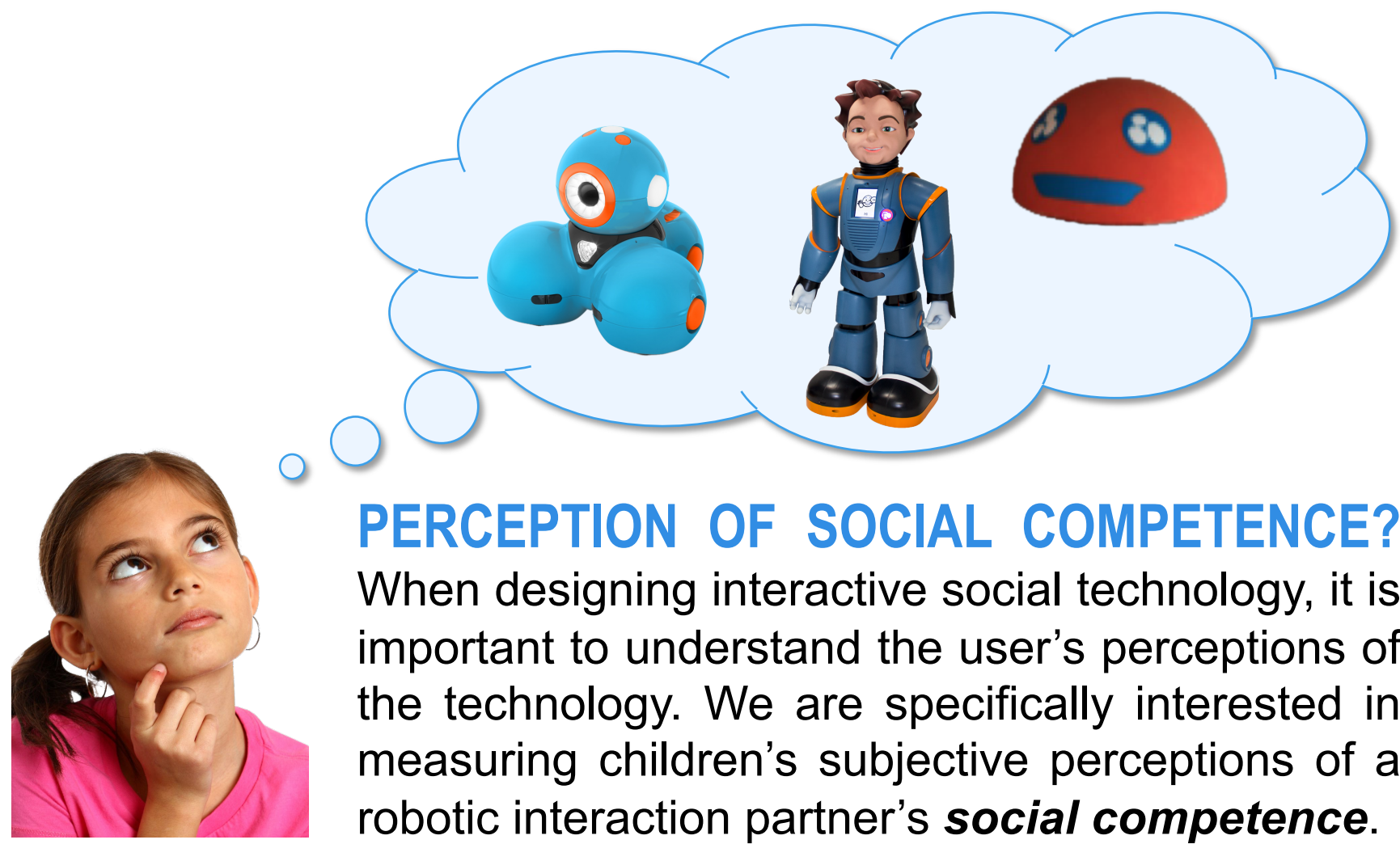


MEASURING CHILDREN'S PERCEPTIONS OF ROBOTS' SOCIAL COMPETENCE: DESIGN AND VALIDATION

Vicky Charisi, Daniel Davison, Frances Wijnen, Dennis Reidsma and Vanessa Evers
Human Media Interaction, University of Twente
Contact: d.p.davison@utwente.nl



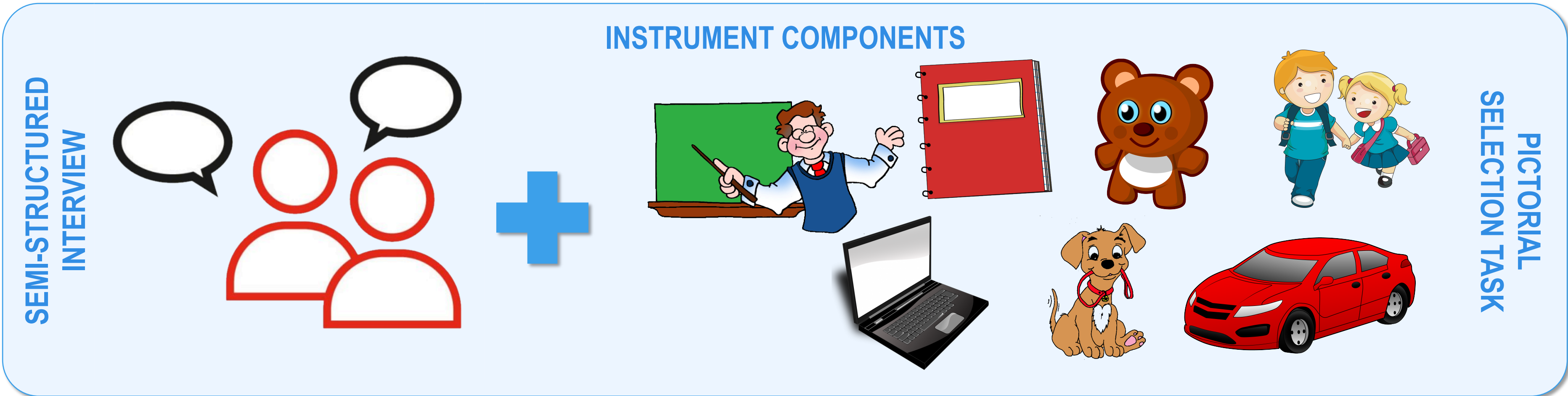
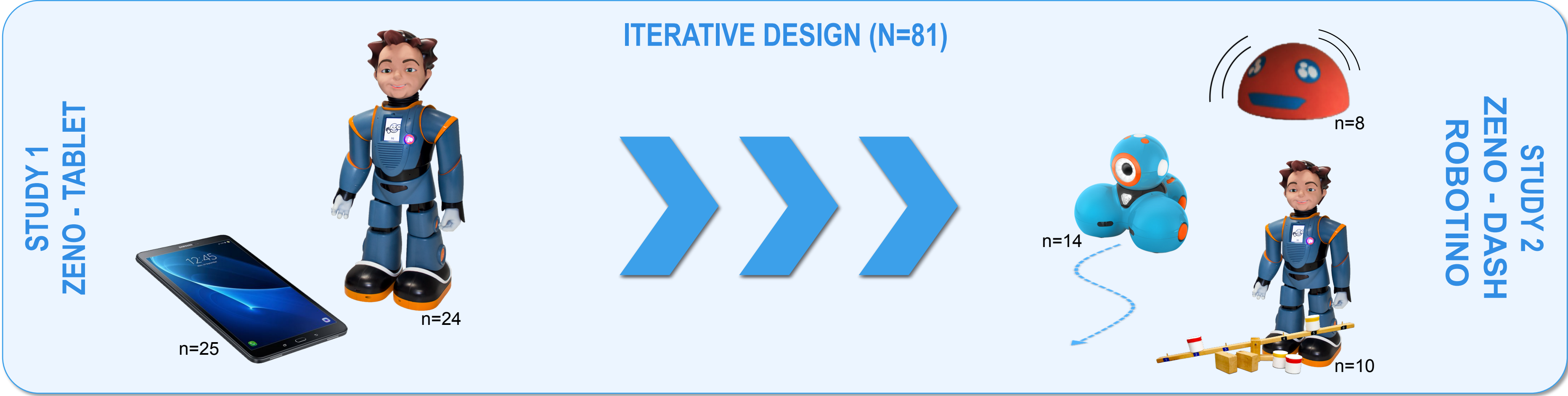
PERCEPTION OF SOCIAL COMPETENCE?
When designing interactive social technology, it is important to understand the user's perceptions of the technology. We are specifically interested in measuring children's subjective perceptions of a robotic interaction partner's **social competence**.

MEASUREMENT INSTRUMENT: DESIGN AND VALIDATION

A recent systematic review showed a strong interest in measuring subjective experiences of children [1]. To our knowledge, there exist no validated tools for measuring perceived social competence across different setups and platforms.

We present our bottom-up iterative design approach and validation of such an instrument. A semi-structured interview (see table 1) and pictorial-based task (inspired by [2]) were designed to extract descriptions of the social competence of our robots. Transcripts were interpreted through an in-depth thematic content analysis.

Interviews and pictorial tasks were examined for convergent validity. Divergent validity was examined on three distinct robotic platforms, operating in different settings.



RESULTS

Interviews: Two main themes emerged, based on children's descriptions of their interactions with the robot. Detailed results are presented in table 2.

Theme A - Perceptions of the interaction with the robot
Theme B - Perceptions of the social capabilities of the robot

Pictorial tasks: Based on children's explanations the following categories emerged. Detailed results are presented in table 3.

- Technology/design of the robot compared to selected picture
- Analogy with tool or function-like properties of selected picture
- Analogy with social traits of selected picture
- Capability of learning from or teaching to the robot

CONSTRUCT VALIDITY

Convergent Validity: Strong correlation between instrument components for Dash ($r = .92$) and Robotino ($r = .78$), moderate correlation for Zeno ($r = .61$).

Divergent Validity: Low correlation ($r = .27$) between humanoid and non-humanoid robots, strong correlation ($r = .78$) between two non-humanoid robots.

| THEME A | THEME B |
|--|---|
| Can you tell me something about the robot? | Could the robot be your friend? |
| How would you describe the robot to friends? | Do you think the robot would like to be your friend? |
| Did the robot help you, or did you help the robot? | Could the robot see / hear you? |
| Would you like to have a robot? What would you do? | Do you think the robot would like to have a lot of friends? |
| Is the robot able to help you with school assignments? Does the robot know everything? | Could the robot be able to harm anybody? |

Table 1. Semi-structured interview questions, arranged in two themes. Each question was followed by more in-depth questions ("Why? How?")

| | THEME A | | | | | THEME B | | |
|----------|--------------|---------------|------|-------------|----------------|---------|-----------------|--------------|
| | TASK RELATED | TECH / DESIGN | ROLE | INTERACTION | THEORY OF MIND | MACHINE | SOCIAL ARTIFACT | SOCIAL AGENT |
| DASH | 29% | 43% | 8% | 11% | 9% | 47% | 24% | 29% |
| ZENO | 10% | 17% | 13% | 38% | 23% | 40% | 13% | 47% |
| ROBOTINO | 8% | 46% | 16% | 8% | 22% | 48% | 16% | 36% |

Table 2. Interview results for the second iteration of the instrument

| | TECH / DESIGN | TOOL / FUNCTION | SOCIAL TRAITS | I LEARNED | I TAUGHT |
|----------|---------------|-----------------|---------------|-----------|----------|
| DASH | 54% | 21% | 21% | 4% | 0% |
| ZENO | 47% | 7% | 20% | 13% | 13% |
| ROBOTINO | 27% | 9% | 55% | 9% | 0% |

Table 3. Pictorial task results for the second iteration of the instrument

[1] Charisi, V., Davison, D. P., Reidsma, D., & Evers, V. (2016). Evaluation Methods for User-Centered Child-Robot Interaction. RO-MAN 2016
[2] Harter, S., & Pike, R. (1984). The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children. Child Development, 55(6)

This handout describes additional details about our proposed **instrument for measuring children's perceptions of robots' social competence**. This document may serve as a guideline for future replication or repetition studies, with additional robot platforms in other contexts. Please refer to this work as:

Charisi, V., Davison, D.P., Wijnen, F.M., Reidsma, D., and Evers, V. (Nov 2017). *Measuring Children's Perceptions of Robots' Social Competence: Design and Validation*. Presented at ICSR 2017, Tsukuba, Japan.

SEMI-STRUCTURED INTERVIEW

The interview covers aspects related to the interaction children had with the robot, and their views of the robot's social competence. Questions are intended to provoke open, genuine, rich responses from children, focusing on their subjective experience. There are no right or wrong answers, and many questions are naturally followed by more in-depth questions, such as "Why?" and "How come?", aimed at eliciting more elaborate explanations.

The interview starts with several **warm-up questions**, to help the children familiarise themselves with the interview process, and to recall the context of the activity and interaction:

1. *What did you do during the activity/interaction? Did you enjoy it? What did you like most? Why? Was there anything you liked less? Why?*

After the warm-up questions, the interview examines two main themes: **Theme A** focuses on the robot's characteristics, while **Theme B** probes the children to talk specifically about the social competence.

2. **A** *Can you tell me something about the robot?* (Drives the children to focus on thinking about the robot more analytically and more in detail. They will talk about the thing that is most prevalent for them)
3. **A** *How would you describe the robot to friends?* (Examines children's perception of the robot in the social context of their friends. Replicates Q2 in a more specific context)
4. **B** *Could the robot be your friend? Why do you think so? How do you know that? What can/can't it do?* (Examines the socio-emotional acceptance of a robot as a potential friend)
5. **B** *Do you think the robot would like to be your friend? Why do you think that? How do you know?* (Examines specifically the social Theory of Mind (ToM) that children may or may not ascribe to a robot)
6. **A** *How would you describe the robot at home, to parents/siblings?* (Seeks to investigate children's perception of the robot in the social context of their family/home. Replicates Q2, Q3 in another context)
7. **B** *Could the robot see you? How do you know?* (Examines the ToM that children may ascribe to the robot)
8. **B** *Could the robot hear you? How do you know?* (Examines the ToM that children may ascribe to the robot)
9. **A** *Did the robot help you, or did you help the robot? Why do you think that? How do you know?* (Examines the prosocial aspects, and the perceived role of the robot in the interaction)
10. **A** *Would you like to have a robot? Why/why not? Would you like to have the robot at home or at school? What was it about the robot that makes you want to have one?* (Examines acceptance in their personal life)
11. **B** *Do you think the robot would like to have a lot of friends? Why do you think that? How do you know?* (Examines social ToM that children ascribe to the robot. Replicates Q5 in a broader context)
12. **B** *Could the robot be able to harm anybody? Why do you think that?* (Examines ToM)
13. **A** *Is the robot able to help you with school assignments? How? Does the robot know everything? Why/why not?* (Examines ascribed roles of the robot, and acceptance of the robot in school environment)

PICTORIAL SELECTION TASK

In this task children select pictures that, in their opinion, "**match**" or "**don't match**" the robot. They are then asked to elaborate on their choice, and explain in more detail. This enables them to use properties of familiar agents and objects to describe features of the robot. On the one hand, the pictures represent various **social agents** from a child's life, such as friends, teachers, pets and stuffed animals. On the other hand, they represent various less-social (**technological**) **tools**, such as a laptop, car and notebook. The pictures used for this task are shown on the back of this handout. The pictures are presented in random order.

A child is first asked to select the picture that **best matches** with the robot, and elaborate/explain their choice. Their first selection will often show their most obvious associations they have with the robot. They are then asked to choose a **second picture** that best matches the robot. This second choice often reveals more varied underlying associations. This same process is repeated for pictures that **don't match** with the robot.

Their choices and explanations are analysed with respect to the characteristics they use in their descriptions; do they refer to social properties, technology/design, tool/function, or educational properties.

For more information, please contact Daniel Davison (d.p.davison@utwente.nl) at the Human Media Interaction group of the University of Twente, The Netherlands. A more extensive manual for this measurement instrument will be made available through the following webpage: <https://www.utwente.nl/en/eemcs/hmi/hmi-people-pages/hmi-profile-pages/danieldavisonprofile/>