Perception of Rehabilitation Patients in Malaysia towards Animal Robot PARO

Winal Zikril Zulkifli[1, *], Syamimi Shamsuddin[1], Lim Thiam Hwee[2], Fairul Azni Jafar[1] and Nur Syafiqah Rayme[1]

[1]Faculty of Manufacturing Engineering, Universiti Teknikal Malaysia Melaka, Hang Tuah Jaya, Melaka, Malaysia
[2] Psychosocial Department, SOCSO Tun Razak Rehabilitation Center (TRRC), Hang Tuah Jaya, Melaka, Malaysia

[*]Corresponding e-mail: syamimi@utem.edu.my

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ABSTRACT – Robotics application in mental healthcare are on the rise worldwide, but in Malaysia, the awareness is still low. Thus, the aim of this study to investigate the perception of Malaysians towards PARO, a robotic seal. A survey with ten questions were administered to 12 patients at a rehabilitation centre. Results were tested with Kuder-Richardson 20 (KR-20) test for reliability and Chi-square analysis for validation. Statistically, 80% of the respondents gave positive response on their emotions and acceptance of PARO as a robot. This shed encouraging light on future applications of animal robots during therapy for rehabilitation patients in Malaysia.

1. INTRODUCTION

The world is constantly evolving, and as a result, advances in technology are essential. Robots have been given a role in society from entertainment, service application to factory automation and applications in the medical field. Robots have been used in social interaction [1]. To investigate the relationship between human and robot, human-robot interaction (HRI) field has been introduced. HRI is a field of study committed to design, understand and examines the framework of robotics for use by humans. HRI usually use social robots as the medium of interaction. Social robots have been used to treat patients with a mental disability such as dementia, autism and Alzheimer [2].

Social robot PARO (Figure 1) has been used at nursing care facilities to treat patients with dementia [3]. PARO features a soft furry coat with built-in intelligence providing psychological, physiological and social effects through physical interaction with humans.With promising results in mental healthcare, PARO has been chosen for this research in the field of rehabilitation. The aim of this survey is to determine the response and acceptance of rehabilitation patients in Malaysia when exposed to an animal-robot PARO for the first time.

Figure 1 Animal-robot PARO

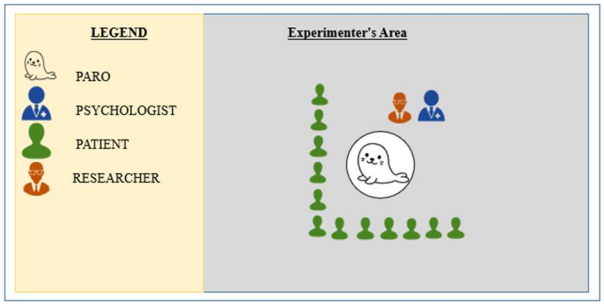

Figure 2 Group therapy layout

2. METHODOLOGY

A survey was conducted on 12 patients undergoing rehabilitation therapy at SOCSO Tun Razak Rehabilitation Center (TRRC) in Melaka, during a weekly group therapy session with a psychologist. All patients gave consent to participate. Figure 2 shows the arrangement during the session. First, the researcher explained about PARO's sensors and abilities, followed by a demonstration for 10 minutes.

Then, the patients were given a chance to interact freely with PARO. Each patient got the chance to personally touch, stroke, hug and talk to PARO. Finally, the survey with ten questions was given to the patients after the interaction. The constructed questions were constructed based on expert advice from an expert in human-robot interaction and psychologist at TRRC. The question topics are shown in Table 1. The first two questions asked about previous experiences with animals. Question 3 until Question 10 covers the patient's opinion and feelings related to PARO, the robotic animal. Respondents gave answers either '*yes*' or '*no*'.

Table 1 List of ten questions in the survey

1.	**Ever own pets?**	**6.**	**PARO looks alive.**
2.	**Do you like animals?**	**7.**	**Feel calm with PARO.**
3.	**PARO is cute.**	**8.**	**Meet PARO again.**
4.	**Like to touch PARO.**	**9.**	**Want to own PARO?**
5.	**Happy with PARO.**	**10.**	**PARO is a robot.**

3. RESULTS AND DISCUSSION

The survey results were analysed in statistical form. To validate the questionnaire, a test of reliability has been done. The resulting nominal data was tested using Kuder-Richardson 20 (KR-20) which is a good option to analyse

reliability with nominal data [4]. The formula used to calculate KR-20 is shown in (1), where n equals to sample size for the test, σ^2 equal to the variance for the test, p equals to the proportion of people passing the item, q is the proportion of people failing the item, and Σ is the sum up. The value obtained from KR-20 is 0.990. In general, a score more than 0.9 is considered as excellent reliability [5]. High reliability of the questions reflects the data consistency.

$$\rho_{KR20} = \frac{k}{k-1}\left(1 - \frac{\sum_{j=1}^{k} p_j q_j}{\sigma^2}\right) \quad (1)$$

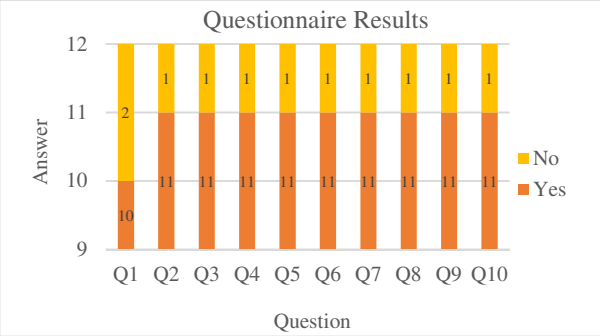

Figure 3 Recorded results for given questionnaire

Results are recorded in a bar graph. As shown in Figure 3. 83% of the respondent chose '*yes*' for the first question (Q1). On the other hand, from question 2 (Q2) until question 10 (Q10), 91.67% answered '*yes*'. The first question suggests that ten respondents had the experience of owning pets. For the second question, 11 respondents like animals. This is important as PARO is a robot modelled after an animal.

Henceforth, questions Q3 until Q10 directly reflect on how participant perceive PARO as an animal robot. Surprisingly, even after the first time interacting with PARO, the participants like to interact with it. They expressed their interaction by touching, stroking and even greeting. Naturally, this interaction influences the answer in the survey. The physical observation of the robot is asked on Q3, Q4, Q6 and Q10. Most respondents think PARO is cute, the like touching it and thinks it looks alive. Next, questions Q5, Q7, Q8 and Q9 focuses on their feelings toward PARO. Then again, the answers are mostly positive. The participants felt happy and calm while interacting with PARO. Given these points, they want to meet PARO again as the interaction pleased them, and even want to own PARO as their robot.

Statistical analysis for categorical type data using Chi-square is conducted to test for statistical validation. With a small sample size of 12, Fisher's Exact Test is a suitable choice for testing in Chi-square.

Table 2 Chi-square analysis for questionnaire results

Fisher's Exact Test (for sample size <20)		
Sample	Question Pair	P- value
1	Q2 & Q5	0.083
2	Q4 & Q7	0.083
3	Q1 & Q8	0.167

From 10 questions, only 3 pairs of question are relevant for testing. This test aims to find question's relationship for physical interaction and behaviour response. Using Fisher's Exact Test, two questions are tested for each sample (Table 2). Fisher's Exact Test of independence results for all sample are statistically not significant. The null hypothesis indicates that there no association between questions. For sample 1 it proposed that people who like animal do not influence their perception to with happiness. On sample 2, there is no association between the interaction of touching the PARO and felt calm during the interaction. Finally, for sample 3, the question of ownership of pet animal does have the relation between the intention to meet PARO again. The test results suggest that there are no relation between direct interaction and conscious experience.

4. CONCLUSION

This paper presents an initial survey on the acceptance of an animal-robot by rehabilitation patients in Malaysia. Majority of the respondents were able to accept animal-robot PARO during their first encounter with this robot. The constructed survey also has the high score of reliability. In the statistical analysis, all null hypothesis is accepted. This study able to extract initial response form rehabilitation patients toward animal-robot in human-robot interaction (HRI) perspective. In the future research, PARO is intended to use as an assisted robot therapy for rehabilitation patients with post-stroke depression.

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