

# Challenges in Measuring Attitudes toward Social Robots

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## Abstract

The present article describes the preliminary findings from an ongoing narrative review work, which aims to understand the current status of the attitude construct in human-robot interaction (HRI) research. It critically examines the conceptualization and measurement of attitudes used in the empirical studies.

## 1. Introduction

A grand challenge in human-robot interaction (HRI) is designing relatable robots that can build and maintain positive social relationships as well as keep humans motivated to interact with them.

**What is done to overcome these challenges?** Endowing social robots with humanlike sociocognitive capacities.

**Does it solve the problem?** No, their display on robots can convey only an **impression** of their social intelligence. The human partner is largely responsible for establishing the common ground during interaction (Thellman & Ziemke, 2021).

**What should be done?** Accurately identifying users' attitudes toward their robot partners and interacting with them.

## 2. Purpose

We aim to understand the current status of the attitude construct (i.e., how attitudes are represented) in HRI research.

## 3. Method

**Identification** Extracting titles, abstracts, and full-texts of the empirical studies published in prominent journals of HRI (e.g., Int J of Soc Rob) via Scopus Document Search

**Research keywords** ("attitude\*" OR "opinion\*" OR "belief\*" OR "intention\*" OR "perception\*" OR "emotion\*") AND ("robot\*" OR "social robot\*") AND ("interaction\*" OR "human-robot interaction\*" OR "hri")

### Exclusion criteria

- Not published before 2003
- Did not use social robots
- Used a non-quantifiable measure
- Used secondary data (e.g., the Eurobarometer survey)

**Included** n = 233

## 4. Preliminary Findings

### 1. Some general observations:

- Attitudes as the outcome (~80%)
- Various social robots in use: NAO, Pepper, iCub and more
- Exposure to social robots in different ways
  - direct
  - indirect (video-mediated, observer)
  - no exposure

**2. Interchangeable concepts:** Attitude, belief, opinion, intention, perception, emotion.

**3. Measurement before concept definition:** Principle of compatibility (Ajzen et al., 2018)

Attitude object: a robot or **the robot**

Attitude object: buying/learning from robots

**4. Attitude-behavior consistency:** Matched specificity of attitude object and behavior under consideration improves the **low** attitude-behavior consistency observed in the field.

**5. Measurement before concept definition:** **Stability of attitudes:** Conceptualizations of attitudes range from structures stored in long-term memory to dynamic, time-dependent constructions built in the situation (Bohner & Dickel, 2011). Yet, most studies did not measure to what extent the attitude they were interested in was stable.

**6. Measurement before concept definition:** **Context sensitivity of attitudes:** Most studies disregarded the dynamism of attitudes, especially in terms of context malleability.

**7. Reliability of attitude measures:**

- Validation and norming with representative samples are rare practices
- Single-item vs. multiple-item scales

## Conclusions So Far

The field can benefit from

- better concept definitions
- practices that lead to improved reliability in measurement
- bringing attitude characteristics such as strength and accessibility into the scene

## References

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