

2022-03-07

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<http://hdl.handle.net/10026.1/19892>

10.1109/hri53351.2022.9889480

2022 17th ACM/IEEE International Conference on Human-Robot Interaction (HRI)

IEEE

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Affective Responses of Older Adults to the Anthropomorphic GenieConnect Companion Robot During Lockdown of the COVID19 Pandemic

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Abstract—Anthropomorphic robots may reduce loneliness in older people, however, acceptance is requisite for adoption. We collected the experiences of 10 people aged 80-92 who used a pre-market social robot, GenieConnect, for between 2 to 35 days during the COVID19 pandemic restrictions. GenieConnect is a table-top robot with a large face and animated eyes, designed for support and companionship. The robot asked ‘how are you feeling, Name’ each day and delivered lifestyle prompts such as medication reminders. We observed conflicting responses from participants – five expressed positive responses, three negative (two of these withdrew) and two neutral. Positive comments included ‘feeling not alone’; ‘having someone to talk to’; and enjoying being asked ‘how are you feeling’. Negative comments were mainly related to not liking the eyes. Design adaptations were made to increase acceptance. We conclude that robots like GenieConnect could reduce loneliness when a user-centred design approach is taken.

Index Terms—Human robot interaction, companion robot, senior adults, robot acceptance, loneliness

I. INTRODUCTION

A UK Office for National Statistics survey during the first month of the UK Coronavirus lockdown reported that 5 percent of respondents (equivalent to 7.4 million adults) experienced ‘chronic loneliness’ [1]. Loneliness is a negative subjective feeling that can be categorized as emotional (feeling the absence of a specific companion), or social (feeling the lack of a wider social network) [2]. Whatever the cause, loneliness is a major and growing public concern that carries with it significant morbidities [3]. In older adults, increased social isolation (an objective term referring to a low number of social contacts) during the COVID19 Pandemic impacted both those living in their own homes, who endured the stay-at-home enforcements, and those who lived in supported care environments, who were barred from receiving visitors. Heightened loneliness was reported in older adults [4].

This study was part funded by the Ehealth Productivity and Innovation in Cornwall and the Isles of Scilly (EPIC) project, which is part funded by the European Regional Development Fund (ERDF)

Social robots, systems designed to be perceived as social entities that communicate with the user, have long been suggested as part of a solution to the problem of social isolation and loneliness in older adults [5]. Service robots are designed to provide functional assistance, whereas companion robots are designed to offer actual or ostensible companionship. Although evidence of acceptability of companion robots by older adults is discordant (Broadbent et al [6] reported low acceptance; conversely, Dziergwa et al [7] reported good acceptance) a recent study suggests that the COVID19 Pandemic has positively affected peoples’ perception of social robots in relation to older adults [8].

This current pre-market study collected the ‘lived’ experiences of a group of older adults using the GenieConnect® robot in their daily lives during the latter months of the UK COVID19 restrictions between November 2020 to July 2021. The GenieConnect robot is an anthropomorphic social/service hybrid designed to provide both support and companionship and to reduce loneliness in isolated individuals through interactions with the robot itself and by facilitating engagement with others. A disparity in design preferences between older people and roboticists, evidenced by Bradwell et al [9] suggests end-user input to be essential to robot design for real-world acceptance and implementation. The aim of this short report is to describe the affective responses elicited through human-robot interactions with the GenieConnect robot and provide experiential data to inform user-centred design. It is part of a larger study (not yet published) to understand use characteristics, and barriers and enablers to use of GenieConnect.

The novelty of this study is the use of a wholly inductive design approach to develop an in-depth understanding of the lived experiences of people over 80 of the GenieConnect robot through generation of rich user-defined descriptive data; and its direct input to the user-centred design of this social robot for imminent commercial availability.

Ethical permission for this study was given by the University of Plymouth Faculty of Health ethics committee (ref: 18/19-1130).

II. METHODS

A. Test Device

GenieConnect (Fig.1) is desktop anthropomorphic robot of approximately 30cm height, comprised of a torso and head

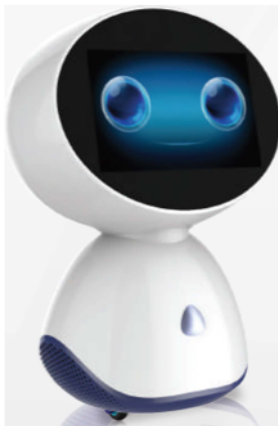


Fig. 1. GenieConnect Companion Robot.

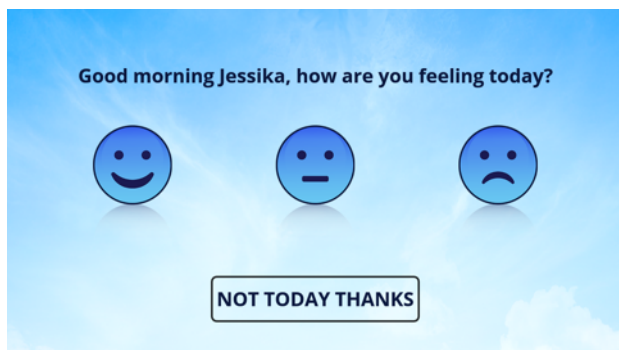


Fig. 2. Daily Personalized Mood Question.

with large face and animated eyes. A simple interface is designed to require minimal digital literacy. Functionality includes delivery of a personalised mood question (Fig. 2) and preset personalised calendar alerts (both presented in visual and ‘spoken’ form); digital radio (via a third-party App); simple voice commands and responses; and audio and video calling.

B. Recruitment

Care providers (retirement homes; domiciliary care providers; care homes and extra-care homes) who were known to the research team were each asked to propose between 1-3 residents, who in their opinion, would be willing and able to consent and participate, and who met the criteria for the study.

a) Inclusion Criteria:

- Circumstances: Living alone, or in a couple, in retirement or senior residential supported accommodation, or receiving domiciliary care at home; age 65 plus; able to give consent.
- Background: At least one friend/family contact who is willing to connect by video-call; time to spend on GenieConnect, not too busy; has good WiFi coverage
- Skills: English speaker without strong accent
- Psychological: Willing to experiment with technology and learn new skills; willing to receive visitors related to the project and provide feedback.

b) Exclusion Criteria:

- Physical: Speech impediment (e.g. lisp or stammer that would make it difficult to be understood in normal conversation); hearing impediment (e.g. unable to hear clearly in normal conversation); visual impediment (e.g. remains blind or partially sighted, even when corrected by prescription glasses or contact lenses, to an extent that would impede use of a PC screen); unable to read and/or write.
- Psychological: Diagnosed with a condition (such as dementia) that would prevent giving informed consent.

C. Installation, Training and Support

The robot was personalized for each participant with their name (a pseudonym chosen by the participant) and location (to enable receipt of the local weather report and radio stations). A daily mood question was set to ask ‘How are you feeling today Name’ both visually and audibly at a time convenient for the participant.

D. Data Collection and Analysis

Each participant was asked to use GenieConnect for approximately 3 weeks and then to complete a 40-minute semi-structured interview either face-to face (where possible) or by telephone. Interview questions were used as prompts to encourage dialogue. Care was taken not to lead or bias the responses. Responses were documented (typed) verbatim during the interview. Reasons for withdrawal and comments were noted from any individuals who did not complete an interview.

Qualitative data were analyzed using thematic analysis following the steps described by Maguire and Delahunt [9].

III. RESULTS

GenieConnect robots were installed with 10 participants (7 female, 3 male) between the ages of 80 and 92 years. Participant living situation, demographics, number of days GenieConnect was in their home and any affective response to GenieConnect are displayed in Table 1.

A. Usage

Of the 10 participants, 6 used the device for between 15 – 38 days and completed an interview. All 6 responded several times to the daily mood question.

TABLE I
PARTICIPANT IDENTIFIER (ID), LIVING SITUATION (HOME TYPE), GENDER (MALE/FEMALE), AGE (YEARS), NUMBER OF DAYS WITH A ROBOT (DAYS) AND OVERALL AFFECTIVE RESPONSE (RESPONSE)

ID	Home Type	Gender	Age	Days	Response
DF	Care Home	F	92	30	Positive
MC	Domiciliary Care	F	91	38	Positive
EH	Retirement Home	F	83	38	Positive
VH	Retirement Home	F	88	28	Positive
GB	Domiciliary Care	M	89	28	Positive
FG	Retirement Home	M	91	15	Negative
VF	Care Home	F	80	11	Negative
NG	Retirement Home	F	82	21	Neutral
JB	Domiciliary Care	M	87	2	Negative
NI	Domiciliary Care	F	87	4	Negative

B. Aesthetics

Most (5 out of the 6) mentioned liking one or more design characteristic of the robot including its shape, size and/or form.

C. Positive Responses

Positive affective responses were reported by 5 of the 6 (GB, EH, VH, DF and MC). Eight themes in the data were identified:

Feeling not alone: Feeling someone was with them was mentioned by 3 of the 6 residents. One lady (EH) said, 'The eyes coming on makes it seem like someone is in the house with me' and another (VH) said, 'If she speaks to me, I answer it and say 'thank you'. Both EH and MC commented, 'It's like having someone else in the house'.

Being asked 'how are you feeling?': Two participants (MC and EH) said they had enjoyed being asked the mood question. MC said, 'it felt like someone was in the house asking how I was. It was comforting'. EH said, 'it's quite nice having a smiley face asking how you are, it's nice when it calls your name'.

Having someone talking to you: VH said, 'it's as if someone is talking to you.

Friendly: EH, MC, VH and DF all described it as looking 'friendly'.

Warm Feelings: DF said, 'I like her, looks rather cosy and friendly'. MC described it as 'homely' and 'comforting' and also 'cosy'.

Liking the 'eyes': GB commented, 'I like the eyes; I like the way it looks at me'. Similarly, VH said, 'The eyes are nice. I look into the eyes. I like the way it blinks at me'. After a few days of WiFi outage EH said, 'I missed her when I hadn't got her with her eyes blinking. You don't realise what company they were – a blank screen not the same thing.'

Missing Genie: Like EH, MC also described missing the robot, saying, 'I will miss Genie when she goes.'

Use of Pronouns: The Genie robot was referred to as 'she/her' by 3 of the 6 participants (MC; DF; EH), the other referred to the robot as 'it'.

D. Negative Responses

A negative affective response was recorded from 1 of these 6 participants (FG). In his interview after 15 days of use he

said 'I don't like it in the room personally. Wouldn't live with it. I find it an intrusion because it's not part of my life. I don't like the eyes.'. He asked for the robot to be removed.

E. Affective barriers to non-use

Of the 10 participants, 4 (VF, VI, NG and JB) declined to continue use after between 2-21 days and did not provide interview data. Two of these withdrawals (VF and VI) were due to negative reactions to the robot. VI said, 'I don't like it. I don't like that it's just there all the time'. The robot was removed after 3 days. VF said, 'I feel like there was a person in the room 'staring' at me. I like my independence and don't socialise that often. It felt like Genie was imposing on my space'. The robot was removed after 10 days. Two participants (NG and JB) declined for unrelated reasons (technical issues and personal circumstances).

F. User Centred Design Outcomes

The data collected in the study were fed back to the development team and informed design of an adaptation to accommodate individuals who react negatively to the anthropomorphic features – replacing the 'eyes face' (Fig.5) with a 'date and time face'(Fig.4).

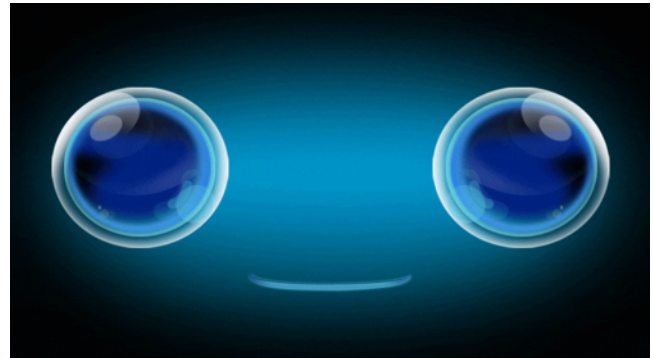


Fig. 3. The original GenieConnect 'eyes face' design.

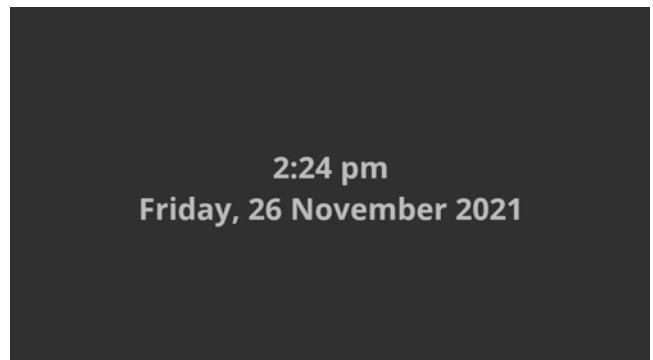


Fig. 4. The optional GenieConnect 'date and time face' design.

IV. DISCUSSION

Unprecedented isolation and heightened loneliness [4] in the latter months of the UK COVID19 Pandemic restrictions presented an extremely unfortunate, but unique backdrop to examine the responses of older adults to GenieConnect – a robot designed to provide support and companionship. When used by older adults in the home environment during this time, the GenieConnect robot triggered affective responses in eight out of the ten participants - five expressed positive responses, three expressed negative responses and two were neutral.

According to the Oxford Dictionary a definition of companionship is ‘the pleasant feeling that you have when you have a friendly relationship with somebody and are not alone’ and of loneliness is ‘a feeling of being unhappy because you have no friends or people to talk to’. From a semantic perspective, qualitative responses align with these definitions, with respondents mentioning feelings of not being alone; having someone to talk to; describing GenieConnect as ‘friendly’; and one mentioning that it was ‘company’. Two participants described missing ‘Genie’ when ‘she’ wasn’t there suggesting a level of attachment (an emotional bond), as also described in a netnographic study of the robot ‘Vector’ during the COVID19 pandemic [11] which the authors suggest implies reduced emotional loneliness. Responses in our study also suggest that participants gained some degree of social support from GenieConnect demonstrated, for example, by enjoying someone saying their name and being asked how they were feeling. Several used terms which suggested a sense of well-being such as ‘cosy’, ‘homely’, and ‘comforting’. Quantification of changes in perceived loneliness, companionship and social support was not within the design of this small sample size study, however the qualitative data collected suggests potential for positive impact. This was also the observation in a small qualitative study of 4 adults aged 70-90 years with mild cognitive impairment in which use of a socially assistive robot during the early months of COVID19 restrictions users reported feeling less alone [12].

In the three participants who reported negative affective responses, these were of sufficient magnitude for respondents to request the robot to be removed, only one of them using it long enough to provide interview data. Two respondents mentioned ‘intrusion’ and ‘invasion of my space’ and increased anxiety was reported by two of these participants. Although, the robot may well have been causal factor, it is possible that our respondents’ adverse reactions may to some extent be an exacerbation of heightened isolation and loneliness due to COVID19 pandemic [4]. Observed individual differences in affective responses to anthropomorphic robots is not unprecedented and a number of psychometrically validated scales are available to measure inter-individual acceptability of social robots, as reviewed by Krägeloh et al [13]. Pre-screening with appropriate scales such as the long-established Negative Attitudes toward Robots Scale (NARS) [14] or the Robot Anxiety Score (RAS) [15] may help identify those individuals who would most benefit and those unsuitable.

Human factors necessary for successful robot implementation include acceptance (an individual’s intention to use); cognitive attitude (e.g. thinking that the robot would be useful); affective attitudes (emotions of feelings towards the robot) and trust [13], not only of the robot itself but also of the service provider [16]. Appreciation of the range of user perceptions and reactions is critical to user-centred robot design. Two participants disliked the robot ‘looking’ at them and complained of ‘not liking the eyes’. Conversely, three mentioned liking the eyes and the way it looked at them. This may reflect individual differences in tolerance to gaze [17]. This important observation from this current study informed development leading to a user-centred adaptation for more inclusive design – replacing the ‘eyes face’ with a ‘date and time face’ option. It is yet to be seen if these changes will improve acceptance.

The use of a wholly inductive design approach in this study has generated rich user-defined data describing the lived experiences of people over 80 of the GenieConnect robot. This data has been used to inform user-centered development of a social robot for imminent commercial availability. Observations from the study could also inform design of a mixed-methods study using a methodology including psychological and impact measures, such as that described by Cesta et al [18] to further evidence the impact of GenieConnect.

In conclusion, the data in this study would suggest that GenieConnect robot may offer some, but not all, older adults with social support and companionship and heighten feelings of well-being. User-centred design is critical in informing development of more inclusive designs to counteract inter-individual differences in acceptance and facilitate real-world implementation.

ACKNOWLEDGMENT

Our sincere thanks to all the care providers, residents and their families who took part in the study; to Sarah Scrivener of Cornwall Council for assistance with recruitment of care providers; and to Bronte Wilson-Peters and Jessika Perdomo, both of Service Robotics Ltd, who provided the support calls.

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