

Title

How people with dementia perceive a therapeutic robot called PARO in relation to their pain and mood: A qualitative study

Running title: Residents' perceptions of PARO

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Abstract

Background: Interacting with social robots, such as the robotic seal PARO, has been shown to improve mood and acute pain for people with dementia. Little attention has been paid to the effect of PARO on people with dementia and chronic pain.

Objective: To explore how people with mild to moderate dementia and chronic pain perceive PARO as an alternative intervention to manage their pain and mood.

Design: A descriptive qualitative approach nested within a pilot randomised controlled trial.

Methods: Participants with dementia and chronic pain were recruited from three residential aged care facilities. They interacted with PARO for 30 minutes, five days a week over a six-week period. A sample of 11 participants completed individual semi-structured interviews at

the end of the intervention. Data were collected from January 2018 to January 2019. Inductive thematic analysis was undertaken. Reporting of findings followed the COREQ checklist.

Results: Four themes emerged from the data: (1) Perceptions of PARO; (2) Therapeutic effects of PARO; (3) Limitations of PARO; and (4) Program improvement. Residents with dementia expressed positive attitudes towards the use of PARO and acknowledged the therapeutic benefits of PARO on mood improvement and relaxation for pain relief but also mentioned the limitations of its weight, voice and characteristics. Residents' responses could also fluctuate during the intervention process, and individual preferences need to be considered.

Conclusions: The PARO intervention is a promising intervention to improve positive emotion and there is some anecdotal evidence that pain may be decreased from the perspectives of people living with chronic pain and dementia.

Relevance to Clinical Practice: Long-term care staff may incorporate PARO therapy into daily dementia care. Understanding of individual's preferences may enhance the implementation of PARO for pain management in this group.

Keywords: social robot, dementia, pain, mood, qualitative study

What does this paper contribute to the wider global clinical community?

- Randomised controlled trials are needed to explore the effectiveness of PARO interventions to manage pain and sleep in people living with dementia.
- The model of delivery, content, and/or duration of PARO interventions should be tailored to individual preferences and programmed into daily clinical practice.
- Education of care staff could focus on the importance of understanding and respecting the perspectives of people with dementia to deliver social robot therapy that is individualised rather than driven by institutional routines.

1. INTRODUCTION

Ageing of the population and the development of artificial intelligence (AI) have resulted in a growing body of research on social robots aiming to meet the care needs of older adults (Moyle, 2019). Social robots are designed to establish social and affective relations with humans (Pedersen, Reid, & Aspevig, 2018). Several animal-shaped social robots, such as the robotic JustoCat (Gustafsson, Svanberg, & Müllersdorf, 2015) and robotic dog Aibo (Fujita, 2001), have been developed to interact with humans as a social companion. To date, the best known example of successful animal robot prototypes is the robotic harp seal called PARO, which has been in use in hospitals and care facilities in more than 30 countries worldwide (Shibata, 2012). PARO can learn users' preference for its behaviour. For example, it can open and close its eyes, move its neck, front and rear flippers as well as respond to users by making a sound when it is being stroked, patted or called. It can also show negative emotions on undesired stimulation, such as being hit (Wada, Ikeda, Inoue, & Uehara, 2010). People with dementia showed positive attitudes towards the use of social robots to reduce loneliness (Wu et al., 2016) and promote social interaction (de Graaf & Allouch, 2014), which supports the notion that involving people with mild to moderate cognitive impairment in qualitative interviews is achievable. With increasing interests in using social robots in aged care, it is therefore essential to understand the needs and perspectives of people with dementia towards the use of social robots for future service delivery (Cridland, Phillipson, Brennan-Horley, & Swaffer, 2016).

2. BACKGROUND

Chronic pain is common in people with dementia with over half of them experiencing pain (van Kooten et al., 2016). However, pain is reported to be undiagnosed and untreated in this population due to their cognitive impairment and reduced ability to verbalise their pain (Knopp-Sihota, Dirk, & Rachor, 2019). Although PARO may have the potential effect to reduce paediatric pain (Okita, 2013), pain in cancer patients (Eskander, Tewari, Osann, & Shibata,

2013) and pain medications in people with dementia (Petersen, Houston, Qin, Tague, & Studley, 2017), few studies have focused on the effect of PARO on pain management in people with dementia. One recent feasibility study indicated that PARO could potentially reduce acute pain associated with care procedures in patients with dementia measured by health professionals using the ALGOPLUS scale (Demange, Pino, Kerhervé, Rigaud, & Cantegreil-Kallen, 2019). Chronic pain is different from acute pain, in particular its long-term impact on the mood and well-being of individuals. Pain is a subjective feeling that can only be expressed by people themselves, even people with cognitive impairment, and yet there remains a lack of studies exploring the effect of interventions such as PARO on chronic pain from the voices of people with dementia (Schofield, 2018). In addition, previous studies have used PARO in a group activity and the frequency of the interaction has been limited to twice (Jøranson, Pedersen, Rokstad, & Ihlebæk, 2015; Robinson, Macdonald, Kerse, & Broadbent, 2013) or three times a week (Moyle et al., 2013). A more frequent intervention (e.g., individual and daily intervention) may produce a different result on the outcome of pain in people with dementia. Therefore, in this study, individual interviews were conducted with participants with dementia and chronic pain to gain a better understanding of their perspectives and experience after individually interacting with PARO for 30 minutes from Monday to Friday over six weeks.

3. METHODS

3.1 Design, sample, and setting

This study was performed as part of a pilot randomised controlled trial, exploring the feasibility and effectiveness of a social robot (PARO) intervention on pain, behavioural and psychological symptoms of dementia for people living in residential aged care facilities (RACFs) in Australia. Participants were randomised into either a daily individual PARO intervention condition or a usual care condition for six weeks. At the end of the intervention, a follow-up qualitative study was used to explore the experiences and perceptions of residents from the PARO intervention

group. Convenience sampling was used to recruit participants who met the following criteria:

Inclusion criteria: (1) Aged 65 years and older and can speak and understand English or Mandarin (the researcher is fluent in both languages); (2) Participants must have been diagnosed with some form of dementia or probable diagnosis of dementia and this was recorded in their medical notes; (3) Participants must have chronic pain, e.g., prescribed with regular pain medications or with an indication of pain. For those who cannot self-report pain, proxy reports of pain in the previous week were obtained; (4) Demonstration of appropriate senses for interaction with PARO, such as vision, hearing or touch; and (5) Living in the care facility for more than three months.

Exclusion criteria: (1) Diseases such as acute exacerbation of chronic obstructive pulmonary disease or renal failure that require patients to be admitted to hospital frequently; (2) Terminal illnesses such as advanced cancer where the patient is in the final palliative stage; (3) A diagnosis of a major mental illness such as schizophrenia to avoid confounding behaviours; as well as (4) Infectious diseases such as AIDS or tuberculosis, or an open wound that is unable to be covered.

To be eligible for the follow-up interview, participants must be capable of verbal conversation and comprehension. As a result, 11 out of 22 participants (i.e. 50%) were purposively selected from the PARO group and participated in the interviews.

3.2 Data collection

Individual semi-structured interviews were conducted by the first author with participants from the PARO group within one week following completion of the daily (five days a week) six-week intervention to explore their perspectives of interacting with PARO, particularly on their mood and pain experience. The first author is a female registered nurse with experience in care of people with dementia. Individual interviews were conducted face-to-face in residents' living rooms. To help participants recall and remind them of their experiences with PARO, the

researcher brought a PARO to the interview. Interview questions were developed and confirmed within the research group (Table 1). These questions were kept simple and easy to understand for people with cognitive impairment. All interviews were audio-recorded.

<Insert Table 1 here>

3.3 Data analysis

Recordings of the interviews were transcribed verbatim by the first author. The thematic analysis process was performed with the help of Microsoft Excel as described by Bree and Gallagher (2016) and followed the six-step inductive thematic analysis of Braun and Clarke (2006): (i) becoming familiar with the data, (ii) generating initial codes, (iii) searching for themes, (iv) reviewing themes, (v) defining and naming themes, and (vi) producing the report. The first author constantly read and reread the interview transcripts to get an overall sense of the content. Second, the transcriptions were analysed, and initial codes were converged and compared continuously across the data during the process. Codes were then reviewed and sorted into emerging themes and subthemes. A second author also reviewed and coded the transcription independently. Modifications of themes and subthemes were made to be more inclusive through discussion with the third author. Finally, four main themes reflecting the content of the interviews were developed. The COnsolidated criteria for REporting Qualitative research (COREQ) (Tong, Sainsbury, & Craig, 2007) was used to report the findings of this study (See Supplementary file 1).

3.4 Trustworthiness

Several strategies were used to ensure trustworthiness. First, the first author spent sufficient time (more than six weeks) in the field and engaged in daily persistent observation to gain a full understanding of the people and phenomenon being investigated (Houghton, Casey, Shaw, & Murphy, 2013). Second, two researchers independently analysed the data to improve credibility of the findings (Nowell, Norris, White, & Moules, 2017). In addition, an audit trail

for coding and categorisation of qualitative data was maintained during the analytic process to ensure rigour of the research (Cassell & Symon, 2011).

3.5 Ethical considerations

Ethical approval for the study was obtained from the Griffith University Human Research Ethics Committee (Reference number: 2017/774). Approval for study sites was then sought from the nursing home administration (Reference number: Pu 22418). This study was also registered with the Australia New Zealand Clinical Trials Registry (ANZCTR, Trial ID ACTRN12618000082202). Consent to participate in the study was sought in writing from people with dementia where they were capable or from their family carer. Assent from people with dementia was also sought at every intervention session.

4. RESULTS

4.1 Characteristics of the participants

Demographic information of interviewed participants is provided in Table 2. All of them had a diagnosis of dementia and experienced mild to severe pain. Most of the interviewees were female (81.82%), and their mean MMSE score was 15.45 ranging from 9 to 24. The interview duration ranged from 5 to 20 minutes.

<Insert Table 2 here>

4.2 Findings

Four themes (Table 3) emerged according to the analysis of participants' data: (1) Perceptions of PARO; (2) Therapeutic effects of PARO; (3) Limitations of PARO; and (4) Program improvement. The overall findings revealed that older persons with dementia had a positive attitude towards using the social robot PARO in terms of *their initial perceptions* of its appearance and interactive behaviours. During their interaction with the robot, residents perceived the *therapeutic effects* of PARO, such as providing comfort and relaxation, a distraction from their pain and the opportunity to bring back positive memories. Regardless of

these benefits, residents also mentioned the *limitations of PARO* concerning its voice, weight and programming. Furthermore, they reported *individual preferences* of the social robot intervention should be considered when PARO is being used in the provision of care for people with dementia. The exemplary quotations followed by participant number (P#) and Mini-Mental State Examination (MMSE) score are outlined to support the analysis.

<Insert Table 3 here>

4.2.1 Theme 1 Perceptions of PARO

This theme encapsulates the initial perception, including the perceptions of its features and behaviours, and positive attitudes towards PARO from the participants' view. Although residents with mild cognitive impairment were aware that PARO was a toy, they still considered it as a real seal and mentioned the robot could provide them comfort.

“It's like a real toy. I think of it as a real thing. The real thing to be comforted by this. Pretty much like a seal.” (P₃₋₅, MMSE 24).

Residents with more advanced cognitive impairment seemed to perceive PARO as a real animal, such as a puppy. The puppy in this sense would be good and could potentially remind them of their previous positive memories of their own pets.

“It's a good puppy and the puppy did a very good job. I used to have a little puppy when it was a little dog like her. And I don't know how it comes to my house. I have to find out with my family. It's probably from my Granddad. They are always good, they can be naughty. But they are always good. (smile)”. (P₂₋₁₀, MMSE 9)

Most participants commented that they had no dissatisfaction with PARO. The appearance and characteristic of PARO encouraged them to interact with PARO, such as its big black eyes, white whiskers, flippers as well as its clean and curly fur. The interactive behaviours of PARO were of interest to participants, in particular, PARO's moving head and tail, as well as its eyebrows and eyes were all described as being beautiful, lovely and PARO being described as intelligent. These features seemed to encourage participants to engage

positively with PARO, for example, they felt they could hug or pat PARO.

“Yes, eyes wide open and closed. Hello, he is listening. He is very intelligent, he knows someone is talking to him. Wonderful. (Head) turns-around from side to side. How wonderful, hello, eyes closed, eyes open, moving the head around.” (P₂₋₆, MMSE 17)

“I like it very much. Lovely and big they're lovely and big. Yeah. You got nice feet.” (P₂₋₁₅, MMSE 9)

“It looks pleasant and warm. I can hug it and pat it.” (P₁₋₁, MMSE 20)

4.2.2 Theme 2 Therapeutic effects of PARO

During interaction and engagement with PARO, participants perceived its therapeutic effects, including mood improvement and relaxation for pain relief. Participants perceived PARO as a friend whom they could talk to and this helped them to feel relaxed and comforted when holding PARO.

“I feel calm, calm and relaxed when I am holding the puppy. Makes me happy and relaxed. Makes me relax a bit more, that was calm down. I just know that they're good for people.” (P₃₋₉, MMSE 10)

“Oh, he (PARO) makes me feel very relaxed and happy. Feeling of love. It helps if you've got a care and you have this little puppy on your lap it makes all the difference. Because when you're sitting here thinking oh what can I do, what can I do and then this little puppy comes along, and it makes you feel wonderful.” (P₃₋₅, MMSE 24)

Specifically, PARO could be a companion for residents who were isolated and socially inactive, as they described they felt lonely living in RACFs especially when they were sitting in their room the whole day without doing anything. In this situation, PARO may bring them joy and happiness.

“People that are lonely. Give them something to talk to and be comfortable about. And not be shy or anxious, you know, things like that. It's lovely.” (P₃₋₉, MMSE 10)

“Actually, sometimes, we are alone and stay here the whole day and then I got a friend to play with. It makes me feel safe and calm. And not to get angry.” (P₁₋₁, MMSE 20)

“That's a good boy. I do remember that I've never had a dog that I can talk to all the time

because my mother and father both do school teaching and they had various occupation to have to live with.” (P₁₋₇, MMSE 12)

Another resident, who could barely move and was always lying on the bed in her room, described that PARO was ideal for people who were unable to engage in activities. She thought PARO was unique and wonderful for people like her.

“Of course, he’s ideal and creates interest. It’s ideal for people who could barely move themselves. That may help people who could not move. Yeah, lovely.” (P₂₋₆, MMSE 17)

People with dementia appear to be at great risk of under-detected or under-treated pain due to reduced ability to verbalise their unmet needs, such as pain. One resident with severe lower back pain described how she coped with her pain, saying that she had no choice but to accept and live with her pain. Although she received regular pain medications to manage her pain, she was still in pain every day.

“The feeling of pain is there, but then it becomes part of you. And it must be there, it won’t go away, so I accept it. Yeah. It won’t go away, so it’s better to accept it.” (P₁₋₁, MMSE 20, severe pain)

It appeared that taking care of PARO could make people feel happy and they may enjoy having PARO as a kind of relaxation, which could modulate their mood as well as assisting in pain reduction.

“Oh, normally every day I feel pain. But when I hold, hold the puppy, that makes me relaxed a bit more. I feel comfortable in the room. you know, relaxed with the puppy.” (P₃₋₉, MMSE 10, moderate pain)

“Well, I’ve never had pain while I had him (PARO). No pain. Yes, you’re a beautiful thing (talk to PARO).” (P₃₋₅, MMSE 24, moderate pain)

Two residents with severe pain mentioned that PARO made them feel calm and had the potential to help with their sleep.

“I feel calm and I want to go to sleep (laugh).” (P₁₋₁, MMSE 20, severe pain)

“Oh, nice. Nice and happy. Makes me very sleepy.” (P₂₋₇, MMSE 23, severe pain)

PARO had the potential to help recall positive memories of the time people spent with their pets, which may also encourage their interactions with PARO and provide the opportunity to distract their attention from their pain.

“I spent some time with (PARO). I’ve sat here for a little while. This is once I can never remember pain.” (P₁₋₇, MMSE 12, mild pain)

“The colour around and the curly fur. Oh, I love dogs. It kicks my mind off (pain) for a little while. Come on. I think you did a good job.” (P₂₋₇, MMSE 23, severe pain)

4.2.3 Theme 3 Limitations of PARO

Although most participants showed their positive attitudes and perceived the benefits of PARO, they also demonstrated some limitations of PARO, such as the weight and voice of PARO. Three residents (P₁₋₁, P₂₋₂, P₂₋₇) mentioned that PARO was too heavy for them to lift. Two residents (P₂₋₁₀ and P₂₋₇) pointed out that the voice of PARO created what they perceived was noise and it sounded like it was crying. Another two residents (P₂₋₁₂ and P₃₋₁) also commented that PARO needs more programming and further animation as it was unable to walk, which implied that they expected a more socially intelligent robot with more interactive capabilities.

“That’s very good. But they can’t walk.” (P₂₋₁₂, MMSE 13)

“If I had to do more, I think, the dog is not enough, it would need more animation. More things to interact with, you know. If I could shake his hands or something like that, that would be lovely. I would possibly last longer if the dog was better put together and better animated. Both things are improving. He’s not doggy enough. Not animated enough to hold. Maybe not everybody would be very satisfied.” (P₃₋₁, MMSE 19)

4.2.4 Theme 4 Program improvement

The PARO intervention was scheduled for 30 minutes every day from Monday to Friday for six weeks. However, different people may have different preferences. Three residents thought the frequency and duration were reasonable, but one resident commented that three times a week would be appropriate for her (P₃₋₅, MMSE 24), and another resident thought shorter periods of intervention, for instance, four weeks, would be enough for him (P₃₋₁, MMSE 19).

In addition, people may have different responses to PARO and their needs may change depending on their interaction of PARO (*“I think it’s quite reasonable. It was short when you won’t learn much, but it is too long, you learn nothing. Sometimes I didn’t feel happy. But gradually I began to like him. At first, I thought it makes no sense. But then I began to like him (PARO).”* [P₁₋₁, MMSE 20]).

5. DISCUSSION

Findings from this study revealed that the participants had positive attitudes towards the social robot PARO and acknowledged the therapeutic benefits of PARO on mood improvement and pain relief but also mentioned the limitations of its weight, voice and characteristics. We should also be aware that not everyone is satisfied with PARO and residents’ responses could fluctuate during the intervention process. Individual preferences should be considered during the application of PARO.

5.1 Perceptions and attitudes of PARO

In this study, PARO was well accepted by participants no matter whether people perceived it as a robotic animal or a pet. Findings are in line with results from a previous study that people with cognitive impairment enjoyed being with PARO although they were fully aware it was an artificial object (Robinson, Broadbent, & MacDonald, 2016). In addition, another involving a relative reported that a robotic animal was not a problem as it improved residents’ quality of life while professional caregivers may have different views if it was not a real animal (Gustafsson et al., 2015). Ethical questions about the deception of PARO has been raised in the context of its use with people with dementia (Coghlan, Waycott, Neves, & Vetere, 2018), such as deception or replacement of humans (Vandemeulebroucke, Dierckx de Casterlé, Welbergen, Massart, & Gastmans, 2019). However, equally, it could be argued that whether improvement in the mood of people with dementia could outweigh the risk of deception. Furthermore, there are practical issues with using living animals, such as the potential of bites and allergies. PARO

was initially developed to offer the benefits of animal-assisted therapy in residential aged care facilities where real animals could not be accommodated.

Participants in this study seem to accept the fact that PARO is a robotic animal and were willing to form a connection with it. We acknowledge further discussions about the ethics of using robots for people with dementia may help to better guide the use of robots in daily practice. Furthermore, the use of PARO should always be discussed in advance with both people with dementia and their relatives.

5.2 Benefits in mood and pain reduction

The benefits of PARO on mood improvement for people with dementia have been widely acknowledged in previous studies, such as to reduce depressive symptoms (Birks, Bodak, Barlas, Harwood, & Pether, 2016; Chen, Jones, & Moyle, 2018) and loneliness (Banks, Willoughby, & Banks, 2008; Robinson et al., 2013). Similar experiences have been reported from nursing home residents that PARO could be a good companion, especially when they feel lonely (Robinson et al., 2016).

As pain is reported to be under-recognised and under-treated in people with dementia, we believe this is an important study in identifying the benefits of PARO to provide the potential for relaxation for pain relief from the perspectives of people with dementia. Earlier reports have also indicated the need for such a study. For example, care staff from a long-term care facility mentioned that a daily 30-minute PARO intervention could be helpful to reduce pain and anxiety of residents (Roger, Guse, Mordoch, & Osterreicher, 2012). An observation of residents in a long-term care facility reported that a PARO intervention could reduce negative observational affect and behavioural indicators such as pain (Lane et al., 2016). Furthermore, Petersen et al. (2017) found that compared to standard care, 12 weeks of a PARO intervention could significantly reduce pain medication for people with dementia. However, another pilot study with 19 residents with dementia implied that compared to reading activities, four weeks of a PARO

interaction did not result in statistically significant differences in observational pain behaviours (Guse, Thompson, Roger, Osterreicher, & Mordoch, 2014). These conflicting results may relate to different methods of pain assessment as well as the varying duration and frequency of intervention.

One possible reason for mood improvement and pain relief is that PARO appeared to bring back people's memories or the time they spent with their pets, which may distract their attention from their pain. Several studies have indicated that robotic pets have the potential to evoke previous memories of pets (Coghlan et al., 2018; Moyle et al., 2016b) and both care staff and family also mentioned the benefits of PARO for reminiscence (Birks et al., 2016; Moyle, Bramble, Jones, & Murfield, 2017a), especially in one-on-one sessions (Moyle et al., 2016b). Demange et al. (2019) also found that PARO could be used as a distraction stimulus of pain during the care of people with dementia, such as bathing, skin care and dressing change. There are also correlations between the modulation of mood and pain perception; therefore, improved mood could also possibly modulate the relief of pain. Positive emotional arousal happens spontaneously when people interact with PARO through the release of neurotransmitters, such as oxytocin, which offers anti-stress effects and increases the pain threshold (Beetz, Uvnäs-Moberg, Julius, & Kotrschal, 2012) when people are engaged in non-noxious sensory stimulation, such as stroking or touching PARO (Jøranson et al., 2015).

Residents with dementia living in RACFs often experience sleep problems. It has been suggested that untreated pain may contribute to sleep problems and results from a recent systematic review suggested that pain may be a moderating factor (Flo, Bjorvatn, Corbett, Pallesen, & S Husebo, 2017). In the interviews from this study, two residents with severe pain mentioned the potential benefits of PARO in improving their sleep. Gustafsson et al. (2015) also mentioned that the comforting effects of JusoCat, a robotic cat, could be used as a replacement for sedative medication. However, in previous studies PARO was reported to have

no significant effects on sleep patterns (Moyle et al., 2018) as well as sleep efficiency (Thodberg et al., 2016) for older people living in nursing homes. The interaction between sleep and pain in people with dementia remains unclear and whether social robots could be a potential non-pharmacological intervention to improve the sleep of people living with pain and dementia needs further exploration.

5.3 Limitations of PARO

Although participants engaged positively with PARO, such as touching or talking to PARO, complaints about the limited reactions of PARO (e.g., voice, unable to walk, not animated enough) were also raised when compared to a live animal. Previous studies also criticised that the auditory response of PARO may distress or overstimulate residents (Jung, van der Leij, & Kelders, 2017; Moyle, Bramble, Jones, & Murfield, 2016a). The developer of PARO reports that PARO is a therapeutic robot but is not for everyone (Shibata, 2012). This sentiment is also echoed in a study by Robinson et al. (2016), who reported that PARO was not found to be appealing to all the residents in an aged care facility. Interviews with nursing home care staff have also reported that PARO cannot comfort all residents (Moyle et al., 2016a) and human rights and autonomy should be respected before the use of social robots as some individuals may prefer live animal interaction.

5.4 Program improvement

Residents may have different responses to PARO relating to their mental and physical health condition. For example, PARO could be a potential psychosocial intervention for residents who feel lonely as well as those who are immobilised. PARO could be a potential daily care activity by providing comfort and distraction during stressful situations, such as pain or agitation, but individualised interventions are needed. In addition, the duration and frequency of PARO intervention should be tailored to individual preferences. Moyle et al. (2017b) also report that there is no single suitable approach to the use of PARO and there is considerable variation in

participant responses to the use of PARO that need to be taken into consideration in clinical practice. In our study, participants engaged with PARO five days a week for six weeks, a higher dose, may produce a different response. Research is also needed to further understand the engagement pattern of users toward robot interventions over a longer period of time to further design personal centred services.

5.5 Challenges in conducting interviews in people with dementia

Although perspectives of people with dementia provide valuable evidence for research and practice, it is challenging to engage people with cognitive impairment in the interview process leading to the short duration of the interview in this study ranging from 5 minutes to 20 minutes. These issues included communication and comprehension barriers, short-term memory and fatigue. Strategies were used to support the process. Firstly, interview questions were adjusted to be short and directive tailoring to people with cognitive impairment. It is suggested that more direct questions are likely to be able to verbalise more easily for those with limited expressive skills (Lloyd, Gatherer, & Kalsy, 2006). Secondly, reminiscence can prompt participants' memories during the interview and may encourage the participant to share information (Beuscher & Grando, 2009). Therefore, the researcher brought a PARO to the interview to help participants recall and remind them of their experiences with PARO. Lastly, the researcher offered the participant a choice of continuing or stopping the interview when they felt tired or nonverbal signs of fatigue were observed. Further, it is recommended to allow flexibility and choices, such as adapting the duration of the interview for each participant and providing options for conducting multiple short interviews (Novek & Wilkinson, 2017).

5.6 Limitations of this study

Due to the severe cognitive impairment of participants involved in the larger pilot study, only a small number of people (n=11) participated in the follow-up interviews. Therefore, findings are limited to a specific group of people, namely residents with mild to moderate dementia and

pain living in RACFs in Australia. Nevertheless, the 11 participants provided relevant data in relation to the aim of the study. From the interview data, similar perceptions emerged and no further relevant information was identified; however, it is unclear if data saturation was reached with this small number of participants. Regarding the trustworthiness of the findings, it is not feasible to undertake member checks with people with dementia, but we involved at least two researchers in the data analysis to enhance the analytic findings. Bringing PARO to the interviews could also be a limitation as the presence of PARO may potentially influence or alter participants' perceptions of their earlier experience with PARO. In addition, the short duration of interviews may limit the richness of the data. Triangulating data from a variety of sources, such as direct observations or video recordings, may increase the credibility of findings. Given the influence of medications on pain and the challenges of assessment of pain in people with dementia, further research using mixed-methods that measures pain medication or observational pain behaviours of participants using the PARO are needed.

6. CONCLUSION AND RELEVANCE TO CLINICAL PRACTICE

Participants' feedback reported that PARO has the potential to improve their psychological well-being and provide relaxation for pain relief for older adults with dementia in residential care facilities. Findings from the qualitative interviews are promising to inform nursing staff and other health care providers of the benefits and limitations of incorporating robot-assisted therapy into their daily practice from the residents' perspectives. Care staff who understand, appreciate and respect these perspectives are in a better position to collaborate with residents to deliver robot-assisted therapy that is individualised rather than driven by institutional routines.

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CONFLICTS OF INTEREST

All authors declare no financial, personal, or potential conflicts of interest.

CONTRIBUTIONS

Study design, and manuscript preparation: LP, WM, CJ; data collection: LP; data analysis: LP, WM, CJ; manuscript finalisation: LP, WM, CJ

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