

# A Kind of Snoezelen – Requirements for a Therapeutic Robot for Older Adults With Dementia According to Caregivers\*

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**Abstract**— Robot-assisted therapy has been researched for more than a decade and has been dominated by the seal shaped robot Paro. It is however unclear unto what extent the development of Paro has been based upon requirements that are mentioned by care professionals. In this pilot study we interviewed two groups of healthcare professionals: one that has been using Paro and one that has not been using Paro. We asked both for the requirements that would suit the target group of dementing inhabitants best and what the relation between these requirements and the stage of dementia was. Results show small differences between these groups, a clear link to other activities and also a demand for more variation in usable pet robots. Moreover, all professionals expressed the need for guidelines for robot-assisted therapy and the exchange of experiences.

## I. INTRODUCTION

Much research has been done on the use of robotic pets for older adults suffering from dementia, suggesting this is a successful form of therapy [1-4]. Although most research has been done in Japan (especially by Wada and Shibata) and with the same seal shaped robot called Paro, it is generally assumed it improves mental and physical wellbeing and results in a more active interaction of the subjects with their environment [5].

Although there are some alternatives [6-10], Paro is by far the most widely used robotic pet for this purpose. This could be due to the fact that Paro is the only robotic pet that is both especially developed for this purpose and commercially available. However, acquiring a Paro is quite an investment since it costs close to five thousand dollars [11]. Eldercare professionals that would like to try working with a robotic pet but have a very limited budget may look for alternatives.

These would be pet robots that would meet the requirements that would make them suitable for robot-assisted therapy.

In this explorative study we want to elicit and specify these requirements by focusing on professional caregivers working with older adults who suffer from dementia. These caregivers may have experience with similar types of interventions, like using real pet animals, stuffed animals or other techniques that stimulate the senses for which the term 'snoezelen' is used. Snoezelen is also called or Multi-Sensory Stimulation (MSS), and is a widely used and accepted approach to nursing home residents suffering dementia [12]. It was developed in the Netherlands (it is Dutch verb) but is becoming more popular in other industrialized countries. [13]. Snoezelen can be defined as an approach that actively stimulates the senses using light, sound, smell, touch and taste [14].



Figure 1. Paro

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The caregivers that are subject to our study may or may not be familiar with robot-assisted therapy. If they are not, this could be due to the unfamiliarity of the possibilities of this form of therapy, but also by the inaccessibility: for caregivers who are interested in applying this therapy, there are hardly any practical guidelines available on how to use which type of robot in which state of dementia, how to deal involve family members and how to respond to any negative responses. It could in that case very well be that a

comprehensible set of guidelines would lead to a wider application of robot-assisted therapy.

We also have to take into account that the caregivers who are familiar with robot-assisted therapy - and especially the ones who have been applying it - may give different responses when asked for the requirements for a suitable robot.

This paper presents the results of an explorative study at the very start of this project. The goal was to elicit and specify requirements according to professional caregivers for a pet robot that can be used in therapeutic interventions with older adults suffering from dementia. Moreover, we wanted to establish how the familiarity of this form of therapy and the experience of applying it would influence the elicitation and specification of these requirements.

In order to achieve this, we wanted to map (a) the familiarity of robot-assisted therapy, (b) the need for guidelines by professional caregivers in Spain and the Netherlands, and (c) produce an inventory of requirements for a suitable robot according to these caregivers.

In the following section we will present the project of which this study is a part. Next, in section III, we will discuss the used questionnaire and respondents. In section IV we will present the results of (a) questions on experience and guidelines and (b) the requirements inventory. In section V we will draw conclusions from this and subsequently we will present a brief discussion.



Figure 2. Alternative robotic pets

## II. NEW FRIENDS FRAMEWORK

The “New friends, old emotions” project is a Dutch-Spanish collaboration which targets the accessibility of robot-assisted therapy for caregivers that work with older adults suffering from dementia. Dutch government funding mainly finances it. Its first aim is to establish the need for guidelines for robot-assisted therapy by caregivers.

Furthermore, it targets an inventory of (1) experiences that some caregivers already have with robotic pets, (2)

available pet robots and their suitability for this form of therapy, and (3) practices by caregivers that can be related to this form of therapy (e.g. using stuffed animals, real pets and activities that otherwise stimulate the senses of the subjects). Moreover, it aims to use the findings of these studies to provide guidelines and to offer supportive workshops for robot-assisted therapy.

The consortium that carries out this project, consists of Dutch and Spanish universities that have technical experience with (pet) robots, experience with field studies concerning older adults, or specific expertise in both studying and working with older adults suffering from dementia. Also a part of the consortium is eldercare institutions in different cities of the Netherlands. The project management is carried out by the Robotics research group of Windesheim Flevoland University of Applied Sciences in Almere, the Netherlands.

TABLE I. QUESTIONNAIRE ITEMS

1. Have you ever heard, seen or read about the use of a pet robot for older adults suffering from dementia?	
2. Have you ever used such a robot?	
Ye	2a. Did you use specific directives?
s:	Yes: which ones and how did you get them? No: Why not? Would you like to have directives?
	2b. Did you involve family members? Yes: Did it go well? Did you use directives? No: Would you want to? Why would or wouldn't you?
No	2c. Would you like to work with it? 2d. What would hold you back or stimulate you?
Please indicate how much you agree with the following statements:	
3. I believe that activities with pet-like robots may increase the quality of life for people suffering from dementia.	
4. I (would) like to work with such robots	
5. I find it important that there are directives for interventions with such robots	
6. These directives should also make it possible for family members to do these interventions	
7. What possibilities and properties should suitable pet robot have?	
a.	What features and qualities are necessary?
b.	What features and qualities are desirable?
c.	How do you expect that older people respond to these properties?
d.	Which expressions are important? (eg facial expression wagging tail etc)
e.	Why?
8. What possibilities and properties should a suitable pet robot certainly not have?	

## III. QUESTIONNAIRE AND PARTICIPANTS

To establish our goal, we decided to gather both qualitative and quantitative data from questionnaires with caregivers that worked in eldercare institutions in the cities of

Almere and Lelystad in the Netherlands and in the city of Madrid in Spain. The caregivers in the Netherlands had no experience in working with a pet robot, while all of the professionals in Madrid had worked with Paro.

The 11 caregivers from the Netherlands were all professionals, aged 19 to 58. They had a lower or higher professional education and they were all female. The 8 caregivers from Spain were aged 25 to 58. They were also female professionals except for one male professional, and they reported to have an education that varied from lower professional to university.

The respondents were asked to fill out the questionnaire individually. This questionnaire (see Table 1) consisted of (a) questions on knowledge of and experience with robot-assisted therapy and (b) the need for guidelines and (c) questions on requirements for suitable robots. Four of the questions (in the listing in Table 1 these are questions 3 to 6) were actually statements to be replied to on a five point Likert scale, indicating the extent to which they agreed (absolutely agree – agree – neutral – not agree - absolutely not agree). The respondents were aware that the answers on this scale corresponded with an attributed score, varying from 5 (totally agree) to 1 (totally not agree).

After the questionnaires were filled out, the respondents had a chance to elucidate their answers in a conversation with one of the researchers. These were recorded.

#### IV. RESULTS

##### A. Experience and guidelines

Most caregivers were more or less familiar with robot-assisted therapy. Of course, those from Madrid had even applied it, but nine out of eleven from the Netherlands had seen a short television documentary on this subject. Four of them compared it to their own experiences with real pets. In one case this was a dog, but the other three who all worked at the same eldercare institution in the city of Lelystad, reported that they held a real cat on their floor. This floor was made to look like a real street with houses and even a bus stop in the seventies. They reported positive effects of cuddling sessions with the cat, but also expressed that a robotic cat would be more beneficial, since it would always be willing to be cuddled.

Four other caregivers reported the use of stuffed animals to be more or less familiar, but even more the practice of “snoezelen”, which aims to evoke emotions by stimulating the senses. The expected robot-assisted therapy to be beneficial since it could also evoke emotions.

All caregivers expressed the need for guidelines and stated that robot-assisted therapy would be far more widely applied if these would be commonly available. Some indicated that guidelines were especially needed for dealing with unexpected responses that could also occur with similar activities that evoke emotions. They indicated that occasionally it could evoke anger, panic or sadness.

Moreover some caregivers from the Netherlands reported that with familiar activities there could sometimes be resistance, reluctance or even animosity by family members who experienced it as humiliating or insulting to see their fathers or mothers playing with stuffed animals and this could also be expected if it were robotic pets. How to deal with this, should also be part of a set of guidelines.

As Table II shows, the scores on the four Likert scale statements were generally “agree” or “totally agree”. For each statement there were only one or two “neutral” scores.

TABLE II. SCORES ON ITEMS 3 TO 6

	Minimum	Maximum	Mean	Std. Deviation
Item 3	3	5	4,21	,535
Item 4	3	5	4,53	,612
Item 5	4	5	4,68	,478
Item 6	3	5	4,32	,671

Table III shows an analysis of the differences between caregivers with and without experience with Paro. For item 4 there is a significant difference: the caregivers without experience score higher on the intention to work with a robot than the ones with experience.

TABLE III. DIFFERENCE IN EXPERIENCE FOR ITEMS 3 TO 6

	Item 3	Item 4	Item 5	Item 6
Mann-Whitney U	30,000	18,000	39,500	26,000
Sig	,156	,014	,645	,101

Table IV shows the (Spearman) correlation on the scores for items 3 to 6 plus age of the caregivers. There is significance for the correlation between Age and Item 6 and between Items 3 and 4. The first correlation could indicate that older caregivers are more willing to involve family members than younger ones. The second correlation is a predictable one: the more caregivers believe in using pet robots, the more they are willing to work with it.

TABLE IV. CORRELATION ITEMS 3 TO 6 AND AGE

	Item 3	Item 4	Item 5	Item 6	Age
Item 3 Correlation	1,000	,532*	,254	,093	-,118
Sig. (2-tailed)	.	,019	,294	,706	,632
Item 4 Correlation	,532*	1,000	,380	,277	,186
Sig. (2-tailed)	,019	.	,109	,251	,447
Item 5 Correlation	,254	,380	1,000	,411	-,010
Sig. (2-tailed)	,294	,109	.	,081	,966
Item 6 Correlation	,093	,277	,411	1,000	,461*
Sig. (2-tailed)	,706	,251	,081	.	,047

## B. Requirements

We had asked the caregivers to indicate which requirements were necessary and which ones were desirable. We tried to combine familiar descriptions so we could easily quantify the results. For example, some caregivers indicated the skin should be soft, some said it should be furry and some indicated it should be ‘pettable like a real animal skin’. All these were categorized under ‘soft pettable fur’ (listed as requirement 1).

TABLE V. REQUIREMENTS FOR CAREGIVERS WITH AND WITHOUT EXPERIENCE WITH PARO

Mentioned requirements	Exp	Not	Total
1. Soft pettable fur	1/-	10/-	11/-
2. Appropriate responses/sounds	2/-	7/5	9/5
3. Mechanical parts are noiseless	-/-	7/2	7/2
4. Young or innocent looking.	4/-	2/1	6/1
5. Huggable (right size cuddle with)	-/-	6/-	6/-
6. Realistic movements (fluent/natural)	1/-	4/2	5/2
7. Looks like a real life pet	5/1	-/-	5/1
8. Able to shut functions on/off independently	1/-	2/1	3/1
9. Autonomous system	-/1	3/-	3/1
10. Mobile (easy to take with you)	2/-	1/-	3/-
11. Can withstand rough handling, solid	1/-	2/-	3/-
12. Easy to use	2/-	-/-	2/-
13. Variety of behaviors and sounds	2/1	-/-	2/1
14. Fur is detachable (to be washed)	-/-	2/-	2/-
15. Responsive to the user	1/1	-/-	1/1
16. Makes realistic sounds	1/-	-/-	1/-
17. Cartoonish appearance	-/-	1/-	1/-

Numbers indicate the counts for necessary/desirable items

Also answers that were given to question 8 could be processed, since they consistently were the reversed versions of the positive expressions. For example, it was often indicated that the robot should not be noisy which is essentially the same as requirement 3 (mechanical parts are noiseless) and a remark ‘It should really not be to breakable’ could be categorized under 11 (can withstand rough handling). All these requirement counts that were derived from answers to question 8 where categorized as necessary.

In many cases features were mentioned repeatedly, both as necessary and desired features and sometimes even again in reversed descriptions answering question 8. In that case, the requirement was only counted once as a necessary feature.

One participant simply stated that the robotic pet should stimulate the user. We could not count this remark as a requirement.

Table V shows the results of this count, for the caregivers that had worked with Paro (Exp) and the ones with no such experience (Not), followed by the total counts. Note that each cell contains the counts for necessary (before the slash) and desired (after the slash) requirements.

The ‘soft pettable fur’ was mentioned in different characterizations by almost each caregiver of the group with no experience and the noiseless mechanical parts by most of them. Some of them mentioned detachable fur (which is actually hardly found for robotic pets). The caregivers with experience mentioned comparatively much that it should look young and innocent and resemble a real life pet.

However, in general the appearance related features were mentioned far more often by the caregivers without experience, even if the larger group size (11 versus 8) is taken into account. As Table VI shows, for other categories the difference in counts is fairly consistent with the difference in-group size.

TABLE VI. CATEGORIZED REQUIREMENTS

Category of mentioned requirements	Exp	Not	Total
The way it appears (1,3-5,7,17)	10/1	26/3	36/4
The way it is used (8-12,14)	6/1	10/1	16/2
The way it behaves (2,6,13,15,16)	7/2	11/7	18/9

## V. CONCLUSIONS

We may conclude that most of the caregivers were familiar with robot-assisted therapy. Moreover, they were generally quite willing to apply it if they did not already do.

Remarkably they easily linked this form of therapy to familiar activities, like working with real pets, stuffed animals and evoking emotions by stimulating the senses.

Also, caregivers generally agreed on the need for guidelines.

Looking at the generated list of requirements we see that a soft pettable fur is mentioned often especially by the caregivers without experience. Remarkable is that the noiselessness of the mechanical part is only mentioned by caregivers without experience.

This list contains 17 items that can be prioritized according to the necessity as indicated by the participants, but also by the frequency.

## VI. DISCUSSION AND FURTHER RESEARCH

We have interviewed caregivers from four different eldercare institutions, three of the in or near Almere. This makes it impossible to state that most caregivers in the Netherlands are familiar with robot-assisted therapy. Nevertheless it is remarkable that at the visited institutions, this form of therapy was known and that caregivers were willing to work with it. However, in further research it would be advisable to obtain a larger and more differentiated group of participants.

Moreover, we have to take into account that all the caregivers from Madrid were experienced and the ones in the Netherlands were not. We are not aware of cultural differences that could be of influence in this context, but research would certainly benefit from a mix of experienced and inexperienced caregivers from both countries.

Further research could focus on the specification of found requirements. We could take this list and ask caregivers to attribute a weight to them. Subsequently we could use this list to compare different robotic pets and establish their suitability for robot-assisted therapy. Moreover we could use it to develop a more affordable robotic pet if it does not appear to be available.

Also the finding that caregivers without experience with robot therapy have a higher intention to work with a robot than the ones who have experience with it needs further research. It could be related to the curiosity of the caregivers without experience, but also there could be a certain disappointment with the experienced ones. In the latter case we would need to find out what experience leads to this disappointment.

One of the most prominent findings of this study could be the fact that many caregivers from the Netherlands spontaneously linked robot-assisted therapy to activities like working with real pets, stuffed animals and evoking emotions by stimulating the senses (snoezelen). When developing guidelines we could indeed observe the experience they have with these activities and establish if they could be applied to the use of robotic pets.

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