Brightwater
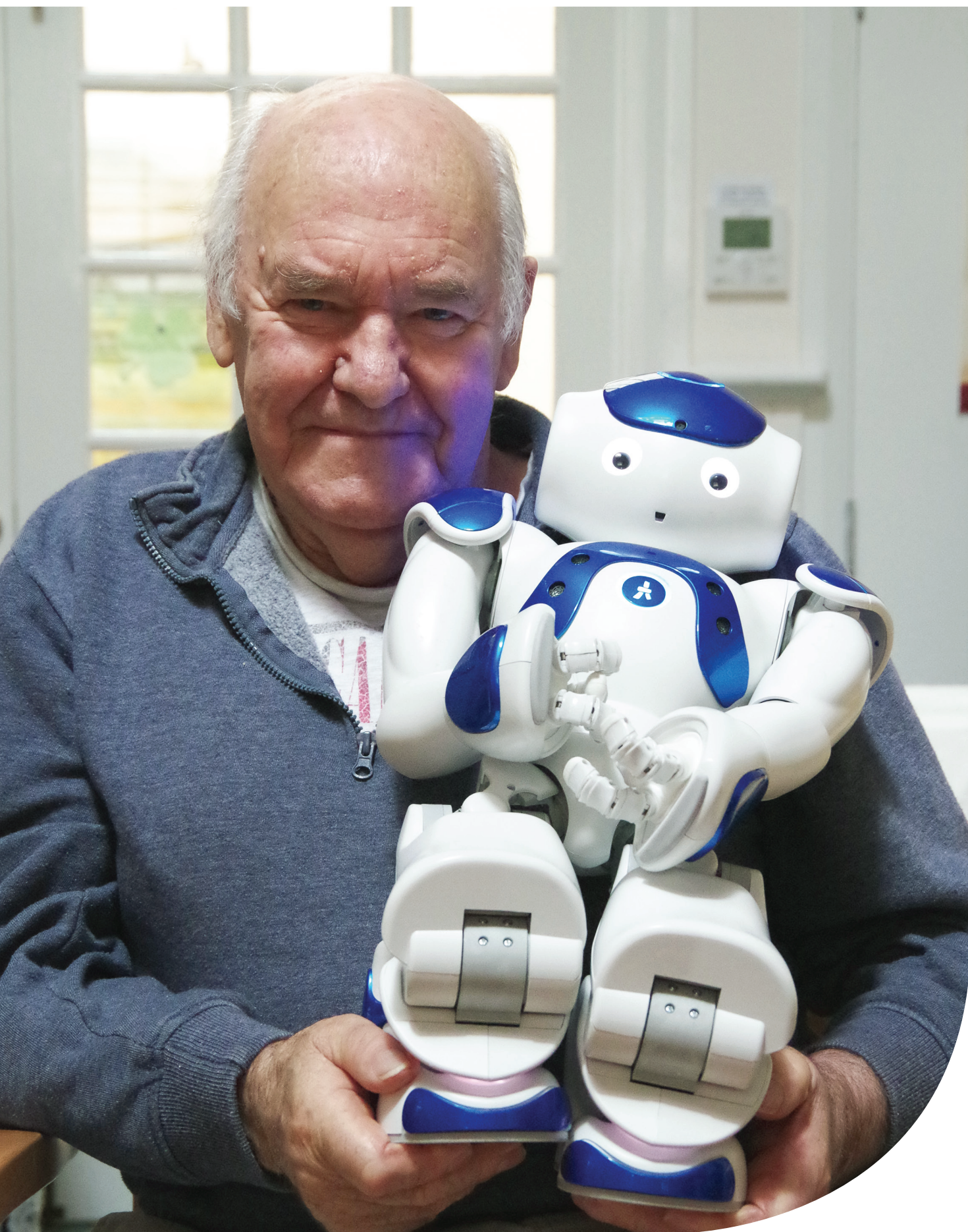
Understanding the impact of
socialisation robots on the
social engagement of older
adults with cognitive decline

June 2017

COGNITIVE
DECLINE
PARTNERSHIP
CENTRE

Acknowledgements

Steering Committee

Wendy Hudson	Brightwater Care Group
Valerie Jenner	Alzheimer's Australia
Angelita Martini	Brightwater Care Group
Bertolt Meyer	University of Chemnitz
Kylie Pratt	Brightwater Care Group
Anitra Robertson	Surgical Realities
Brett Robertson	Surgical Realities
Karla Seaman	Brightwater Care Group
Elly Williams	Brightwater Care Group

Project Working Group

Chris Erhardt	Care Worker
Colin Farmer	Brightwater Resident
Valerie Jenner	Alzheimer's Australia Consumer Consultant
Victoria Ludlam	Occupational Therapist
Deirdre Pastina	Lead Therapy Assistant
Kylie Pratt	Registered Nurse/Project Officer
Leanne Ruggiero	Lifestyle Coordinator
Marie Sakotic	Educational Program Developer
Kath Steyger	Lead Therapy Assistant
Elly Williams	Senior Research Officer

Correspondence:
Elly Williams
Senior Research Officer
Brightwater Care Group
Level 3, 355 Scarborough Beach Road
Osborne Park WA 6017
Email: research.enquiries@brightwatergroup.com

Overview

In 2016 and 2017, Brightwater Care Group introduced a human-like robot named Alice to two of its residential aged care facilities with an aim to improve social interaction and wellbeing.

This report details the investigation into the social engagement of older adults with cognitive decline when involved in activity programs with and without a socialisation robot. Concurrently, staff attitudes towards robots were evaluated pre and post the inclusion of a socialisation robot. It was found that a socialisation robot had the potential to increase social engagement of older adults with cognitive decline and this worked best when activities were created specifically for the socialisation robot, working to its strengths. Staff attitudes towards robots improved and staff began to see more opportunities to use the robot as a therapy tool to encourage social interaction among residents.

Report outline

- Who is Alice?
- About this project
- Key findings
- Social engagement
- Staff attitudes
- Why use Alice?
- What next?
- References

Who is Alice?

Alice is a therapy tool robot, used to encourage social interaction and engagement among aged care residents. Alice is controlled by a staff member through a simple tablet (e.g. iPad) and is as easy to use as a smartphone, making the technology accessible to all staff.

Every robot receives a family name when incorporated into a facility to create a more personal experience and connection. Brightwater's robot is called Alice, and therefore staff and residents may refer to the robot by that name throughout this report.

Used widely across Europe in hospitals and residential aged care, this project is the first to use this type of robot in the Australian residential aged care context.

Robot features

- 7kgs in weight
- Knee height at 57.4cm
- Operates by battery with a 90 minute life
- Made from polycarbonate/hard plastics
- Two high definition cameras
- Two lateral loudspeakers
- Four directional microphones
- Speech recognition and voice synthesis in 19 languages
- Four sonars (two emitting and two receiving) designed to foster direct interactions through face tracking

About this project

This project aimed to understand social engagement outcomes of older adults with cognitive decline when incorporating a socialisation robot into activities in residential aged care facilities. Secondary to this, the project also investigated staff attitudes towards socialisation robots in aged care.

The project wanted to know:

1. Can a socialisation robot increase social engagement of residents with cognitive decline?
2. How do staff feel about socialisation robot use in aged care?

This project took place at four of Brightwater Care Group's residential aged care facilities in Western Australia. Two of these were smaller sites acting as a control measure while two participated in the full intervention.

The project ran from September 2016 to June 2017.

How was Alice included in facility activity programs?

Measurements of resident engagement and attendance at activity groups were taken across three separate eight-week interventions. The control sites only had measurements taken in intervention one.

Figure 1 outlines the design of the project and Figure 2 summarises the activity groups that were included in each intervention.
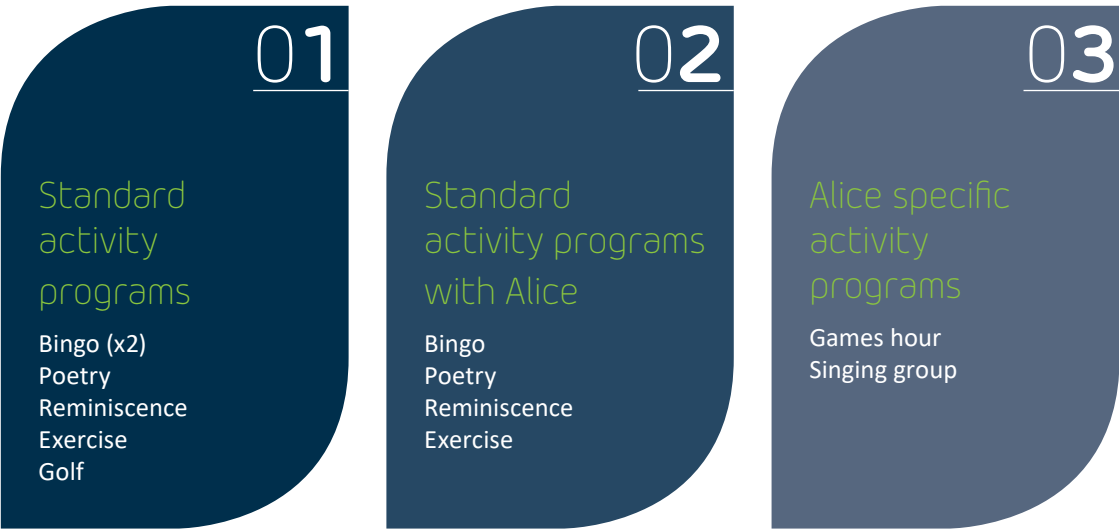
Figure 1

Project intervention design

Facility 1 & 2 (Intervention sites)

1. Standard activity program
2. Standard activity program with Alice
3. Alice specific activity program facilitated by Alice

Facility 3 & 4 (Control sites)

1. Standard activity program

Intervention 1 included taking measurements of engagement in usual facility activities, while in intervention 2 the robot was incorporated into groups from intervention 1. This included beginning the standard activity with a song from Alice; Alice reading out numbers in bingo, joining in exercises and commenting on events during reminiscence groups. In intervention 3 Alice led the newly created groups from start to finish.

Figure 2

Activity groups included in each intervention.

01

Standard activity programs

Bingo (x2)
Poetry
Reminiscence
Exercise
Golf

02

Standard activity programs with Alice

Bingo
Poetry
Reminiscence
Exercise

03

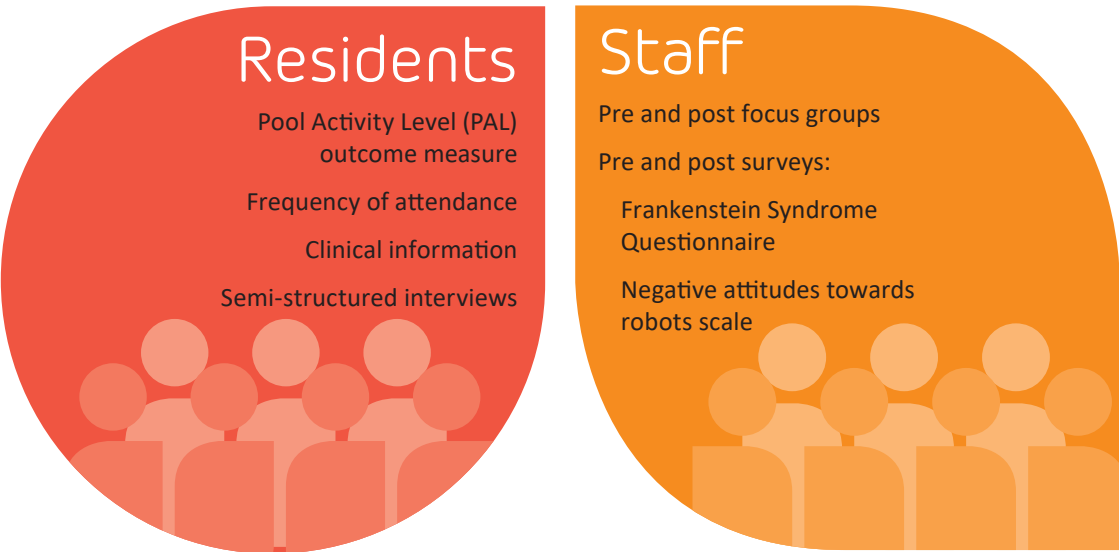Alice specific activity programs

Games hour
Singing group

How was the project evaluated?

Data was collected from both staff and residents at two intervention facilities and two control facilities across the nine month study period using a variety of qualitative and quantitative data collection tools for residents and staff outlined below in Figure 3.

Figure 3

Data collection tools for residents and staff

Residents

Pool Activity Level (PAL) outcome measure

Frequency of attendance

Clinical information

Semi-structured interviews

Staff

Pre and post focus groups

Pre and post surveys:

Frankenstein Syndrome Questionnaire

Negative attitudes towards robots scale

Key findings

Figure 4

Summary of the project key findings

Residents

- Creating new activities that were run solely by Alice was more effective in increasing social engagement
- Residents developed connections not previously seen with other therapy tools
- Residents had difficulty understanding Alice at times
- Average attendance levels at activities run solely by Alice were consistently high

Staff

- With time and exposure to socialisation robots, staff confidence and ability to utilise the technology increased
- The majority of staff believed Alice was beneficial to aged care following their involvement in the project
- Staff attitudes towards robots improved after being involved in the study

Residential aged care

- Greater resources in terms of time, training and staff numbers need to be applied to ensure the potential smooth transitioning of robot technology, if required, into the workplace

Socialisation robot technology

- The socialisation robot is as effective as its user and is reliant on the creativity and ability of staff members
- Improvements in the speech, reaction time and movements of the robot are required to ensure its usability
- IT support is critical to ensure technical issues are dealt with efficiently
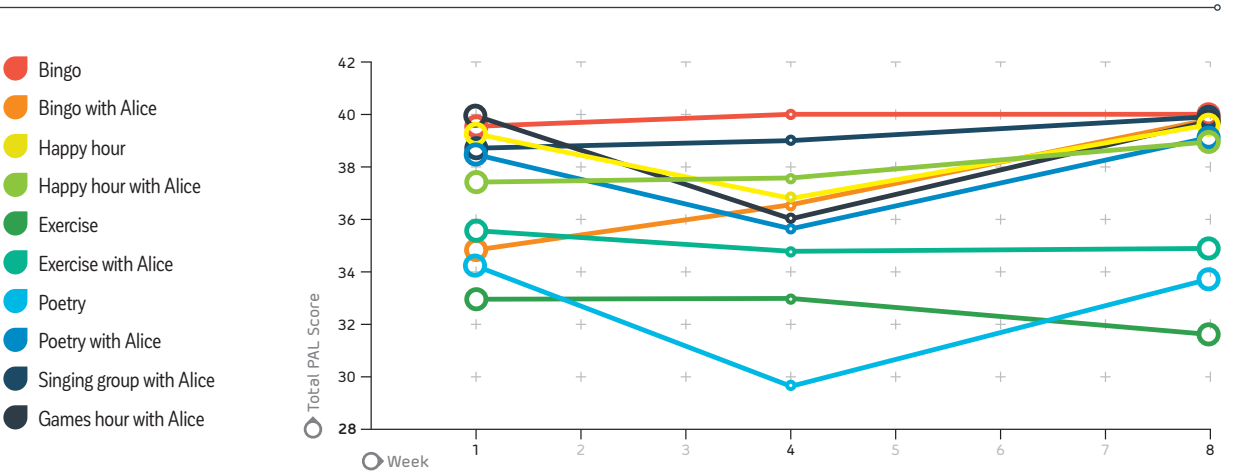

Social engagement

Pool Activity Level (PAL)

To measure social engagement, the Pool Activity Level (PAL) occupational therapy tool was used (Pool, 2013) at weeks one, four and eight. Throughout all other weeks the social interaction subscale of the PAL tool was used. The total PAL scores for each intervention group are displayed in Figure 5.
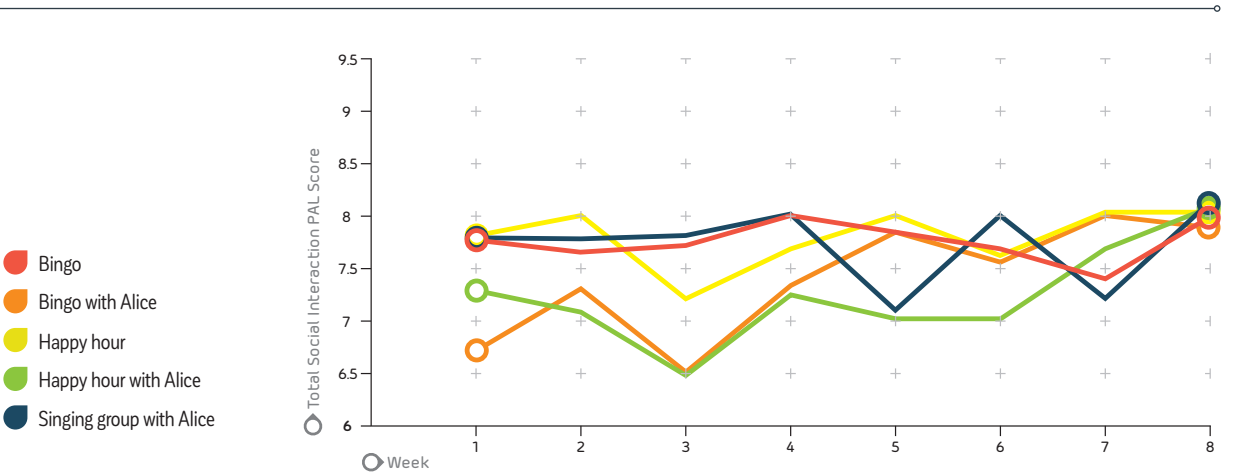
Figure 5

Total PAL Scores at weeks 1, 4 and 8 of each intervention. A higher number indicates increased social engagement.

The social engagement of residents participating in activity groups was highest for groups that were created specifically for Alice. Games hour and singing group on average experienced higher social engagement levels compared to standard activity programs, and those programs that incorporated Alice into standard activity programs. Including Alice in poetry group increased social engagement, while incorporating Alice into bingo, happy hour and exercise led to a decrease in social engagement.
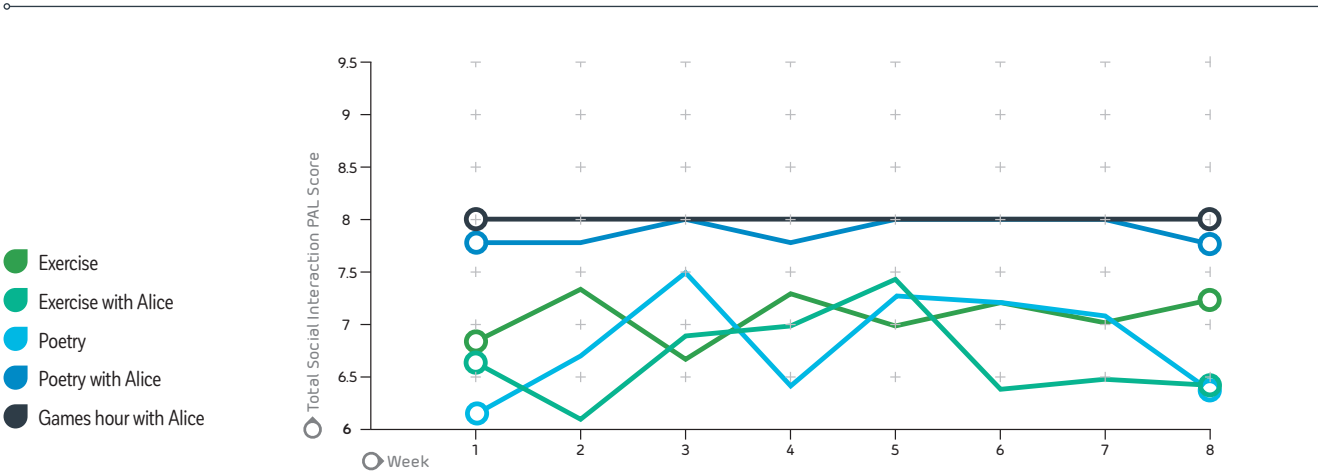
Figure 6

Total social interaction subscale PAL scores of all intervention groups at facility one.

The total average of social interaction at facility one (Figure 6), noted an average score decrease when Alice was introduced into an existing activity. Average social interaction at bingo therapy group decreased from 7.8 to 7.4, and within the happy hour group the average social interaction score started at 7.8 and declined to 7.2. The range of measured social interaction in the singing with Alice group was between 7.1 and 8, while across all therapy groups the average social interaction PAL score ranged from 6.5 to 8.

Figure 7

Total social interaction subscale PAL scores of all intervention groups at facility two.

Figure 7 reveals that residents generally experienced lower levels of social engagement in exercise groups with Alice (6.7) than when Alice was not present (7.1) at the exercise group. Conversely, residents experienced higher levels of social engagement when participating in poetry sessions with Alice (7.9) compared to when participating in poetry group without Alice (6.8). Figure 7 demonstrates that there was no change to the average level of social engagement by residents when participating in the Alice-specific games hour, rather a consistent score of 8 was recorded. Residents participating in the games hour group at facility two had the highest average social interaction scores for the whole project.
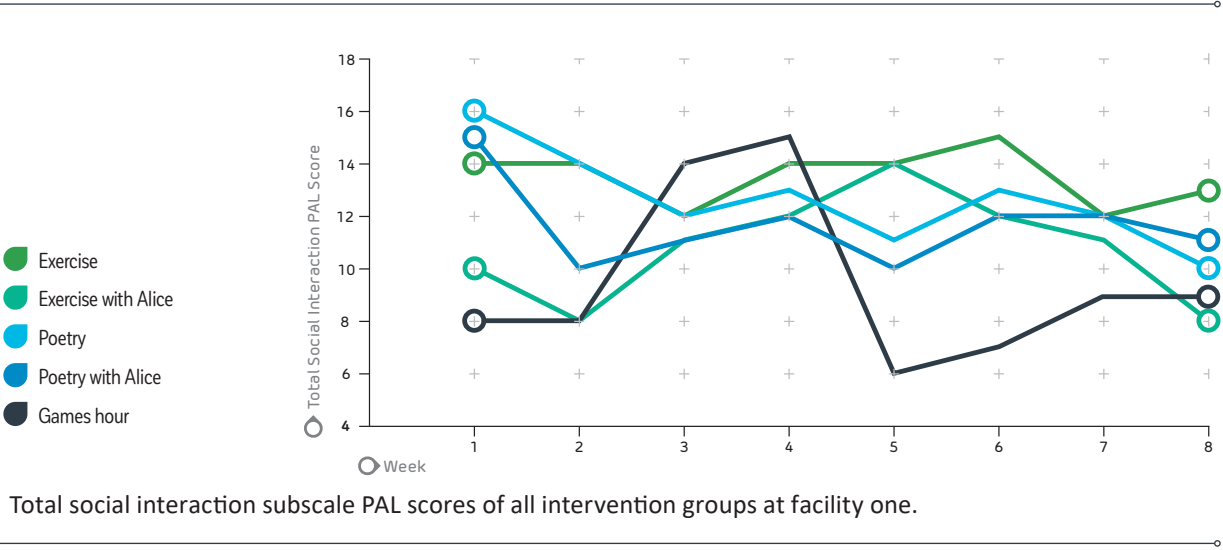
Figure 8
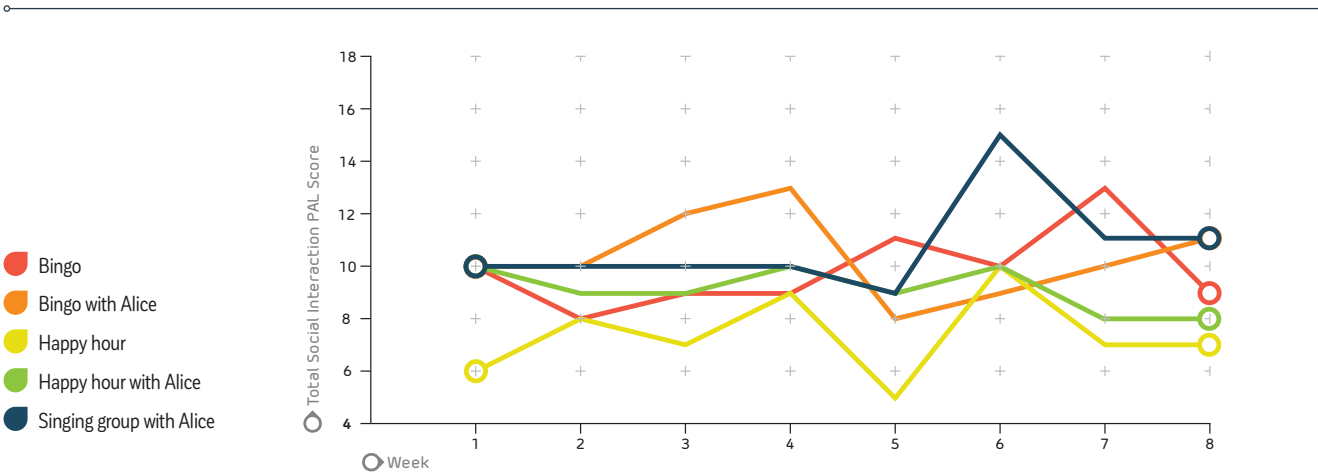
Weekly attendance numbers at therapy groups throughout each intervention at facility one.

At facility one, the singing group created specifically for Alice had steady group attendance levels and the highest average attendance of 10.8. Average attendance levels in both therapy groups with Alice present (bingo 10.4 and happy hour 9.1) were higher than when Alice was not present at these therapy groups (bingo 9.9 and happy hour 7.4). The attendance levels for each week at the different groups are displayed in Figure 8.

Figure 9

Total social interaction subscale PAL scores of all intervention groups at facility one.

Legend:
- Exercise
- Exercise with Alice
- Poetry
- Poetry with Alice
- Games hour

At facility two, average resident attendance at both the exercise (13.5) and poetry (12.6) groups was higher without Alice compared to incorporating Alice in these groups (exercise 10.8 and poetry 11.6). The average attendance to the Alice specific games hour (9.5) was lower on average compared to all the other therapy groups. The level of attendance for each intervention can be seen in Figure 9.

Interviews and observations

The interviews overwhelmingly indicate that residents think that Alice would produce positive outcomes for other residents, but with the caveat that Alice was working properly and staff were fully trained in the use of Alice. Residents likened Alice to a person and attached human-like traits and characteristics to the robot, showing a very high level of connectedness and potential socialisation in this setting. The endearing and very personable attributes residents attached to Alice are borne out by observations that residents felt they could relate to her, found Alice absorbing and described her as "getting you in". It was also observed that they enjoyed speaking with her and seeing her while admiring her stubbornness (another human trait), talking about her ability to tell the residents what "she thought" and that "you knew where you stood with her".

Residents were able to build a relationship with Alice, with residents using endearing and personal terms to describe her. In addition residents showed a higher degree of engagement and focus on Alice not otherwise apparent with other therapies. Examples included being protective of Alice and engaging in activities where no previous engagement was visible. Other observable positive behaviour included smiling and interacting with other residents, triggering a not previously seen awareness of their environment, socially engaging with Alice while previously being introverted, and non-English speakers. Other residents watched and cared for Alice until she was packed away. Staff also observed personal relationships being developed between several residents as a result of attending activities run by Alice.

> Staff also observed personal relationships being developed between several residents as a result of attending activities run by Alice.

Staff surveys and focus groups

Prior to the inclusion of Alice in facility activity groups, staff had mixed opinions and a variety of attitudes towards robot technology and its use in aged care. Across two questionnaires; the Frankenstein Syndrome Questionnaire FSQ (T. T. Nomura, Syrdal, & Dautenhahn, 2015) and the Negative Attitudes towards Robots Scale NARS (T. Nomura, Suzuki, Kanda, & Kato, 2006) every question received a full spectrum of Likert scale responses. Following the three interventions of the project staff, attitudes became increasingly positive towards robots. As seen in Figure 10 there was a significant change in staff responses to 'Humanoid robots can create new forms of interactions both between humans and between humans and machines' from pre to post intervention (p=0.048).

Figure 10
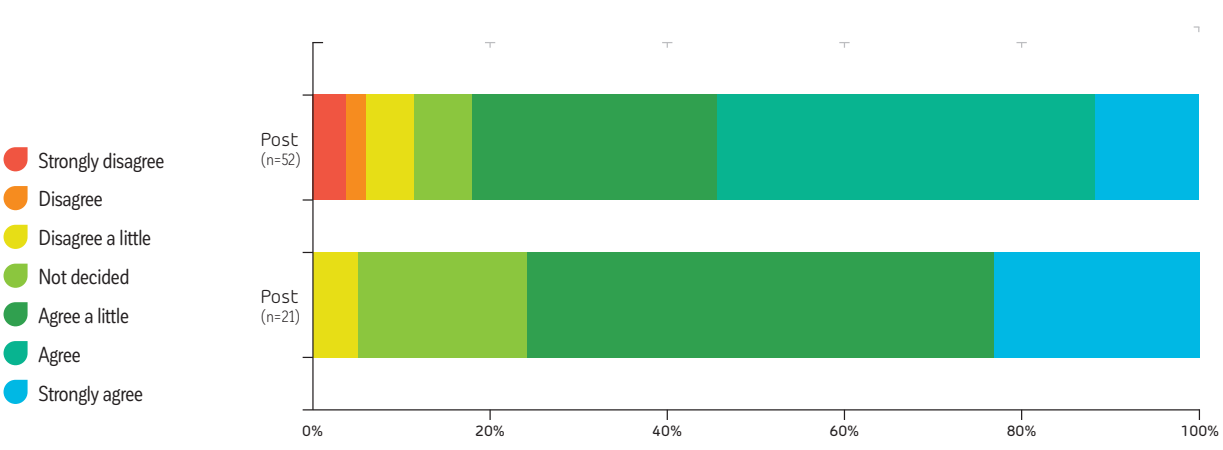
Staff responses to 'Humanoid robots can create new forms of interactions both between humans and between humans and machines' (p=0.048).

Legend:
- Strongly disagree
- Disagree
- Disagree a little
- Not decided
- Agree a little
- Agree
- Strongly agree

As predicted, the majority of staff were unsure whether the robot would be beneficial to aged care prior to the project commencement (58%), while only 6% of responses were negative, indicating staff had an open mind to the possible impacts of Alice in aged care (see Figure 11). Following the interventions, 67% of staff responding to the survey agreed they thought Alice would be beneficial to aged care while 28% of staff were unsure (see Figure 12). This demonstrates a greater understanding and positive review of the incorporation of Alice into activities for the benefit of residents with cognitive decline.
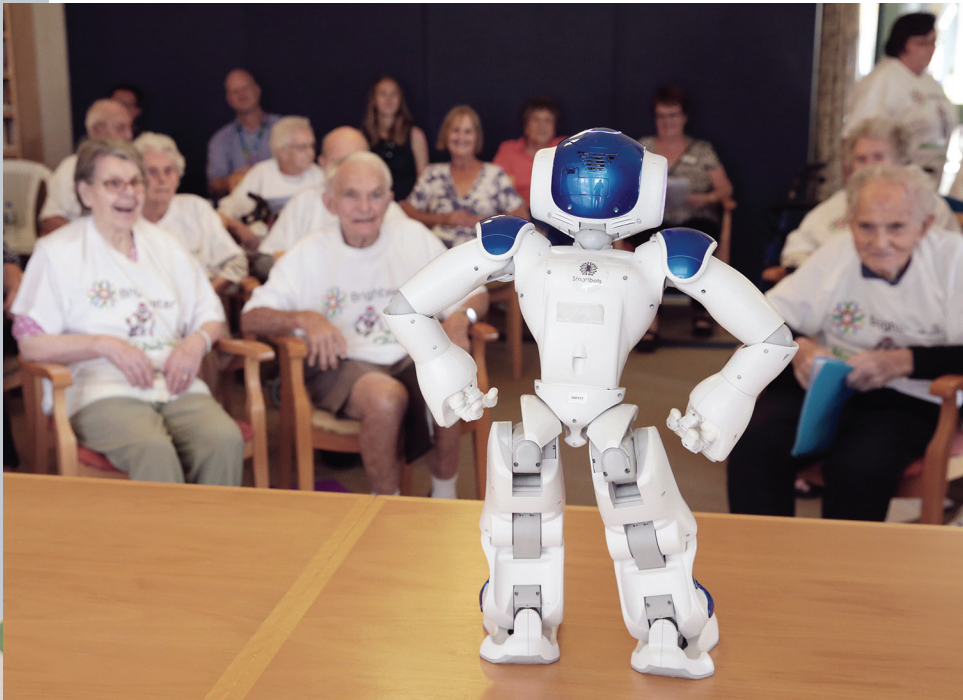
Figure **11**
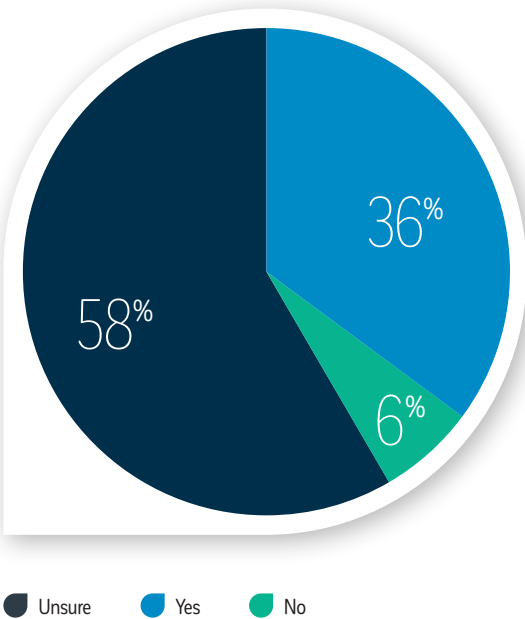
Pre staff survey responses to 'Do you think Alice will be beneficial to aged care?' (n=48).

Figure **12**

Post survey staff responses to 'Do you think Alice will be beneficial to aged care?' (n=21).

Staff participated in focus groups both pre and post intervention. Analysis of the pre focus groups found two major themes: outcomes for residents; and staff needs and support. Staff concerns for residents included communication issues, human care and interaction, individual needs and responses, novelty vs. familiarity and potential uses and settings.
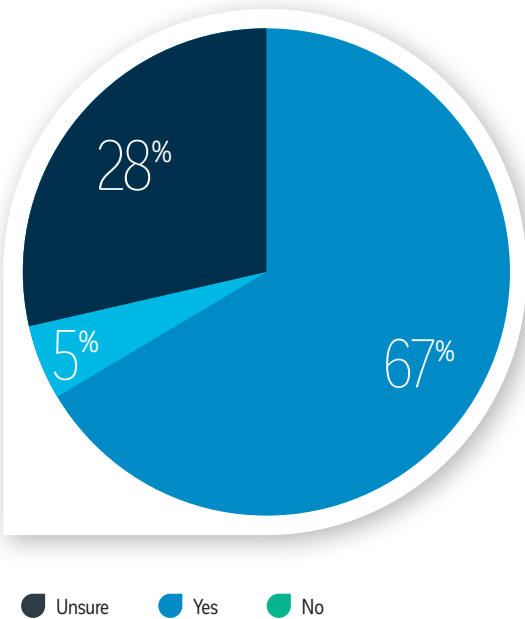
Staff were unsure whether Alice would aid or impede residents' communication and expressed concerns regarding Alice reducing or replacing human-human contact and face-to-face interaction. Many participants expressed that they "...would hate to see that robots take over and ever replace that human contact". A recurring discussion point was Alice's potential to provide interest and intrigue for residents, and a "new avenue" for intervention. However, attitudes towards this prospect were mixed. Staff saw potential for Alice to assist in both one-on-one and group settings.

Regarding their needs and support, staff raised the following concerns: information and assistance, training, time and preparation, open-minded approach and the need for a cultural shift. Along with training, various staff members requested that information, guides and troubleshooting help be available when using Alice. Fear and apprehension about using the robot technology was a common sentiment, with many participants expressing anxiety about not being "tech savvy", technology malfunctioning, making mistakes, or losing residents' interest. "I'm not a big fan of technology but I'm happy to learn, and as long as somebody gives me the right training then I'm quite happy to use the tools."
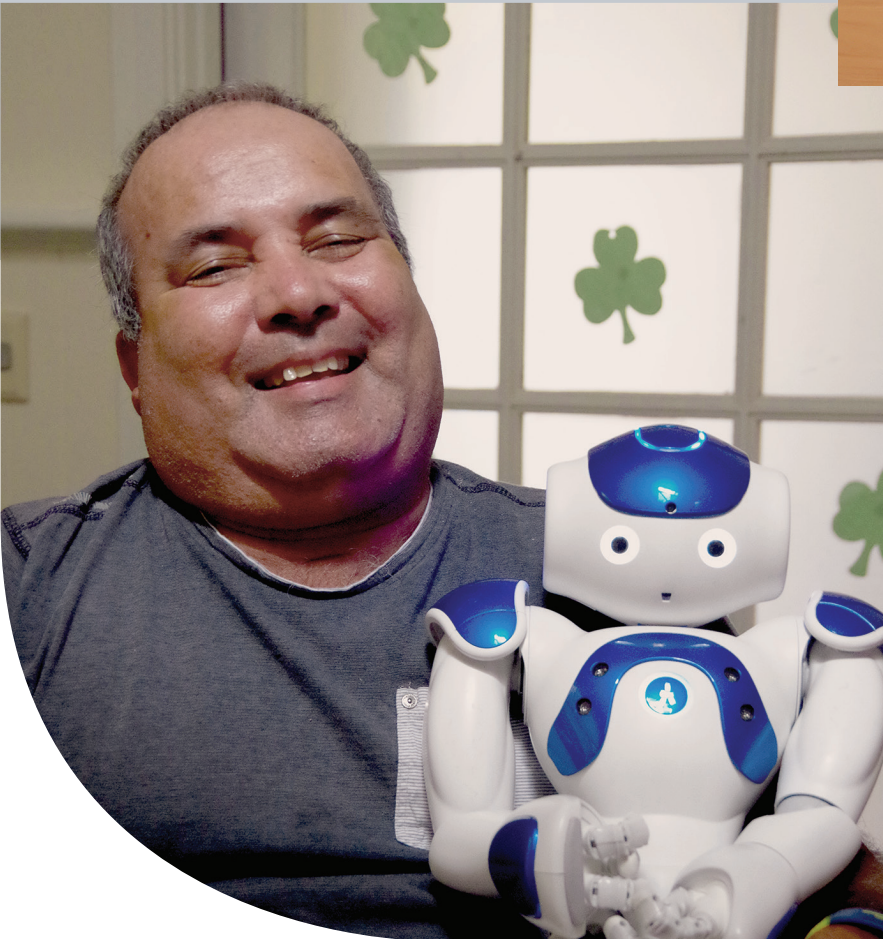

Staff saw potential for Alice to assist in both one-on-one and group settings.

This sentiment was echoed by others who felt that the time commitment to initial training and practice was important; e.g. "enough time for preparation is really important," "I think that's the biggest thing, we need to have an open mind over it."

Staff revealed as the project progressed they were much more positive towards Alice and her usefulness in the workplace, with positive interactions by residents, their family members as well as staff being observed. One of the more prominent themes raised by staff relates to Alice's voice. It was noted that residents struggled to hear and to therefore understand what Alice was saying. This could have a negative impact on the ability of residents to effectively interact and socialise with other residents, staff and Alice. However, staff also noted that although residents were frustrated with Alice's voice and interruption of communication, this did not alter their attendance negatively.

Staff indicated that using Alice was very time consuming and needed extra effort and energy to successfully implement the use of the robot. Staff were often frustrated and indicated that they needed more time to unlock the potential of Alice. Spending time with Alice will require that staff spend less time elsewhere. Staff generally rated Alice above other comparative therapies saying they thought residents reacted very differently because Alice was more human-like, able to break down barriers and able to elicit reactions not seen before with other therapy.

Why use a socialisation robot?
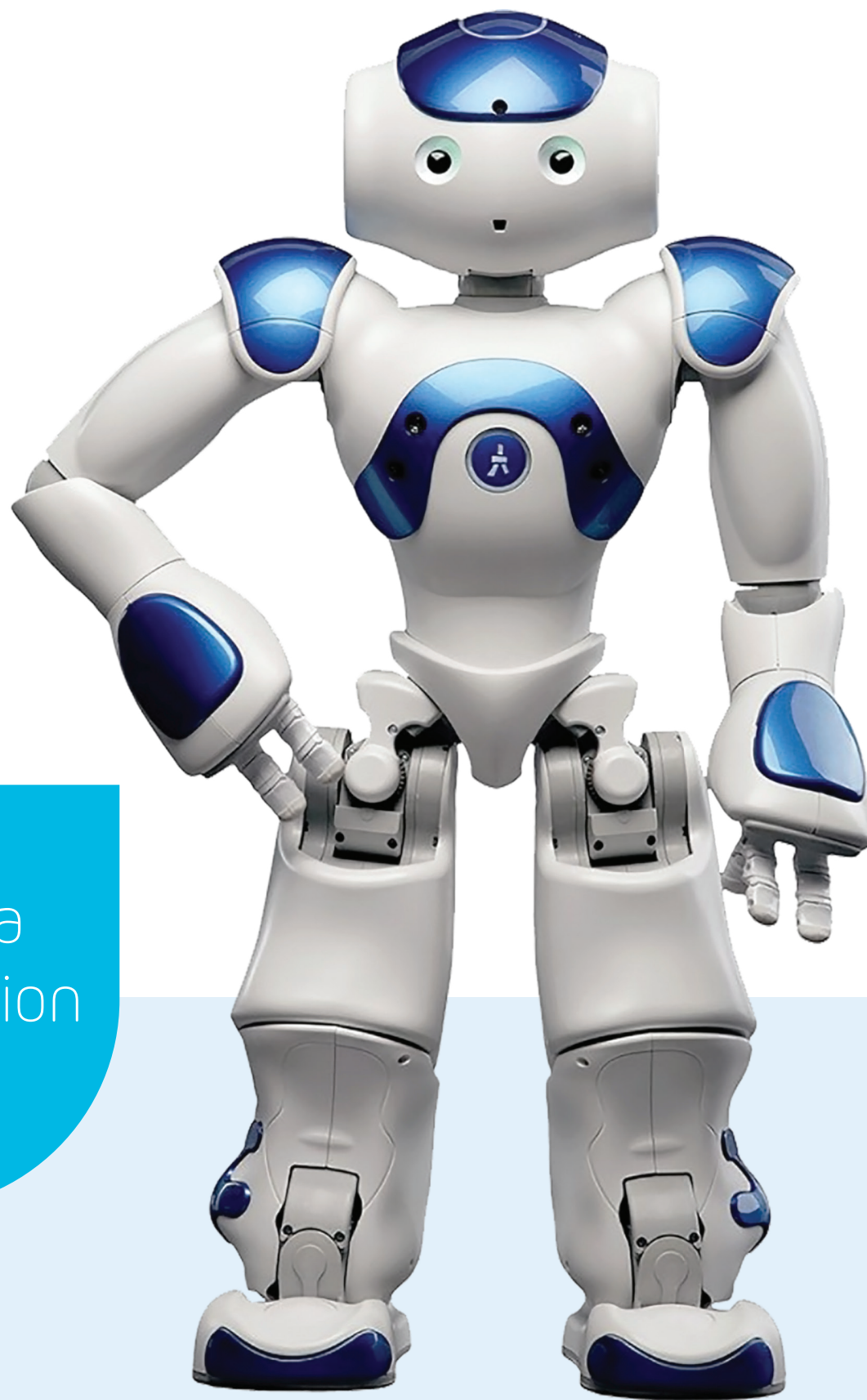
Alice played a large role in creating connections and conversations

The robot in this study provided residents with a larger choice when considering activity/therapy programs. As a therapy tool to encourage social engagement, the robot can elicit a positive response from older adults with cognitive decline and influence social engagement.

Alice played a large role in creating connections and conversations among residents in this project. Concurrently, social interaction was also observed between residents and the robot; and residents and staff. The use of a humanoid robot in an aged care setting can influence social engagement among adults with functional and cognitive decline.

What next?
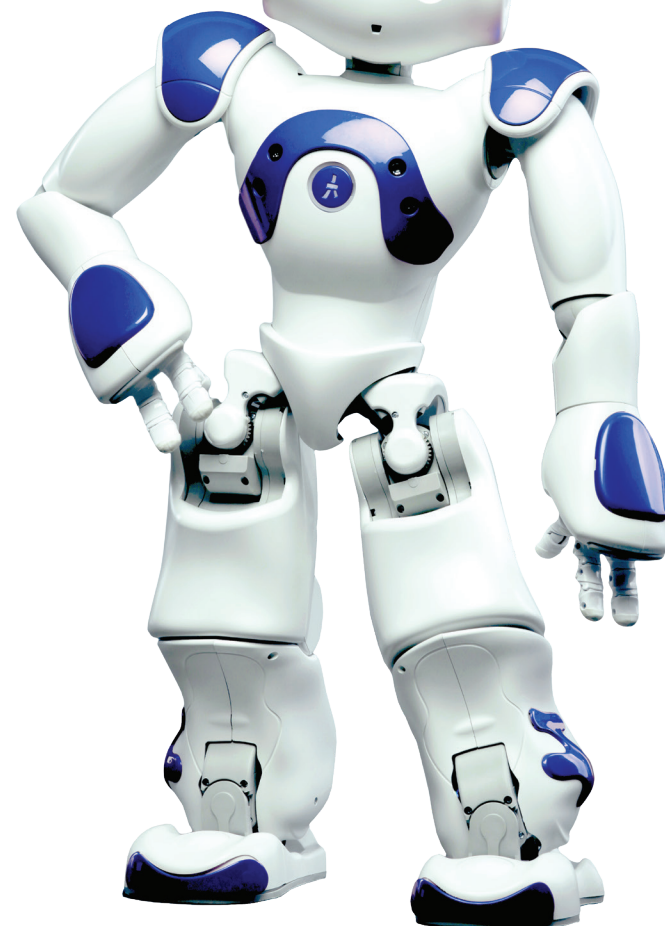
Brightwater Care Group will continue to use Alice in its residential aged care facilities.

Findings suggest that the use of a robot in residential aged care requires further research and the technology of Alice requires improvements to run smoothly for staff and resident satisfaction.

There is potential for Alice to be used for people from culturally and linguistically diverse backgrounds as well as for individual therapy and group therapy. These possibilities will be explored in future activities within the organisation.

References

Nomura, T., Suzuki, T., Kanda, T., & Kato, K. (2006). Measurement of negative attitudes toward robots. Interaction Studies, 7(3), 437-454.

Nomura, T. T., Syrdal, D. S., & Dautenhahn, K. (2015). Differences on social acceptance of humanoid robots between Japan and the UK.

Paper presented at the Procs 4th Int Symposium on New Frontiers in Human-Robot Interaction. Pool, J. (2013). The Pool Activity Level (PAL) Instrument for Occupational Profiling (4th ed.). London, UK: Jessica Kingsley Publishers.