Comparison on Negative Attitude toward Robots and Related Factors between Japan and the UK

Tatsuya Nomura

Department of Media Informatics,

Ryukoku University

1-5, Yokotani, Seta-ohe-cho,

Otsu, Shiga 520-2194, Japan

nomura@rins.ryukoku.ac.jp

Abstract

As one of further researches on cross-cultural comparison on attitudes toward robots, an online survey was conducted in Japan and the UK, using the Negative Attitudes toward Robots Scale and items on perceptions of the relation to the family and commitment to religions. The results found some differences on the attitudes between the nations and age groups, and correlations between the attitudes, perceptions of the relation to the family, and commitment to religions only in specific nation and age groups.

Author Keywords

Attitudes toward robots; perceptions of the relation to the family; commitment to religions; age

ACM Classification Keywords

H.1.2 [User/Machine Systems]: Human factors

Introduction

Negative Attitudes toward Robots Scale (NARS) is a psychological scale to measure humans' attitudes toward robots, that is, psychological states reflecting opinions that people ordinarily have about robots [3]. Since the development of this scale, some research

works have found influences of negative attitudes into human perception and behaviors toward robots, and factors affecting these attitudes [2,4,7,9].

Moreover, some studies used this scale to explore cultural differences on attitudes toward robots. Bartneck, et al., [1] suggested cultural differences on the NARS scores through an international comparative survey among seven different countries. Wang, et al., [8] found in their experiment of human-robot interaction that Chinese participants had more negative attitudes toward robots than did the USA, and relied less on the robot's advice.

As one of further researches on cross-cultural comparison on attitudes toward robots, an online survey using the NARS was conducted in Japan and the UK. The survey aimed at verifying differences on attitudes toward robots between these nations and exploring factors influencing these attitudes. As factors to be explored, the survey firstly focused on age. In the survey conducted in Japan about ten years ago, our research group found that 40's persons had positive opinions of robots in comparison with other generations [5]. Thus, the survey aimed at comparison between 50's and 20's to clarify age differences. Moreover, perceptions of the relation to the family and commitment to religions have been adopted as indices reflecting differences between societies in different nations [6]. The survey included these two factors.

Method

Date and Participants
The survey was conducted from January to February, 2014. 100 Japanese and 100 UK respondents were recruited by a survey company at which about one million and six hundred thousand Japanese and one million and one hundred thousand UK persons have registered. Respondents in each nation were limited to people who were born and had been living only in the corresponding nation. The respondents consisted of fifty persons in 20's (male: 25, female: 25) and fifty persons in 50's (male: 25, female: 25) in each of the nations.

The homepage of the online survey had been open for these participants during the above period.

Survey Design
The questionnaire of the online survey was conducted with the native language for the respondents in each of the nations. It did not instruct the definition of robots, or include any photo and image of robots. The questionnaire consisted of the following items.

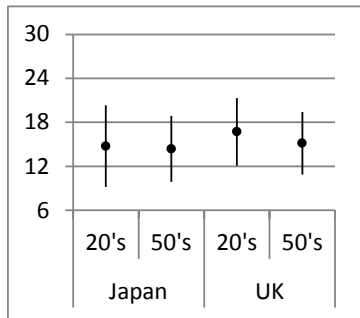PERCEPTIONS OF THE RELATION TO THE FAMILY AND COMMITMENT TO RELIGIONS

The following two items, which were used in the comparison survey between Japan and the Northern Europe by Otsuka et al. [6], were presented on the face sheet:

Do you think you relate to your family members?
(five-graded answer from "1. I completely agree" to "5. I completely disagree")
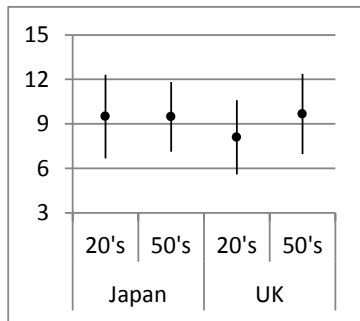
Does such notion as "I have nothing to do with religion or faith" apply to you?
(five-graded answer from "1. It strongly applies to me" to "5. It does not apply to me at all.")

NEGATIVE ATTITUDES TOWARD ROBOTS SCALE (NARS)

The scale consists of 14 items classified into three subscales. The first subscale (S1, six items) measures negative attitude toward interaction with robots (e.g., "I would feel paranoid talking with a robot."). The second subscale (S2, 5 items) measures negative

30
24
18
12
6

| 20's | 50's | 20's | 50's |
| Japan | | UK | |

Interaction with robots

15
12
9
6
3

| 20's | 50's | 20's | 50's |
| Japan | | UK | |

Emotional interaction

Figure 1. Means and Standard Deviations of the NARS Subscale Scores

attitude toward the social influence of robots (e.g., "Something bad might happen if robots developed into living beings."). The third subscale (S3, 3 items) measures negative attitude toward emotional interaction with robots (e.g., "I feel comforted being with robots that have emotions."). Each item is scored on a five-point scale: 1) strongly disagree; 2) disagree; 3) undecided; 4) agree; 5) strongly agree, and an individual's score on each subscale is calculated by adding the scores of all items included in the subscale, with some items reverse coded.

Results

NARS Scores, Nations, and Age Groups
Cronbach's α-coefficients of the NARS subscales were .854, .779, and .842 on S1, S2, and S3, respectively. These values showed the sufficient internal consistencies of these subscales.

ANOVAs with nations (Japan v.s. the UK) x age groups (20's v.s. 50's) found statistically significant levels of the main effect of nations on negative attitude toward interaction with robots ($F(1, 196) = 4.073$, $p = .045$, $\eta^2 = .020$), and interaction effect on negative attitude

toward emotional interaction with robots ($F(1, 196) = 4.743$, $p = .031$, $\eta^2 = .023$). Figure 1 shows the means and standard deviations of these subscale scores. The UK respondents had more negative attitude toward interaction with robots than did the Japanese respondents. A simple main effect test with Bonferroni's method revealed that the UK respondents in 20's had less negative attitude toward emotional interaction with robots in comparison with the UK respondents in 50's and the Japanese respondents in 20's.

Perceptions of the relation to the family and commitment to religions
Table 1 shows Pearson's correlation coefficients between the NARS subscale scores and item scores of perceptions of the relation to the family and commitment to religions based on the nations and age groups. Tests of equality on correlation coefficients found a statistically significant difference between the four respondents groups on the correlation between negative attitude toward interaction with robots and perception of the relation to the family ($\chi^2(3) = 8.824$, $p = .032$), differences at statistically significant trend levels on correlations between negative attitude toward

			Religion commitment	Interaction	Social influences	Emotional interaction
Perception of the relation with the family	Japan	20's	.254	-.061	-.130	.240
		50's	.012	.374**	.218	-.017
	UK	20's	.043	-.048	-.079	-.056
		50's	-.040	.348*	.311*	.289*
Commitment to religions	Japan	20's		-.052	-.096	.000
		50's		-.014	.298*	.068
	UK	20's		-.042	-.196	.218
		50's		.115	.107	.047

Table 1. Correlation Coefficients between the NARS Subscales, Perception of the Relation with the Family, and Commitment to Religions (*$p < .05$, **$p < .01$)

social influences of robots and perception of the relation to the family ($\chi^2(3) = 6.962$, $p = .073$), and between negative attitude social influences of robots and commitment to religions ($\chi^2(3) = 7.101$, $p = .069$).

Discussion

There was a trend, which was not found in the previous study [1], that the UK people had more negative attitudes toward interaction with robots than did the Japanese people. Moreover, the elder people perceiving weaker relation to their family members had more negative attitude toward interaction with robots in both the nations. The elder UK people perceiving weaker relation to their family members also had more negative attitude toward social influences of robots, and the elder Japanese people having stronger commitment to religions had more negative attitude toward social influences. These results suggest that factors influencing negative attitudes toward robots may differ dependent on cultures and age.

The survey reported here was at a preliminary level, and did not take into account concrete attitudes toward the relation to the family and commitment to religions. Moreover, the survey did not adopt any image stimulus of robots in order to avoid influences of images of specific types of robots. Future surveys should include more sophisticated items while exploring dominant images of robots in the corresponding nations.

References

[1] Bartneck, C., Suzuki, T., Kanda, T., and Nomura, T. The Influence of People's Culture and Prior Experiences with Aibo on their Attitude towards Robots. *AI & Society, 21*, 1-2 (2007), 217-230.

[2] Cramer, H., Kemper, N., Amin, A., Wielinga, B., and Evers, V. 'Give me a hug': the effects of touch and autonomy on people's responses to embodied social agents. *Computer Animation and Virtual Worlds, 20* (2009), 437-445.

[3] Nomura, T., Suzuki, T., Kanda, T., and Kato, K. Measurement of Negative Attitudes toward Robots. *Interaction Studies, 7*, 3 (2006), 437-454.

[4] Nomura, T., Suzuki, T., Kanda, T., Yamada, S., and Kato, K. Attitudes toward Robots and Factors Influencing Them. *New Frontiers in Human-Robot Interaction*, John Benjamins Publishing (2011), 73-88.

[5] Nomura, T., Tasaki, T., Kanda, T., Shiomi, M., Ishiguro, H., and Hagita, N. Questionnaire-Based Social Research on Opinions of Japanese Visitors for Communication Robots at an Exhibition. *AI & Society*, *21*, 1-2 (2007), 167-183.

[6] Otsuka, M., Akiyama, M., Mori, K., and Hoshino, H. Comparative Study of Values, Work Ethics, and Lifestyles in Japan and Sweden: An Initial Report. *Bulletin* of *Human Science, 33* (2011), 105-119. (in Japanese).

[7] Riek, L.D., Rabinowitch, T-C., Bremner, P., Pipe, A.G., Fraser, M., and Robinson, P. Cooperative gestures: effective signaling for humanoid robots. *Proc. 5th ACM/IEEE Int. Conf. Human-Robot Interaction* (2010), 61-68.

[8] Wang, L., Rau, P-L.P., Evers, V., Robinson, B.K., and Hinds, P. When in Rome: the role of culture & context in adherence to robot recommendations. *Proc. 5th ACM/IEEE Int. Conf. Human-Robot Interaction* (2010), 359-366.

[9] Weiss, A., Bernhaupt, R., Tscheligi, M., and Yoshida, E. Addressing user experience and societal impact in a user study with a humanoid robot. *Proc. 1st Symposium on New Frontiers in Human-Robot Interaction* (2009), 150-157.