Adaptation of the Cognitive and Affective Trust in Human–Robot Interaction Questionnaire to Slovak

Anna Karikó-Tóth¹, Igor Farkaš²

 ¹ Faculty of Education and Psychology, Eötvös Loránd University, Budapest
² Faculty of Mathematics, Physics and Informatics, Comenius University Bratislava karikoanna@student.elte.hu, farkas@fmph.uniba.sk

Abstract

This study presents the Slovak translation and psychometric validation of the Cognitive and Affective Trust in Human–Robot Interaction (HRI) questionnaire, originally developed by Bernotat et al. (2021). Slovakspeaking university students (n = 46) evaluated 20 items on a 7-point Likert scale as part of a larger study. An exploratory factor analysis revealed a moderately replicable two-factor structure. However, a unidimensional construct was ultimately favoured due to theoretical overlap and item cross-loadings. The final 17-item scale demonstrated strong internal consistency (Cronbach's α = .872), supporting the use of the questionnaire in future HRI research.

1 Introduction

Understanding human attitudes toward robots is essential for designing effective and positive human–robot interaction (HRI) experiments. One important framework for interpreting such attitudes is the Computers Are Social Actors (CASA) paradigm proposed by Nass and Moon (2000). According to CASA, people tend to apply social rules and expectations to computers and robots just as they would in human–human interaction.

Trust plays a critical role in the success of HRI, shaping user behaviour, expectations, and engagement. Definitions of trust vary, but most researchers highlight the uncertainty of the situation, the vulnerability of the trustor and expectations toward the trustee as central concepts (Mayer et al., 1995; Onnasch and Hildebrandt, 2021).

According to Rempel et al. (1985), there are two key dimensions of trust in human-human interactions: (1) cognitive trust, which is based on perceived reliability and competence and (2) affective trust, which is based on perceived emotional connection or sincerity. These constructs can be assessed using validated questionnaires. However, to date, Slovak versions of trustrelated questionnaires in HRI are lacking.

This study aims to fill that gap by translating and validating the Cognitive and Affective Trust in HRI questionnaire for Slovak speakers.

2 Methods

2.1 Participants

46 Slovak-speaking university students (male: n = 22, female: n = 24; age: M = 21.9, SD = 2.12) participated voluntarily for course credit. The study received ethical approval from the Ethics Committee of the Faculty of Mathematics, Physics and Informatics of Comenius University Bratislava as part of a larger study. All participants provided informed consent. Data were anonymised before analysis.

2.2 Measure

The Cognitive and Affective Trust in HRI Questionnaire (Bernotat et al., 2021) contains 20 items, which are rated on a 7-point Likert scale (1 ="I do not agree at all" to 7 = "I fully agree"). It includes 10 items per subscale (Cognitive and Affective Trust), with items 9 and 10 reversed.

2.3 Translation Process and Procedure

The original Cognitive and Affective Trust in HRI Questionnaire was forward-translated into Slovak using DeepL and reviewed by Slovak-speaking professionals for accuracy and clarity. A backward translation to English was conducted to verify conceptual equivalence. Recent research supports the use of large language models for questionnaire translation when combined with expert review to ensure linguistic and cultural appropriateness (Haavisto and Welsch, 2024; Sørensen et al., 2025).

Participants took part in a larger study examining trust and attitude in HRI. As part of the procedure, they completed the CAT questionnaire along with other measures, both before and after engaging with a humanoid robot in a virtual reality setting. Responses from the two time points were averaged and used in the exploratory factor analysis.

3 Results

Prior to analysis, item-total statistics were examined. Three items (8–10) were removed due to low or negative corrected item-total correlations (.069, -.123, and .163), which improved internal consistency ($\alpha = .83$). Exclusion of these items was supported by semantic and structural differences of the items from the rest of the questionnaire.

An exploratory factor analysis (EFA) using maximum likelihood extraction with Varimax rotation was conducted on the remaining 17 items. Sampling adequacy was confirmed (*KMO* = .724), and Bartlett's test was significant, $\chi^2(136) = 423.36$, p < .001. The two-factor solution was moderately consistent with theoretical expectations about the cognitive and affective components of trust, however, several items loaded onto both factors, and the distinction between the factors was unclear. Therefore, trust was considered as a single, overall construct in subsequent analyses.

The final scale that contained 17 items showed great internal consistency (Cronbach's α = .872), supporting its reliability for capturing general trust in human–robot interactions.

4 Discussion

This study provides initial evidence for the reliability of the Slovak version of the Cognitive and Affective Trust in HRI questionnaire. Although the original two-factor structure was partially observed, a unidimensional approach was proposed.

These findings align with recent discussions in the HRI literature that view trust as a fluid and multidimensional construct shaped by individual differences, robot characteristics, and contextual factors (Natarajan and Gombolay, 2020; Mou et al., 2020; Corrales-Paredes et al., 2023). Further studies should explore confirmatory factor structures and validate this scale in different populations and contexts. A thorough examination of the items' semantic and syntactic characteristics could also be helpful in understanding the underlying concepts of affective and cognitive trust.

5 Conclusion

The Slovak version of the Cognitive and Affective Trust in Human–Robot Interaction questionnaire is a psychometrically sound tool for assessing trust in robotic agents. While the current findings support its internal consistency and overall reliability, additional research is necessary to explore its dimensional structure more thoroughly and explore the cognitive and affective components of trust in Slovak-speaking populations.

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