Carrier-pigeon Robot: Promoting Interactions Among Older Adults in a Care Home

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Figure 1: On the left, a group of older adults listens to the message recorded by the other group (located in a different room) and transmitted by DASH. On the right, four of the custom snap-on blocks, used by participants to command the robot.

ABSTRACT

Communication among older adults in a care home is often reduced due to cognitive, communication, and mobility impairments. They tend to become isolated, which may lead to faster cognitive decline. We present an approach in which a robot is used as a communication vehicle between people located in adjacent rooms. To program the robot, we resorted to physical blocks with 3D icons. Older adults are able to create a sequence of messages that the robot delivers to another person or group. The blocks represented user-recorded voice messages, pre-recorded messages (e.g., proverbs), or actions (e.g., delivering cookies). A preliminary study with 22 older adults in a care home showed positive engagements between groups and an overall sense of excitement and fun. Carrier robots promise to extend the action range and operate as a communication tool, enabling interactions between people who may not be able to interact whenever they feel compelled to.

CCS CONCEPTS

• **Human-centered computing → Accessibility technologies**.

KEYWORDS

carrier-robot, older adults, human-robot interaction, social robotics, communication

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1 INTRODUCTION

Older adults in care homes sometimes feel isolated and experience a lack of communication in their day to day [1]. This isolation may be due to personality traits, mental issues, or weak environmental dynamics [2, 5, 7]. Communication is essential for cognitive stimulation and also vital for a group's sense of belonging to a community [2]. Furthermore, the disproportionate ratio between formal caregivers and the expanding number of older people makes staff less available to give permanent attention and to motivate further communication.

Previous studies have explored the use of a robot in different contexts with older adults. In these, the use of robots is shown to encourage older people to better engage in activities and to promote recreational therapy [3, 4]. In such studies, participants interact with a robot with its behaviour already set. In our approach, we empower people to control the interaction, by actively determining the robot's actions with physical blocks (Figure 1, on the right). Such setting reinforces the feeling of agency over the communication as well as engagement in the activity.

Results from the preliminary study show that this type of interaction can lead to a greater engagement in communication activities. The use of a robot as a communication vehicle had the potential to foster communication between people in different rooms. Importantly, participants actively engaged in the activities and felt a sense of agency that also stimulated their will to communicate. These preliminary results support the usage of social robots in care settings to augment a person's communication abilities with others.

2 CARRIER-PIGEON ROBOT

We conceive the use of a robot as a way to bridge the communication gap between older people in a care home. In this context, the robot acts as a tangible communication vehicle that carries and transmits messages between people or groups of people (Figure 1, on the left). We also enable people to have the sense of agency in the interaction by using different blocks to command the robot. They can choose which actions the robot should perform and record custom messages to communicate with another person or group of people. The ability to program a robot is a stimulating activity by itself, that may impact people's cognitive decline.

2.1 Preliminary Study

We performed a preliminary study in a care home with overall 22 participants in two sessions. During the two sessions, two groups of older adults without cognitive impairment interacted in adjacent rooms. Each group was composed by 4 to 6 people around a table. We enabled turnover to allow several people to have the opportunity to participate. All groups had a set of blocks and a paper with descriptive captions, which helped participants to understand and remember the action that each block represented.

First, we explained that the robot would perform the actions they assembled to the other group, showed the actions they could assemble, and how to command the robot to perform such actions. To command the robot, users must join custom snap-on blocks to create a sequence of actions. We used nine blocks with different functions: (A) a play block - to start the sequence; (B) target blocks - to target the message to the group or to the staff and (C) 6 different action blocks - 5 audio pre-recorded actions, and a free option that allowed people to record new and personalised messages. The 5 pre-recorded actions were: 1) inviting to lunch; 2) listen to music; 3) greet; 4) telling proverbs and 5) inviting to eat crackers.

We applied a Wizard-of-Oz methodology where the control of a robot was done by a researcher, with a tablet (Wonder Workshop [1]), mimicking the actions assembled by the group. We used a streaming setup involving two computers, one for each group and room. This way, participants were able to observe the other group's reactions (when the robot approached them).

We video-recorded the sessions and later performed inductive thematic analysis. We report the main identified themes.

Understanding and Autonomy. Several participants exhibited enthusiasm and curiosity in interacting with the system while others were more reticent at the beginning, mainly due to their perceived lack of digital literacy. The use of intuitive block design permitted to ease the understanding of which actions the blocks represented. We also observed that, at the beginning, participants were more conservative in the use of blocks; they placed less actions into the sequence. After some interactions, they started to assemble more blocks and the interaction became more autonomous. As soon as the robot left the room, participants immediately began to think what they would communicate next.

Emotional experience. We observed vivid emotional experiences. For instance, affective relationships were potentiated when participants used the robot to communicate with a group where they had friends. Participants also expressed their emotional feelings in relation to the occupational therapist; they sent him praise messages in recognition of his friendship. Participants also recorded personal messages stating their love about their own relatives to communicate to the other group, so they could know them better.

Competition and collaboration. Eventually, positive competition began to exist between groups. One of the action blocks was related to proverbs. When this block was used, the robot announced half a proverb, encouraging people to say the missing part. Since we only had two prerecorded proverbs, people started using the audio recording block to create more proverbs and riddles. This block in particular started to be central in the interaction dynamics between groups using the robot. They started with easy riddles, but soon the groups began to add difficulty, showing competitiveness. Collaboration occurred mainly at the musical level, where one group sang half a chorus, and the other group completed it.

Importantly, the activity generated a great level of cooperation within groups with participants having dialogues and agreements on the actions the robot should perform. They permanently negotiated and cooperated which maintained them more actively engaged and motivated in the activity.

Extension of action. At the end of each session, we asked which action or behaviour they would like the robot to perform to communicate between both groups. One participant said she wished the robot had arms to hug the other group. Another participant mentioned that she would like to have the robot as a communication tool between her and her friends at the care home because they were her family now. They also considered other actions the robot could perform, such as helping with housework, displaying warnings about medication, or calling a professional to fetch a walker or a cane. For people with a more significant motor decline, the robot has shown considerable potential as an extension of their action. Through the robot, they have the opportunity to interact with other people at a distance in the care home that could, otherwise, be an impediment.

3 OUTLOOK

The preliminary study showed that the participants quickly understood the way to command the robot, and were excited to be able to program the next message to send to the other group. There is the potential to create stimulating environments that could increase the social interactions in care homes using robots as proxies, particularly among people that may set themselves apart [6]. One of our future goals is to understand how the system would be used in a long-term deployment, as well as studying different ways to promote cognitive stimulating activities within this context.

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