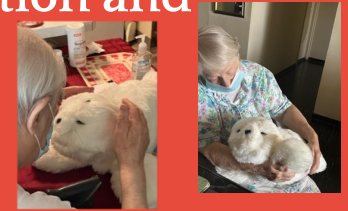# Utilizing the PARO Therapeutic Device to Decrease Social Isolation and Loneliness in Homebound Older Adults

Iryna Lyuta, MSN, FNP-BC

Oak Point University

Abstract

This DNP project is focused on reducing social isolation and loneliness in homebound older adults by allowing interaction with the PARO robot during home visits. PARO is a medical device in the form of a baby harp seal. It has visual, tactile, auditory, temperature, and postural sensors, allowing effortless interaction with humans. The Food and Drug Administration (FDA) approved the device and categorized it as a Class II biofeedback machine (Shibata et al., 2021). Homebound adults aged 65 years and older living in Chicago and surrounding suburbs participated in this project. They were recruited from the patients of Zinger Medical Offices. Only medically stable and cognitively intact seniors were involved. The subjects received fifteen minutes interactive sessions with PARO twice a week for eight weeks. The UCLA Loneliness Questionnaire was completed before and after the intervention to evaluate the effectiveness of human-robot interactions.

Introduction

Definition:

- Social isolation is a lack of contact with social support systems, including friends, family members, communities, and society (Henning-Smith et al., 2019). It is an objective state when a person has limited social contact or social relationships (National Academies of Sciences, Engineering, and Medicine, 2020).
- Loneliness is a subjective state when an individual feels isolated despite being around other people.

Prevalence of Social Isolation and Loneliness:

One-fourth of community-living older adults aged 65 years and older are socially isolated, and 43% of individuals over the age of 60 perceive themselves as lonely (NASEM, 2020).

In Europe, 20-30% of the geriatric population feels lonely. A similar prevalence is seen in Latin America and China where 25-32% and 29.6% of older adults lack meaningful social relationships. In contrast, a higher number of isolated older adults is noted in India comprising up to 44% (World Health Organization, 2021).

In addition, loneliness and social isolation affect approximately 25-29% of older adults in the United States and 20-34% of older people in 25 European countries (WHO, 2021).

Predisposing factors:

- chronic illnesses
- physical and mental disabilities
- mobility limitations
- memory problems
- sensory impairments
- loss of friends or family members
- being homebound
- immigration
- social discrimination
- unemployment
- poor socioeconomic status

- divorce
- disorganized and poorly planned environments
- inadequate transportation
- lockdown policies during the Covid-19 pandemic
- dependence on assistive devices, insurance-based or public transportation, and supportive programs

Detrimental Effects of Social Isolation and Loneliness:

According to the Centers for Disease Control and Prevention (2021), social isolation is associated with an increased risk of heart problems by 29%, stroke by 32%, dementia by 50%, and premature mortality from all causes. Notably, poor social involvement is associated with up to 30% increase in mortality rates, including premature death. Moreover, WHO (2021) recognized that social isolation and loneliness predispose people to cardiovascular diseases, diabetes, stroke, high cholesterol, cognitive decline, and mental problems, including depression, anxiety, and suicidal ideation. Moreover, similar detrimental health outcomes are seen with conditions including smoking, obesity, sedentary lifestyle, substance abuse, and inadequate access to healthcare that have been addressed for decades by major health organizations.

Theoretical Framework

The Adaptation Model of Nursing, developed by Sister Callista Roy, was used to analyze the problem of social isolation in older adults. This theory describes the relationships between individuals and their environment. A person constantly interacts with the environment. The environment is the surrounding of an individual and involves its circumstances, conditions, and forces that directly affect behavior. The health of a subject depends on their personal ability to adapt to changes. Lastly, nurses are the facilitators of adaptation and are valuable to support positive behavioral changes (Current Nursing, 2020).

Project Aim and Objectives

The aim of this DNP project:

Reduce social isolation and loneliness in homebound older adults by allowing interaction with the PARO biofeedback device during home visits.

Project Objectives:

- Identify the perceived level of social isolation and loneliness in homebound older adults by using the UCLA Loneliness Scale.
- Promote patient socialization and positive emotional responses through the interaction with the PARO therapeutic device during home visits for fifteen minutes twice a week for eight weeks.
- Evaluate the effectiveness of the patient-device interaction in reducing social isolation and associated loneliness as measured by the UCLA Loneliness Scale.

Methodology

Pre-intervention

After receiving the IRB approval, the DNP student started the recruitment of participants. The student contacted the Director of the primary care practice to obtain the list of homebound patients. Then, the medical records were reviewed by applying the inclusion and exclusion criteria. Next, the DNP student contacted the patients over the phone and introduced the topic of the DNP project. The pre-intervention screening included asking an open-ended question if a person feels socially isolated and lonely. A positive response indicated that the patient is eligible to participate in the project. Then, a pre-intervention visit was scheduled. This visit included providing full disclosure about the project, planned intervention, outcomes, possible risks and benefits, and no penalties for withdrawal. The participants signed inform consent. In addition, during this visit, the DNP scholar provided verbal instructions about the PARO device and presented a brief video about the robot. The patients received a copy of the PARO manual for reference. After that, the UCLA Loneliness Questionnaire was administered to the participants in pen and paper format. Next, the patients were provided with a printed calendar to list the dates and times of the subsequent encounters.

Intervention

The DNP student called patients one day before the visit to confirm the scheduled meeting. The two-hour window was specified to subjects to cover possible delays associated with traveling between patients. The student charged the PARO device in the office before the visit and checked the functioning of the robot after the setting was completed, to ensure its safe performance. PARO was transported in the carrier. During transportation, the device was turned off and placed in the car's trunk away from extreme heat and light sources.

After entering the patient's home, the DNP student and the patient performed hand hygiene with an alcohol-based hand sanitizer or soap and water. Facemasks were provided to subjects at the beginning of each visit to ensure infection control. Then, the scholar reinforced information about the PARO device presented during the pre-intervention visit and introduced the robot. Specifically, PARO was placed on a hard surface such as a table or a chair in front of the patient. The DNP student turned on the device. The timer on the watch was set for fifteen minutes. The participant was encouraged to have verbal, visual, and tactile contact with PARO. The interaction involved unstructured activities such as grooming, petting, hugging, greeting, and talking. The student encouraged human-robot interaction and answered any pertinent questions. At the end of the session, PARO was turned off and disinfected with PDI Super Sani-Cloth Germicidal Disposable Wipe. The device was placed in the carrier. Both the student and the patient washed their hands with an alcohol-based hand sanitizer or soap and water. Then, the DNP student reviewed the upcoming visits with the patient and adjusted the schedule if modification was requested. Afterward, the DNP scholar continued to travel between scheduled participants to provide individual PARO sessions per the protocol listed above.

The interactive PARO sessions involved twice-a-week visits and lasted eight weeks, comprising sixteen meetings. A week before the last visit, patients were informed of the end date of the project. They were provided the handout, "Understanding Loneliness and Social Isolation: How to Stay Connected," obtained from the National Institute on Aging (2020), and the list of community resources created by the DNP student. During the final visit, patients had the PARO interactive session followed by the completion of the UCLA Loneliness Questionnaire in pen and paper format.
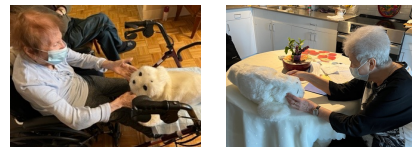
Post-intervention

Pre- and post-intervention scores received from the UCLA Loneliness Scale were used for the data analysis, utilizing the SPSS software. The inferential statistical procedure, specifically paired T-test, was utilized to answer the question of whether the PARO therapeutic device's effect on reducing social isolation and loneliness is statistically significant or due to a chance.
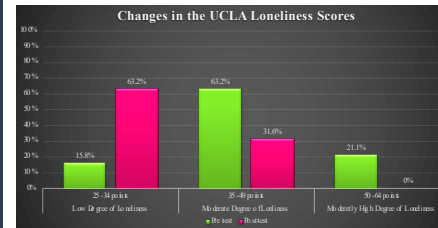
Results

Nineteen participants completed pre- and post-intervention UCLA Loneliness Questionnaires. A substantial decrease in the post-intervention survey scores was noticed. Among the nineteen people, the total score obtained on post-intervention surveys ranged between 24 and 45 points compared to the pre-intervention scores of 30 and 55 points. In addition, the mean value for the post-intervention total scores was 32.7, the median value was 31, and the modal was 31. In contrast, the mean value for the pre-intervention scores was 42.5, the median value was 42, and the modal value was 48. The post-test total scores' standard deviation (SD) was 5.66 compared to 7.15 in pre-intervention.

Table 1: Descriptive statistics of the pre- and post-intervention data

	Pre-test	Post-test
Mean	42.5	32.7
Median	42	31
Mode	48	31
Standard Deviation (SD)	7.15	5.66
Minimum score	30	24
Maximum score	55	45

The changes in the severity of social isolation and loneliness among the participants were also identified. Out of nineteen subjects completing the post-intervention survey, no participant (0%) scored a moderately high degree of loneliness between 50 and 64 points. In contrast, four subjects (21.1%) scored a moderately high degree of loneliness prior to the intervention. In addition, the number of individuals with a moderate level of loneliness between 35 and 49 points decreased from twelve subjects (63.2%) to six subjects (31.6%) on the post-intervention assessment. Furthermore, twelve participants (63.2%) post-intervention scored a low degree of loneliness between 25 and 34 points compared to three subjects (15.8%) during pre-intervention. One subject scored 24 points, which is below the category of a low degree of loneliness. Therefore, it was not included in any of the mentioned above categories. As a result, a low degree of loneliness became the most commonly observed on the post-intervention assessment instead of the moderate level of loneliness seen before the project implementation.

Changes in the UCLA Loneliness Scores

Legend: Pre-test, Post-test

- 25 - 34 points / Low Degree of Loneliness: 15.8%, 63.2%
- 35 - 49 points / Moderate Degree of Loneliness: 63.2%, 31.6%
- 50 - 64 points / Moderately High Degree of Loneliness: 21.1%, 0%

Furthermore, the most considerable reduction in the sum of scores on the post-intervention survey was observed in question 14, 'How often do you feel isolated from others?' by displaying a decrease of 28 points from pre-intervention, depicted in Table 2. This indicates that the PARO interactive sessions strongly influenced the reduction of social isolation in the selected participants.

Table 2. UCLA Loneliness Questionnaire - question responses breakdown

UCLA Loneliness Questionnaire	Pre-test response (sum of scores, n=19)	Post-test response (sum of scores, n=19)	Difference
1. How often do you feel that you are "in tune" with the people around you?	30	27	3
2. How often do you feel that you lack companionship?	51	37	14
3. How often do you feel that there is no one you can turn to?	36	31	5
4. How often do you feel alone?	49	33	16
5. How often do you feel part of a group of friends?	55	41	14
6. How often do you feel that you have a lot in common with the people around you?	37	32	5
7. How often do you feel that you are no longer close to anyone?	33	22	11
8. How often do you feel that your interests and ideas are not shared by those around you?	49	36	13
9. How often do you feel outgoing and friendly?	29	23	6
10. How often do you feel close to people?	38	27	11
11. How often do you feel left out?	32	22	10
12. How often do you feel that your relationships with others are not meaningful?	37	35	2
13. How often do you feel that no one really knows you well?	42	26	16
14. How often do you feel isolated from others?	58	30	28
15. How often do you feel you can find companionship when you want it?	33	34	-1
16. How often do you feel that there are people who really understand you?	32	31	1
17. How often do you feel shy?	48	40	8
18. How often do you feel that people are around you but not with you?	47	39	8
19. How often do you feel that there are people you can talk to?	32	23	9
20. How often do you feel that there are people you can turn to?	35	24	11

Results

Statistical Analysis: A paired T-test was used to detect changes in the pre- and post-intervention scores. The null hypothesis for the project was that the PARO interaction sessions would not reduce social isolation and loneliness in homebound older adults. The alternative hypothesis was that the PARO interactive sessions would reduce social isolation and loneliness in homebound older adults. The differences between the pre- and post-intervention scores were calculated by subtracting the post-test value from the pre-test value for each participant. The differences ranged between -1 and 22, with the mean difference being 10.59. The paired T-test showed a significant difference between pre- and post-intervention scores (t(18)=7.1667, p < 0.0001). Therefore, strong evidence of a difference between the pre- and post-scores was found. Consequently, this statistical analysis demonstrated that PARO interactive sessions reduced social isolation and loneliness in homebound older adults.

Conclusion

- PARO interactive sessions are effective in decreasing social isolation and loneliness in homebound older adults, as demonstrated by the significant reduction in the post-intervention UCLA Loneliness scores and the statistical analysis results of the paired T-test.
- The UCLA Loneliness Scale can be applied in the clinical setting as a screening tool to identify patients with poor social involvement and detect changes in their degree of social isolation and loneliness.
- Human-robot interactions elicited positive emotions and the feeling of joy in geriatric patients, supporting the benefits of using technologies for patient care in this population.
- PARO interactive sessions can potentially be utilized as a therapeutic approach to other patient populations and clinical settings due to the simplicity of the intervention, the substantial benefits seen in this and other evidence-based projects, and the lack of standardized approaches to address the social isolation and loneliness problem in the medical field.

Acknowledgments

References

Centers for Disease Control and Prevention (2021). *Loneliness and Social Isolation Linked to Serious Health Conditions.* https://www.cdc.gov/aging/publications/features/lonely-older-adults.html

Current Nursing (2020). *Roy's Adaptation Model.* https://currentnursing.com/nursing_theory/Roy_adaptation_model.html

Henning-Smith, C., Moscovice, I., & Kozhimannil, K. (2019). Differences in social isolation and its relationship to health by rurality. *The Journal of Rural Health: Official Journal of the American Rural Health Association and the National Rural Health Care Association, 35*(4), 540–549. https://doi-org.resu.idm.oclc.org/10.1111/jrh.12344

National Academies of Sciences, Engineering, and Medicine (2020). *Social isolation and loneliness in older adults: Opportunities for the health care system.* Washington, DC: The National Academies Press. https://doi.org/10.17226/25663.

National Institute on Aging (2020). *Understanding Loneliness, and Social Isolation: How to Stay Connected.* https://order.nia.nih.gov/sites/default/files/2021-01/understand-loneliness-and-social-isolation.pdf

Russell, D. W. (1996). UCLA Loneliness Scale (Version 3): Reliability, validity, and factor structure. *Journal of Personality Assessment, 66*(1), 20. https://doi-org.resu.idm.oclc.org/10.1207/s15327752jpa6601_2

Shibata, T., Hung, L., Petersen, S., Darling, K., Inoue, K., Martyn, K., Hori, Y., Lane, G., Park, D., Mizoguchi, H., Takano, C., Harper, S., Leeson, G. W., & Coughlin, J. F. (2021). PARO as a biofeedback medical device for mental health in the COVID-19 era. *Sustainability, 13*(20), 11502. https://doi.org/10.3390/su132011502

World Health Organization (2021). *Social Isolation and Loneliness Among Older People: Advocacy Brief.* ISBN 978-92-4-003074-9