Position Paper on Assistive Technology for Older Australians

Assistive Technology:

"products and services which enable individuals' functioning and participation"

Assistive Technology Product:

"devices, equipment, instruments and software used by or for persons with disability"

https://apo.org.au/sites/default/files/resource-files/2018/06/apo-nid182236-1213376.pdf

8

Types of Assistive Technology

9

Assistive Technology Australia Categories

Beds and Bed Equipment
includes mattress, pillows, backrest and legrest positioning, elbow and skin protectors, bed raisers, bed rails, bed transference.

Building Requirements and Design Ideas
includes basins, toilets, bidets, showers, baths, whitegoods, slip-resistant floorings, water temperature controls, taps, doors, gates, hinges, rails, fixed ramps, switches.

Clothing and Dressing
includes bibs & clothing protectors, body-worn back supports, body protectors, dressing aids.

Communication, Phones, Reading and Writing Aids
includes communication devices, audio and braille publications, reading aids, writing aids, telephones, clocks, alerting devices, speech and sound amplification, emergency call systems.

Computer Access
includes keyguards, keyboards, mouse, switches, mouth sticks, head pointers, computer software, ECU.

Continence Products
includes bed and chair protection, disposable and reusable pads and pants, uridomes, catheters, enuresis alarms.

Eating and Drinking
includes cutlery, plates, bowls, plate guards, trays, drinking aids.

Environmental Control
includes sensors, remote controls, home automation systems and accessories.

Hire
includes resources and services from government, hire companies, community organisations and support groups.

Household Aids
includes can and jar openers, containers, tap turners, scissors, slip-resistant aids, key holders, reaching aids, trolleys.

Hygiene
includes bath boards, shower chairs, commodes, shower trolleys, toilet supports, portable bidets, change tables, medication, hair care, oral hygiene, weighing devices.

Library and Resources
includes reports, surveys, guides.

Lifting, Transferring and Standing Equipment
includes slings, hoists, lifting and transferring aids, stairlifts, stair-climbers, ladders and steps, standing frames, evacuation equipment.

Maintenance and Repairs
includes companies, suppliers, and organisations that offer AT servicing, maintenance and repairs

Organisations and Services
includes AT related organisations and resources

Recreation
includes gardening aids, arts and crafts equipment, sports, games, holidays, home entertainment.

Seating
includes lift chairs, office chairs, lounge chairs, kneel-sit chairs, legrests, footrests, chair raisers, neck supports, back & body supports, harnesses, portable resting seats.

Sensory Processing and Cognition
includes calming, weighted, fine motor, gross motor, oral motor, and other sensory equipment, memory and sleeping aids.

Transport
includes vehicle seating, vehicle transfer aids, lifters and trailers, seat belts and harnesses, driving controls, driver assessment and education, parking regulations.

Vocational Aids and Equipment
includes desks and workstations, wrist and forearm supports, portable and angled work surfaces, workstation accessories, keyboard platforms, industrial trolleys and carts.

Walking and Mobility Aids
includes walking frames, crutches, walking sticks, quadrupods, tripods.

Wheelchairs, Scooters, Cushions and Ramps
includes buggies, push-chairs, scooters, cushions, postural supports, portable ramps, batteries and chargers, powered wheelchair controls.

https://at-aust.org/browse

10

Robotic Assistive Technology

3 Main Types:

1. **Rehabilitation Robotics**: pursue the recovery or regaining of impaired motor function
2. **Assistive Robotics (AR)**: substitute or compensate for missing motor and sensing skills
3. **Socially Interactive Robotics (SIR)**: primarily involved with human behaviour through robotic companion, speech and gestures.

Socially Assistive Robotics (SAR):
Cross between AR & SIR

11

Socially Assistive Robotics (SAR)

- Acts as a social mediator
  - Human-computer interaction (HCI)
  - Human-robot interaction (HRI)
- Defined as an artificial agent embodied with features of a human or an animal
- **Telepresence robots**
  - Focus on human-computer interaction (HCI)
    - establishes connection between the telepresence robot (i.e. where the older person / patient is located) and the remote user (i.e. family carer / health professional) via the internet using specialised software downloaded onto a computer (i.e. at home / workplace)
- **Social robots, companion robots, social companion robots**
  - Focus on human-robot interaction (HRI)
    - assists people through social interaction rather than physical interaction

12

Telepresence Robots

1. Moyle, W., Jones, C., & Sung, B. (2019). Telepresence robots: Encouraging interactive communication between family carers and people with dementia. *Australasian Journal on Ageing* https://doi.org/10.1111/ajag.12713
2. Moyle, W., Jones, C., Dwan, T., Ownsworth, T., & Sung, B. (2018). Using telepresence for social connection: Views of older people with dementia, families, and health professionals from a mixed methods pilot study. *Ageing & Mental Health* https://doi.org/10.1080/13607863.2018.1509297
3. Moyle, W., Arnautovska, U., Ownsworth, T., & Jones, C. (2017). Potential of telepresence robots to enhance social connectedness in older adults with dementia: An integrative review of feasibility. *International Psychogeriatrics, 29*(12), 1951-1964. https://doi.org/10.1017/S1041610217001776
4. Moyle, W., Jones, C., Cooke, M., O'Dwyer, S., Sung, B., & Drummond, S. (2014). Connecting the person with dementia and family: A feasibility study of a telepresence robot. *BMC Geriatrics, 14*(7), 6-11. https://doi.org/10.1186/1471-2318-14-7

13

Social Robot - PARO

1. Moyle, W., Bramble, M., Jones, C., & Murfield, J. (2019). 'She had a smile on her face as wide as the great Australian bite': A qualitative examination of family perceptions of a therapeutic robot and a plush toy. *The Gerontologist, 59*(1), 177-185. DOI: 10.1093/geront/gnx180.
2. Moyle, W., Jones, C., Murfield, J., Thalib, L., Beattie, E., Shum, D., & Draper, B. (2019). Using a therapeutic companion robot for dementia symptoms in long-term care: Reflections from a Cluster-RCT. *Ageing & Mental Health, 23*(3), 329-336. DOI: 10.1080/13607863.2017.1421617
3. Jones, C., Moyle, W., Murfield, J., Thalib, L., Beattie, E., Shum, D., & Draper, B. (2018). Does cognitive impairment and agitation in dementia influence intervention effectiveness? Findings from a cluster-RCT with the therapeutic robot, PARO. *Journal of the American Medical Directors Association, 19*(7), 623-626. DOI: 10.1016/j.jamda.2018.02.2014
4. Mervin, C., Moyle, W., Jones, C., Murfield, J., Draper, B., Shum, D., O'Dwyer, S., & Thalib, L. (2018). The cost-effectiveness of using Paro, a therapeutic robotic seal, to reduce agitation and medication use in dementia: Findings from a cluster-randomised controlled trial. *Journal of the American Medical Directors Association, 19*(7), 619-622. DOI: 10.1016/j.jamda.2017.10.008
5. Moyle, W., Jones, C., Murfield, J., Thalib, L., Beattie, E., Shum, D., O'Dwyer, S., Mervin, C., & Draper, B. (2018). Effect of a robotic seal on the motor activity and sleep patterns of older people with dementia, as measured by wearable technology: A cluster-randomised controlled trial. *Maturitas, 110*(1), *10-17*. DOI: 10.1016/j.maturitas.2018.01.007
6. Moyle, W., Bramble, M., Jones, C., & Murfield, J. (2018). Care staff perceptions of a social robot called PARO and a look-alike Plush Toy: A descriptive qualitative approach. *Aging and Mental Health, 22*(3), 330-335. DOI: 10.1080/13607863.2016.1262820
7. Moyle, W., Jones, C., Murfield, J., Thalib, L., Beattie, E., Shum, D., O'Dwyer, S., Mervin, C., & Draper, B. (2017). Use of a robotic seal as a therapeutic tool to improve dementia symptoms: A cluster-randomised controlled trial. *Journal of the American Medical Directors Association, 18*(9), 766-773. DOI: 10.1016/j.jamda.2017.03.018
8. Moyle, W., Beattie, E., Draper, B., Shum, D., Thalib, L., Jones, C., O'Dwyer, S., & Mervin, C. (2015). Effect of an interactive therapeutic robotic animal on engagement, mood states, agitation and psychotropic drug use in people with dementia: A cluster-randomised controlled trial protocol. *British Medical Journal – Open, 5*(8). DOI: 10.1136/bmjopen-2015-009097

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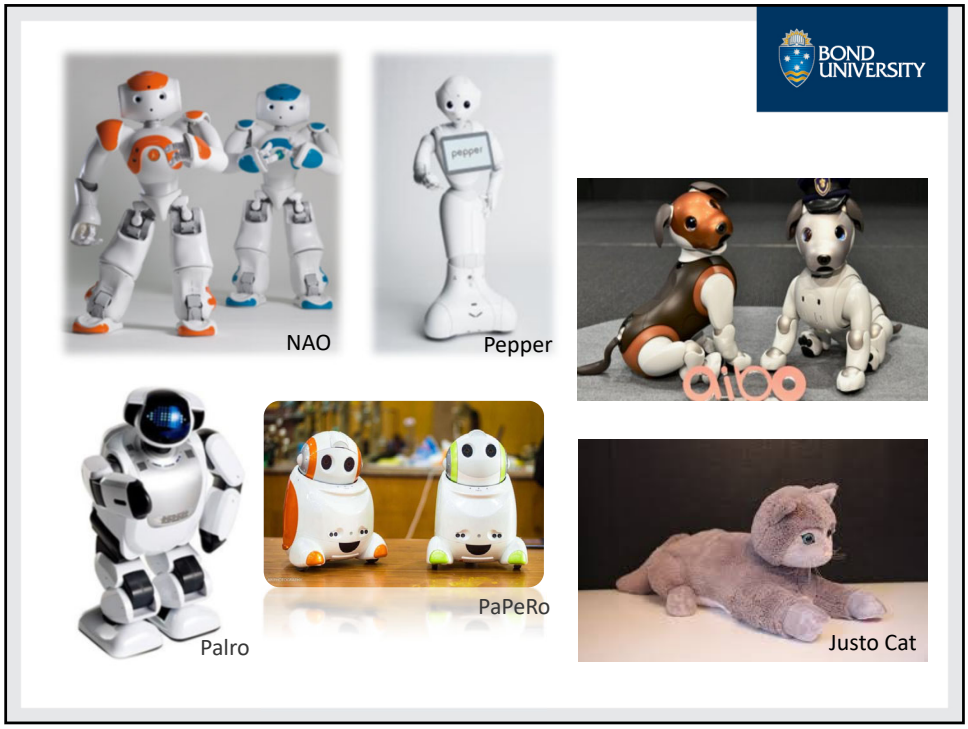
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Pepper
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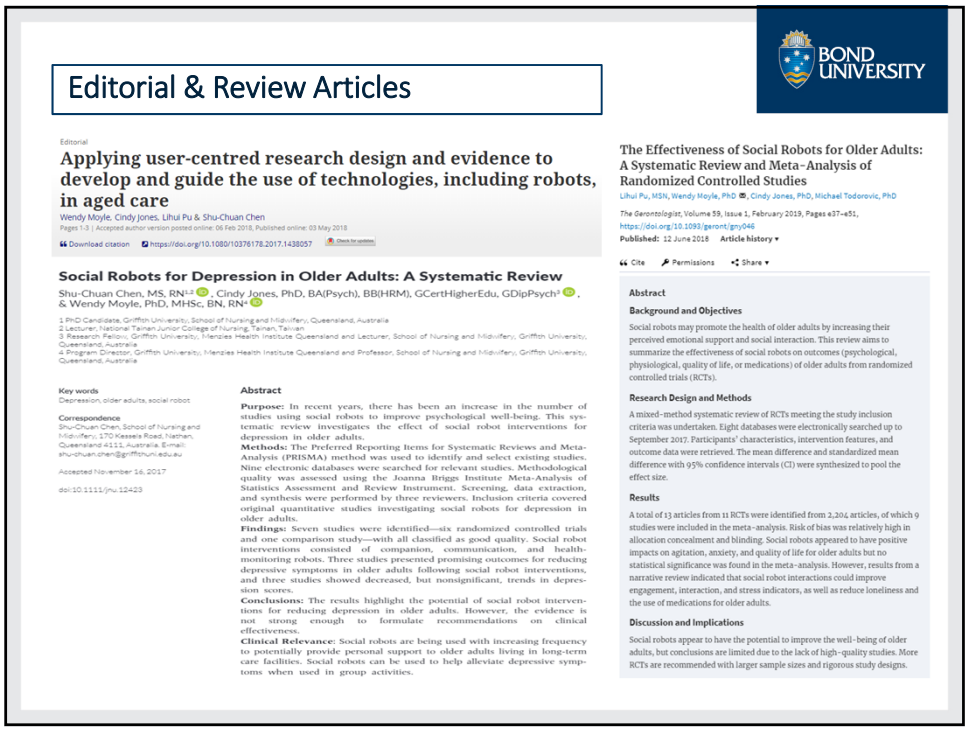

BOND UNIVERSITY
Editorial & Review Articles
Editorial
Applying user-centred research design and evidence to develop and guide the use of technologies, including robots, in aged care
Wendy Moyle, Cindy Jones, Lihui Pu & Shu-Chuan Chen
Social Robots for Depression in Older Adults: A Systematic Review
Shu-Chuan Chen, MS, RN, Cindy Jones, PhD, BA(Psych), BB(HRM), GCertHigherEdu, GDipPsych, & Wendy Moyle, PhD, MHSc, BN, RN
Abstract
Purpose: In recent years, there has been an increase in the number of studies using social robots to improve psychological well-being. This systematic review investigates the effect of social robot interventions for depression in older adults.
Methods: The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) method was used to identify and select existing studies. Nine electronic databases were searched for relevant studies. Methodological quality was assessed using the Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument. Screening, data extraction, and synthesis were performed by three reviewers. Inclusion criteria covered original quantitative studies investigating social robots for depression in older adults.
Findings: Seven studies were identified—six randomized controlled trials and one comparison study—with all classified as good quality. Social robot interventions consisted of companion, communication, and health-monitoring robots. Three studies presented promising outcomes for reducing depressive symptoms in older adults following social robot interventions, and three studies showed decreased, but nonsignificant, trends in depression scores.
Conclusions: The results highlight the potential of social robot interventions for reducing depression in older adults. However, the evidence is not strong enough to formulate recommendations on clinical effectiveness.
Clinical Relevance: Social robots are being used with increasing frequency to potentially provide personal support to older adults living in long-term care facilities. Social robots can be used to help alleviate depressive symptoms when used in group activities.
The Effectiveness of Social Robots for Older Adults: A Systematic Review and Meta-Analysis of Randomized Controlled Studies
Lihui Pu, MSN, Wendy Moyle, PhD, Cindy Jones, PhD, Michael Todorovic, PhD
The Gerontologist, Volume 59, Issue 1, February 2019, Pages e37–e51,
Abstract
Background and Objectives
Social robots may promote the health of older adults by increasing their perceived emotional support and social interaction. This review aims to summarize the effectiveness of social robots on outcomes (psychological, physiological, quality of life, or medications) of older adults from randomized controlled trials (RCTs).
Research Design and Methods
A mixed-method systematic review of RCTs meeting the study inclusion criteria was undertaken. Eight databases were electronically searched up to September 2017. Participants' characteristics, intervention features, and outcome data were retrieved. The mean difference and standardized mean difference with 95% confidence intervals (CI) were synthesized to pool the effect size.
Results
A total of 13 articles from 11 RCTs were identified from 2,204 articles, of which 9 studies were included in the meta-analysis. Risk of bias was relatively high in allocation concealment and blinding. Social robots appeared to have positive impacts on agitation, anxiety, and quality of life for older adults but no statistical significance was found in the meta-analysis. However, results from a narrative review indicated that social robot interactions could improve engagement, interaction, and stress indicators, as well as reduce loneliness and the use of medications for older adults.
Discussion and Implications
Social robots appear to have the potential to improve the well-being of older adults, but conclusions are limited due to the lack of high-quality studies. More RCTs are recommended with larger sample sizes and rigorous study designs.

16

Social Robot - CUDDLER

- Moyle, W., Jones, C., Sung, B., Bramble, M., O'Dwyer, S., Blumenstein, M., & Estivill-Castro, V. (2016). What effect does an animal robot called CuDDler have on the engagement and emotional responses of older people with dementia? A pilot feasibility study. *International Journal of Social Robotics, 8*(1), 145-156. DOI: 10.1007/s12369-015-0326-7

Health Technologies – Virtual Forest

- Moyle, W., Jones, C., Dwan, T., & Petrovich, T. (2018). Effectiveness of a Virtual Reality Forest on people with dementia: A mixed methods pilot study. *The Gerontologist, 58*(3), 478-487. DOI: 10.1093/geront/gnw270

17

Enablers & Barriers – Adoption & Implementation

- Substitution of human care
  - replace the essence of social & physical human to hum interactions?
  - intuitive to react to unpredictable event associated with aged care?
  - over reliance or use?
  - emotional attachment?
  - increase disorientation in people living with dementia?
- Ethical considerations – deception & dignity
- Knowledge and attitudes – end users, family and health professionals
  - replacement, change, advanced technology, ongoing cost/support
- Development – user centric focused
- Cost effectiveness
- True efficacy – individualised? person-centred?

18

DreamPad

Feasibility Study to Improve Sleep & Reduce Wandering & Agitated Behaviour

19

Background

- Sleep disturbances are common in people living with dementia
- Shorter, light & more easily disturbed sleep
- Fragmented sleep-wake cycle
  - More during the day
  - Less at night
  - Further amplified for Lewy Bodies

Sundowning

- increased arousal or impairment (late afternoon, evening or at night)
- disruptive behaviours (e.g. wandering, agitation, incoherent vocalisation, confusion and disorientation)
- ~10-25% in people living with dementia
- Increase burden of care, risk of falls

20

Background

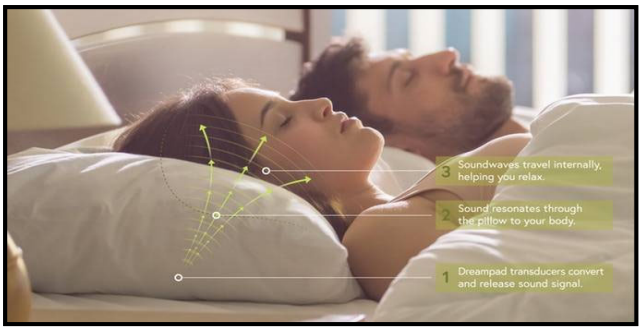
Existing Sleep Related Interventions

- Pharmacological interventions (limited benefits & side effects)
- Psychosocial interventions (outcomes & protocol inconsistent)

DreamPad – Sleeping Device

- Delivers low frequency-rich music through a gentle, calming vibration (carried internally by the cranium to the cochlea)
- Induce relaxation - *"massage to the nervous system"*
- Reduce stress. improve sleep & decrease sensory hypersensitivity

21



Intrasound Technology™

- Replicates the natural process where human bones are natural conductors
- When a person speaks, the vibration caused by his/her voice is carried by the bone and tissue to his/her inner ear
- Sound waves activate parasympathetic nervous system via vagus nerve that regulate stress

Promising results: ADHD, people with self-reported poor sleep & insomnia

22

Study Aim

To determine the feasibility and acceptability of Dreampad™ and explore its effects on sleep disturbance and wandering and agitated behaviours in people living with dementia in residential aged care facilities.

23

Methodology – Design & Participants

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Design

- Exploratory case study design

Participants

- 4 residents with dementia
  - aged 65 years and over
  - no auditory impairments
  - a diagnosis or probable dementia with a Mini-Mental State Examination (MMSE) score of 26 or less
  - a recent history reported by care staff and/or family of sleep disturbance and wandering and agitated behaviours

24

Methodology – Intervention & Measures

Intervention

- Use DreamPad daily for 4 weeks

Measures

- Demographic data
- Cohen-Mansfield Agitation Inventory-Short Form (CMAI-SF): Before (baseline) & after intervention
- SenseWear: Actigraph use to assess wandering (i.e. step count) as well as sleep duration and efficiency of participant
  - 24hrs period at Week 0 (baseline) & Weeks 1-4

25

Measures - Checklist

Participant ID: _____
Completed by: _____
Start Date: _____
(SenseWear [SW] to be worn for 24hrs per week – Tues 12pm to Wed 12pm)

Week 1 Date:	Mon	DreamPad used: Yes/No Time on:	Notes:
	Tues	SenseWear used: Yes/No Time on: DreamPad used: Yes/No Time on:	Notes:
	Wed	SenseWear (SW) removed: Yes/No Time off: Data downloaded and SW charged: Yes/No DreamPad used: Yes/No Time on:	Notes:
	Thurs	DreamPad used: Yes/No Time on:	Notes:
	Fri	DreamPad used: Yes/No Time on:	Notes:
	Sat	DreamPad used: Yes/No Time on:	Notes:
	Sun	DreamPad used: Yes/No Time on:	Notes:

26

Measures – Semi-Structured Interview Protocol

- Staff (n=3) & Family Member (n=1)
- Perceptions of the feasibility & acceptability of Dreampad™ & its effect sleeping patterns & behaviours of wandering & agitation

• Tell me your initial perceptions of the Dreampad™? Did these perceptions change at any time after residents started using the Dreampad™?
• Did you notice any improvement or decline in residents' sleep patterns and behaviours of wandering or agitation?
• What benefits/limitations do you see of the Dreampad™? Why? Tell me more about that.
• Do you have any concerns about the use of the Dreampad™? What are these concerns?
• The Dreampad™ costs $530. What are your perceptions about the cost of the Dreampad™?
• Should facilities purchase Dreampad™? Could families be asked to contribute to the cost?

27

Discussions/Conclusions

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DreamPad

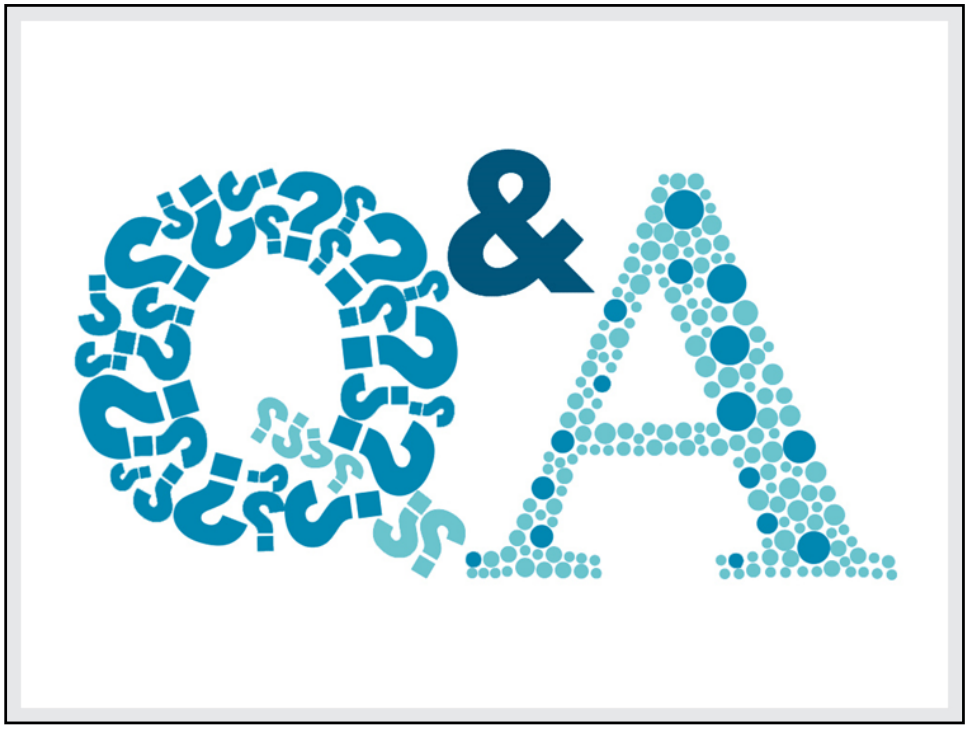
- feasible for use by people living with dementia
- use & cost acceptable to family & care staff
- may improve sleep in people living with dementia
- influence on behaviours of agitation and wandering remains unclear

Limitations

- small sample size
- poor wear adherence of SenseWear
- accuracy of step count recordings using SenseWear
- lack of insight into what participants were doing over the 24-hour period
- inconsistent or irregular use of Dreampad

DreamPad can potentially be incorporated into daily use if efficacy is established

28



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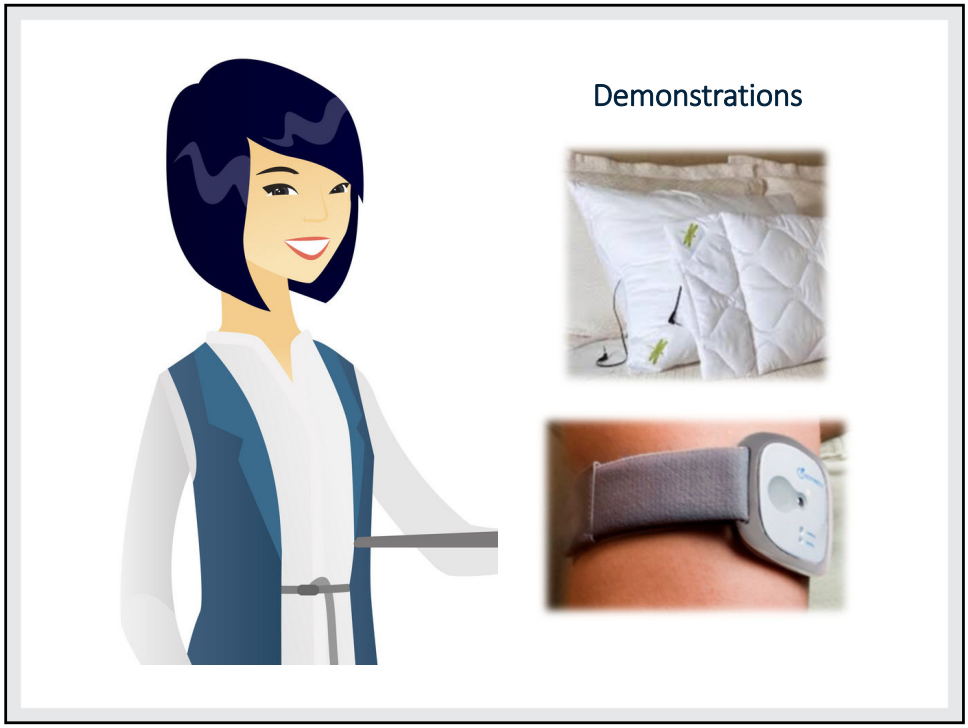

30

Mentor: Professor Wendy Moyle

"As our life expectancy continues to be extended, the world faces a new and growing challenge - dementia. Professor Wendy Moyle's research on the use of robots as a therapeutic tool could change the face of dementia care globally, while also allowing people to stay in their own homes longer."

In 2019, Prof Moyle is named one of 30 women in robotics you need to know about in 2019 by Robohub a US not-for-profit company.

https://robohub.org/30-women-in-robotics-you-need-to-know-about-2019/

31

32