The Illusion of an autonomous social robot in a therapy setting

Johanna Elisabeth Spanier
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands
j.e.spanier@student.utwente.nl

ABSTRACT

Autism Spectrum Disorder is a common disorder for which no remedies have been found. In recent decades, social robots have been increasingly used in behavioural therapy for autistic children as they have positive effects on these children. Social robots can have different forms of autonomy. Therapists prefer semi-autonomous robots controlled by a visible Wizard of Oz (WoZ). The purpose of this research was to examine the effects of a visible WoZ on the anthropomorphic inferences of children on social robots. In a qualitative experiment, two independent variables were evaluated: the visibility of the WoZ (visible versus traditional) and, in addition, the level of robot-initiated interaction with the supervisor. In total, 12 children aged 6 to 9 participated in which only one child was diagnosed with ASD. The children took part in a semi-structured interview after listening to several stories told by a humanoid robot. The interviews were analyzed for anthropomorphic inferences. The results showed no effects of a visible WoZ on the anthropomorphic inferences of a child on a social robot. Children did not attribute more anthropomorphic characteristics to a robot when it was controlled by a traditional WoZ. Also, the additional robot-initiated interaction did not increase the anthropomorphic perception of a social robot. The research rather identified trends towards anthropomorphic inferences on social robots.

Keywords

Autism Spectrum Disorder - Therapy and education objectives - Children - Social robots - Robokind Zeno R25 - Wizard of Oz

1. INTRODUCTION

It is estimated that 1 in 59 children in the United States suffers from some form of Autism Spectrum Disorder (ASD) [12]. This is an increase in prevalence from 2016 to 2018 by 15 percent. Autism is a widespread developmental and neurological disorder in society. The core symptoms are deficits in communication and social interactions as well as restricted, repetitive patterns of behaviour [8]. Autism is a lifelong disorder for which no remedies have been found. Some people with ASD need high-level support throughout their entire lives. However, early educational and behavioural interventions and therapies can improve the quality of life of autistic people.

Over the past two decades, interactive technologies, and in particular social robots, have been used to treat autistic children [8]. Social robots are used in therapy to teach social and communicative behaviour. Autistic children show a strong interest in robots because they are perceived as predictable and non-threatening. Studies have shown that children are more communicative, show more initiative and learn faster while interacting with social robots within therapy [4, 8, 10].

The DE-ENIGMA project, coordinated by the University of Twente, is working on a humanoid robot (Robokind Zeno R25) that can be used for an emotion-recognition and emotion-expression teaching program for school-aged autistic children [6]. The robot is semi-autonomous, which means that it follows a defined setting but the therapist has control over the robot and can intervene during a session.

There are various forms of autonomy of social robots used in Robot-Assisted Therapy (RAT). Warren et al. are working on a closed-loop adaptive robot system that can interact with a child based on its real-time response [17]. Senft et al. suggest an autonomous action selection mechanism that allows the robot to interrupt an interaction as needed and return control to the therapist [11]. A semi-autonomous social robot follows a predefined script but is also partially controlled by the therapist using the Wizard of Oz (WoZ) framework. In a traditional WoZ framework, a subject interacts with a system that the subject believes works autonomously but is actually controlled by a person from behind the scenes [9] (hereinafter referred to as "traditional WoZ"). In RAT, the therapist gives the patient the illusion of interacting with an autonomous robot, while secretly controlling it, which makes the therapist the WoZ. As a result, the therapist can obtain the desired behaviours of the robot and adapt to unforeseen events [11]. This setting differs from the traditional WoZ framework because the therapist does not act from behind the scene but is visible to the child (hereinafter referred to as "visible WoZ"). A semi-autonomous approach is desired by ASD professionals because they want to have some control over the social robot as they believe that it does not have the ability to recognize the emotions, comfort or stress of a patient [8].

In a semi-autonomous approach, however, there is a greater risk that the autistic child will recognize the correlation between the robot and the therapist. This effect could negatively affect RAT efficiency as the child no longer sees the robot as a separate, social entity. In general, children are aware of the differences between human and robots [7]. Nevertheless, children attribute characteristics

31st Twente Student Conference on IT Jul. 5^{th}, 2018, Enschede, The Netherlands.

to robots which are connected to living systems [2, 1]. It is referred to as *anthropomorphic inferences* when human characteristics are attributed to non-human beings, which can already be observed in children as young as 3 years old. Factors that influence anthropomorphic inferences vary and are not limited to physical appearance. Researchers suggest factors such as verbal and non-verbal communication, the perceived "emotions" of a robot, its intelligence or predictability [18]. An experiment by Beran et al. showed that a significant proportion of children, in particular, ascribe affective characteristics to robots [2]. For example, 64 percent of children said that the robot liked them. Anthropomorphic inference to a social robot motivates children to emotionally open up to it.

In addition to the difficulty of maintaining the illusion of an autonomous robot, the therapist must also focus on the functionality of the robot and the behaviour of the child during therapy, which can be very challenging. As part of the DE-ENIGMA project, researchers are working on improving a user interface that allows the therapist to easily control the robot. In the early stages of the research, a user interface was hidden under the table, accessible to the therapist. This approach was rather unwieldy for the therapist. It is desirable to have a user interface that the therapist can use on a tablet that does not remain hidden from the patient. Thus, to use an approach in which the WoZ (therapist) is fully visible to the child.

The aim of this research is to identify the effects of this approach on the anthropomorphic inferences of a child on a social robot. On the one hand, the effects of a traditional versus visible WoZ are examined. On the other hand, it is investigated whether a robot-initiated interaction with the therapist in combination with a traditional or visible WoZ causes anthropomorphic inferences of a child on a social robot. Research has shown that children are likely to attribute human characteristics to robots. The manipulation of the social behaviour of the robot could, therefore, make its role as a social actor more credible. This research is a pilot study and provides a basis for future research. It is therefore mainly conducted with non-autistic children who are a less vulnerable target group than autistic children. The research question is defined as follows:

RQ 1: What effects does a visible WoZ have on the anthropomorphic inferences of a child on a social robot?

The resulting hypotheses are:

H 1: Children have more anthropomorphic inferences on a social robot when it is controlled by a traditional WoZ.

H 2: The additional robot-initiated interaction increases the anthropomorphic perception of a social robot when it is controlled by a traditional WoZ.

2. METHOD

2.1 Research Design

The research was carried out in the form of a qualitative experiment based on a between-subjects design with two independent variables. Each variable had two values. The first independent variable was the visibility of the WoZ with the values 1) open versus 2) traditional WoZ. The second independent variable was the level of interaction initiated by the robot with the interviewer. In one scenario, the robot initiated a dialogue with the interviewer, in the other it did not. The overview of the group division is given in table 1. Each group consisted of 3 children randomly assigned.

Table 1. Group division overview

	Traditional WoZ	Visible WoZ
No robot-initiated interaction	Group 1	Group 2
Robot-initiated interaction	Group 3	Group 4

2.2 Participants

In total, 12 children (5 female, and 7 male) between the ages 6 and 9 ($M = 7.42$, $SD = 1.08$) participated in the experiment. They were children from a daycare centre at the University of Twente. One of the 12 participants was diagnosed with a form of autism. This child was accompanied by an educator during the experiment. The experiment was conducted on two days in spring 2019. At the beginning of the academic year 2018/2019, the parents of the participants signed a general informed consent for experiments carried out by the University of Twente. This study was approved by the Ethics Committee EWI of the University of Twente as a study that falls under the general consent (RP 2019-46). It was therefore not necessary to obtain consent for this particular experiment. Some children participated in former experiments by the University of Twente involving social robots. None of the children was familiar with the Robokind Zeno R25.

2.3 Robot

The Robokind Zeno R25 used for the experiment was controlled via an interface on a laptop (see 2.4 Interface & Audio). A router served as the connection between the robot and the laptop. Each button on the interface triggered a defined sequence of movements and audios. In combination with audio, the robot performed mostly facial expressions and, in some cases, other body movements during the experiment, such as movements of the arms or hips.

2.4 Interface & Audio

The interface used to control the robot was limited to the features required for the experiment. The interface was divided into four sections (see figure 1). The head contained buttons needed to connect to the robot through the router. The storytelling buttons contained all storytelling sequences. Generic buttons were integrated for unexpected events during the experiment. For example, if a child asks the robot an unexpected question, the robot refers to the interviewer when triggering the "Let's ask interviewer" button. Stimuli buttons were used for the robot-initiated interaction with the interviewer (independent variable 2).

The voice of the robot was synchronized by a Dutch-speaking, female colleague. The audio, facial expressions and body movements of the robot were coordinated.

2.5 Procedure

The experiment followed a defined script (see appendix A. Experiment Script). The robot was placed standing on a table. The robot's eyes were open and it had a neutral facial expression. The interviewer sat to the left of the table. The child was placed on a chair in front of the table, facing the front of the robot (see figure 2). The second experimenter, who interacted as a traditional WoZ, sat in the back of the room. When the child sat in front of the table, it was unable to see the second experimenter. The experiment was conducted in Dutch since the children's native language was Dutch. During the experiments with

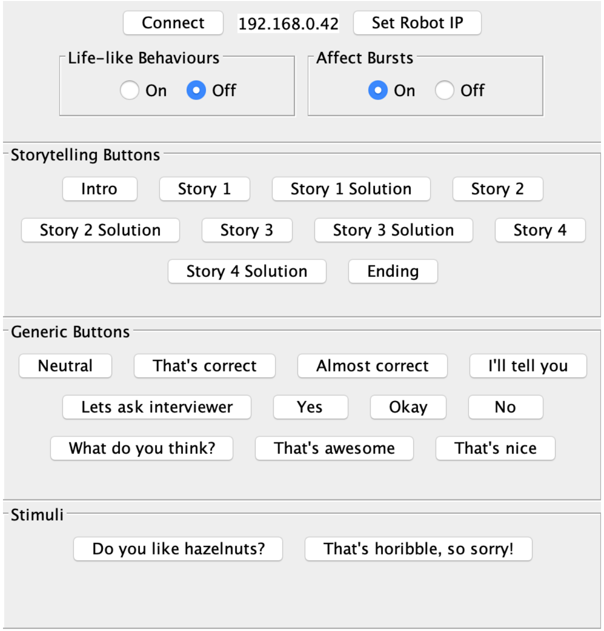

Figure 1. Interface for controlling the robot

the visible WoZ, the interviewer placed his laptop on the table in front of him. The child saw only the back of the laptop but not the screen. During the experiment with the traditional WoZ, the laptop of the interviewer was closed until he started the interview. The second experimenter controlled the robot from a second laptop hidden to the child.

At the beginning of each experiment session, the interviewer introduced himself, the second experimenter and gave a brief introduction to what to expect during the experiment. In addition, the child was asked about its age, and whether it was familiar with the Robokind Zeno R25 and/or robots in general. The child was also asked to give the robot a name (first interview question).

Figure 2. Child listening to the robot's stories

The interviewer used the chosen name later in the session when talking or referring to the robot. After the introduction part by the interviewer, the robot introduced itself and started to tell the child short stories. In total, the robot told four short stories with an average of 23 seconds per story. The content of the stories built on each other and appealed to a certain emotion. The four emotions were anger, happiness, sadness, and fear. The stories were from a research study by Wallbaum et al. [16]. After telling a story, the robot asked the child how it (the robot) felt within the story. Upon receiving the child's answer, the robot confirmed or corrected the child. The interviewer interacted as a moderator during the narrative part. For example, he would ask the robot to continue with the next story. Research has shown that children sustain a social relationship with the robot if it tells familiar social references [10]. Therefore, the stories contained only social references to which the child could relate. In one of the stories, the robot received hazelnuts, which it was very pleased about. In those experiments in which the robot initiated an interaction with the interviewer, it turned to the interviewer and asked him if he also loved hazelnuts. The interviewer would answer that he is allergic and the robot would pity him for that. After that, the robot told the next story. The storytelling part ended with the robot thanking the child for listening and pretending to take a nap. The robot would close its eyes and stop moving. The interviewer then started the interview with the child. After performing all the experiments, the participants were informed about the actual purpose of the experiment and how the robot worked.

2.6 Measures

Semi-structured interviews were conducted to identify differences in the children's anthropomorphic inferences on the robot. Each interview response was analyzed for attributions of anthropomorphic or machine/non-human characteristics and categorized accordingly. Responses were identified as anthropomorphic inferences when a child ascribed to the social robot 1) visual, 2) verbal, 3) physical or 4) cognitive human characteristics (like human-intelligence), or 5) emotions. Sometimes it was not clear whether a response had anthropomorphic characteristics, for example, if a child did not know why it confirmed a question. In this case, the response was assigned to the machine-category. The reason for this is that children tend to say "yes" regardless of the question or what they think about it [3]. Only one category (anthropomorphism/machine) was awarded for each interview question. Then the frequency and the sum of the answers assigned to the two categories were measured. This was done for the individual child, for the four groups, and then for socio-demographic criteria such as age and sex.

The semi-structured interview contained nine questions and lasted 5 to 10 minutes. The questions were partly based on a study by Beran et al., which focused on perceived animism in the interaction between children and robots [2], and partly self-defined. The interview was thematically divided into two sections. The first section contained three questions about the general description of the robot. The second section contained six questions on the robot's characteristics, including two cognitive, three affective and one behavioural question. Cognitive questions focused on knowledge and memory, affective questions on emotions, and the behaviour question on physical abilities and actions [2]. If a child answered "Yes" or "No" to a question, the child was asked why or why not it thought so.

3. RESULTS

3.1 Evaluation of Hypotheses

The research question in this paper asked for the effects of a visible WoZ on the anthropomorphic inferences of a child on a social robot. Hypothesis 1 predicted that children would draw more anthropomorphic inferences to a social robot when controlled by a traditional WoZ. Hypothesis 1, therefore, predicted that Group 1 and Group 3 would have higher anthropomorphic inferences than Group 2 and Group 4. Hypothesis 2 predicted that additional robot-initiated interaction increases the anthropomorphic perception of a social robot when it is controlled by a traditional WoZ. Based on this hypothesis, Group 3 was expected to exhibit the most anthropomorphic inferences.

Figure 3 shows a comparison of the groups with respect to the anthropomorphic inferences made. Each point on the x-axis represents a child in a particular group. The y-axis shows the total of questions (per child) which included anthropomorphic inferences. The mean indicates the average sum of anthropomorphic-classified questions within a group.

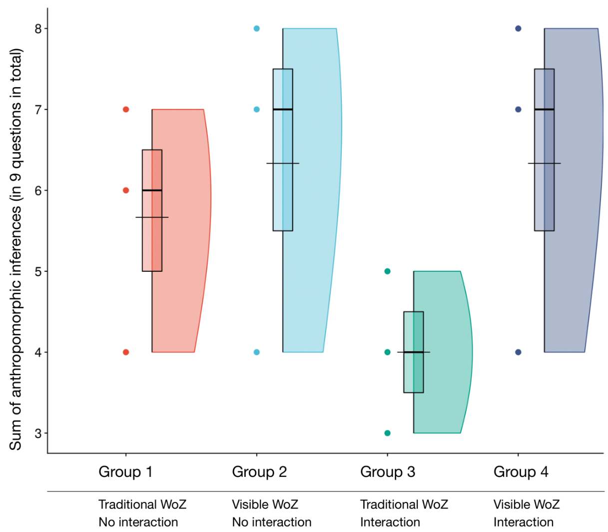

Figure 3. Number of anthropomorphic attributions identified in the interviews per group

Group 2 and 4 have the highest mean of 6.33. Group 1 has a mean of 5.67, and Group 3 has a mean of 4, the lowest average of anthropomorphic-classified questions of all groups. According to Hypothesis 1, Group 1 and Group 3 should have a higher mean than Group 2 and Group 4. The results show that the opposite is the case. Group 1 and Group 3 have a lower mean than Group 2 and Group 4. Therefore, Hypothesis 1 cannot be confirmed. There is no evidence that children perceive a social robot differently in a visible WoZ approach than in a traditional WoZ approach. Children seem to draw a similar amount of anthropomorphic inferences regardless of how the robot is controlled. Similar results were identified in the information session after performing all experiments. The children were asked who they thought was controlling the robot. The majority of the children who were willing to answer the question were either not sure or believed that the interviewer was controlling the robot. This was also the case with children who participated in a traditional WoZ experiment. Also, the majority of children did not see a correlation between the use of the laptop by the visible WoZ and the robot. Children who said that the robot had been controlled by the interviewer thought that the robot reacted on speech recognition. It should be noted, that the results of the feedback session only give an indication. They were not included in the research measure.

According to Hypothesis 2, Group 3 should have the highest mean of all groups. Again, the opposite result was identified. Therefore, Hypothesis 2 cannot be confirmed either. There is no evidence that robot-initiated interaction increases anthropomorphic perception. Since Hypothesis 1 and Hypothesis 2 are not proven, no generalized conclusions can be drawn from this study.

3.2 Evaluation of Group Characteristics

There is no evidence for the correlation between the independent variables in the experiment and the group results. Therefore, the group characteristics are evaluated to find indications as to why Group 3 has a comparable lower mean and standard deviation ($SD = 1$) than the other groups (Standard Deviation between 1.53 and 2.08). All members of Group 3 said they were familiar with robots, either because of previous experiments or because of television. In comparison, Group 1 had two, and Group 2 and Group 4 only one participant who was familiar with social robots. On average, participants who professed to be familiar with robots drew fever anthropomorphic inferences ($M = 4.86$) than children without experience ($M = 6.6$). When comparing the sexes, the average sum of anthropomorphic classified questions of female participants is slightly higher ($M = 6.4$) than that of male participants ($M = 5$). The two participants with a maximum of 8 anthropomorphic inferences in a total of 9 questions in Group 2 and Group 4 are female. In comparison, the child with a minimum of 3 is male. Only one in five children with a score between 3 and 4 is female. The average age of the children per group varied. It is unrecognizable that the children's age had an effect on anthropomorphic inferences.

3.3 Evaluation of Participants

On average, anthropomorphic inferences were found in 5.58 out of 9 questions. This means that a child attributed anthropomorphic characteristics to the social robot on average in more than half of the questions. In the following, children are discussed who showed striking findings regarding the attribution of machine-like characteristics to the robot.

As mentioned earlier, only one girl had a lower score than 5, and therefore, drew anthropomorphic inferences in less than half of the questions. This particular girl was the (only) child that had some form of ASD. The autistic girl was 8 years old, unfamiliar with the Robokind Zeno R25 but participated in earlier experiments with social robots. Compared with the average mean of female participants ($M = 6.4$), the autistic girl had a relatively low mean ($M = 4$). Anthropomorphic inferences were identified in questions 1, 6, 8 and 9, which were three affective and one descriptive question. The girl gave the robot the human name "Lucas" because she knew someone with that name. She believed that the robot liked her because "he was nice to her". She also thought the robot would not feel left out when playing with another friend because "he" was a good friend of hers and knew that "he" did not have to be jealous. In addition, the autistic girl argued that the robot was the friend of the interviewer because "they are here together." In contrast, she was critical of the age of the robot, because that would depend on when the robot was built. She was also unsure of the robot's intelligence because it "only" told stories but did not have educational skills (like knowledge in math). In addition, she questioned the robot's ability to be a good playmate because he lacked sand resistance. The trend that children answered the interview questions with ”yes” was evaluated. 6 out of 9 interview questions were closed questions. On average, 4 out of 6 questions were answered with ”yes”. In contrast, the autistic girl answered only two questions with ”yes”. This is the lowest score of all participants. The autistic girl said twice ”not sure” and ”yes” and once ”no” and ”maybe”.

As mentioned above, if children could not elaborate on their Yes/No answer, the response was assigned to the machine-category. A 6-year-old boy from Group 2 had a comparatively low score of 4 because in 5 out of 9 questions he was not able to say why he answered a question accordingly. He had particular problems explaining his reasoning in affective and descriptive questions. Overall, it can be seen that children had the most problems to explain, 1) why the robot liked them, and 2) why the robot was the friend of the interviewer (both affective questions).

Another child who showed striking results in terms of assigning machine-attributions to the robot was a 6-year-old boy with the lowest score of 3. The boy said he knew robots from television and called the robot ”Robot that can do everything”. He answered several questions by referring to the robot's ability to do ”everything”. For example, when he was asked for his impression of the robot, the boy said he liked the robot because he could do everything, and in terms of the robot's memory, he said robots would never forget anything. In contrast, he was not sure how to explain the two affective questions about the robot liking him and the robot being the interviewer's friend.

3.4 Evaluation of Interview Questions

Rather than finding differences in the perception of the robot per experimental group, the research results show a general trend towards a high use of anthropomorphic inferences by children (see table 2). It also shows that children tend to draw more anthropomorphic inferences on affective and cognitive questions. On average, most anthropomorphic inferences were found in affective questions, followed by cognitive and descriptive questions. Anthropomorphic inferences are relatively limited in the behavioural question. A comprehensive tabular overview of the evaluation of each interview question is given in Appendix B. In the following, questions with the most anthropomorphic inferences are discussed.

Table 2. Comparison of interview questions regarding anthropomorphic inferences

Question type	Question	Attribution	# of children
Descriptive	Q1: Robot name	Anthropomorphism	9
		Machine	3
Descriptive	Q2: Robot age	Anthropomorphism	10
		Machine	2
Descriptive	Q3: Robot impression	Anthropomorphism	1
		Machine	11
Cognitive	Q4: Robot intelligence	Anthropomorphism	8
		Machine	3
Cognitive	Q5: Robot remembers you	Anthropomorphism	7
		Machine	5
Affective	Q6: Robot likes you	Anthropomorphism	9
		Machine	3
Behavioral	Q7: Robot as playmate	Anthropomorphism	4
		Machine	8
Affective	Q8: Robot feels left out	Anthropomorphism	11
		Machine	1
Affective	Q9: Robot being friend of interviewer	Anthropomorphism	7
		Machine	5

The highest number of anthropomorphic inferences were found in Question 8 (see table 3). They were identified in 11 out of 12 responses. These answers are marked with an asterisk in the table. The majority of children reported that the robot would feel left out if the child played with another friend. Children explained that the robot would feel lonely, left out (e.g. ”Because I am not playing with him anymore”), or jealous. One child also mentioned in this context that the robot, however, would not mind if the boy was playing with a ”cute girl” instead. Only two children assumed that the robot would not feel left out. One child argued that the robot was not yet her friend. The other one said that the robot ”is a good friend and does not need to be jealous”. Children mainly referred to emotions and personal experiences to explain their reasoning.

Table 3. Participant responses to Question 8

Q8: If a friend came over and you were playing with your friend, would the robot feel left out?		Children
Yes		10
	*Would feel jealous**	*1*
	*Would feel alone**	*3*
	*Could not play with me anymore**	*4*
	*You should always let others participate**	*1*
	Not sure why	*1*
No		2
	*Robot is not my friend yet**	*1*
	*Robot is good friend, knows that he does not need to be jealous**	*1*

**Answers that contain anthropomorphic inferences*

Another affective question that scored high on anthropomorphic inferences was Question 6 (see table 4). The children were asked if the robot liked them. The majority of children agreed. The children reported human characteristics, e.g. that the robot was ”friendly” and ”spoke nicely” to them. Others referred to the nice stories it told. One child said the robot was quite positive towards her, but ”he” needed to get to know her better in order to really like her. Children mainly referred to the robot's behaviour and emotion to explain themselves.

In terms of the cognitive questions, the majority of children considered the robot intelligent and to have a human-like memory. For example, children thought the robot was intelligent because it could tell stories or because of what the robot did in the stories. Similarly, most children thought that the robot would remember them or not for the same reasons as humans. For example, the robot would remember the children because it ”saw” and recognized the children, or it might forget them after a long period of time because ”that is what people do”. In summary, it can be stated that children attributed to the social robot mainly cognitive human-like characteristic (e.g. human-intelligence and memory). It is also recognizable that children who were familiar with robots assigned less anthropomorphic characteristics in cognitive questions.

Table 4. Participant responses to Question 6

Q6: Does the robot like you?'		Children
Yes		11
	*(Would not have) told story ** *2*	
	*He is sweet / nice to me** *3*	
	*I was nice to him** *1*	
	*Did a lot together** *1*	
	*Finds me sweet** *1*	
	Not sure *3*	
A bit		1
	*Needs to get to know her better** *1*	

**Answers that contain anthropomorphic inferences*

While children made many anthropomorphic inferences on affective and cognitive questions, children were more critical of the robot's ability to be a good playmate. Only 4 out of 12 children assigned anthropomorphic characteristics. For example, by playing different games with the robot such as Nintendo, trains and blocks or with a spaceship (story-related content). Several children did not consider the robot a good playmate because of its fragile construction and physical limitations. Again, children with robot experience assigned fewer anthropomorphic characteristics to the behavioural question.

Descriptive questions showed high and low scores on anthropomorphic inferences. The majority of children gave the robot a name, considered it male and thought it was between 6 and 8 years old. Children referred to the visual appearance of the robot as a reason for their statement (e.g. "looks like it", "looks young"). An interesting result is that children also referred to the story the robot had told. For example, they said the robot was young because "he wants a spaceship" and "he went alone for a walk". Similar results were obtained in other questions. For example, children said that the robot was not intelligent because he went alone into a forest. When asking about the child's impression of the robot, the majority of children gave positive feedback. However, only one child drew anthropomorphic inferences in this context.

The experience of the WoZ during the experiment is not a measure for answering the defined research question. Nevertheless, it is mentioned to identify the differences in the visible versus traditional WoZ approach. Performing experiments with a traditional WoZ was more difficult than conducting experiments with a visible WoZ. Some unforeseen situations required minor changes in the experiment script. In this situation, it was easier for the interviewer to control the robot himself.

4. DISCUSSION

This research examined the effects of a visible WoZ on the anthropomorphic inferences of children on social robots. The comparison of the robot being controlled by a visible versus a traditional WoZ showed no great difference in the attribution of anthropomorphic characteristics to the humanoid robot Zeno. Children did not seem to identify the correlation between the WoZ and the robot. Children mainly thought the robot reacted to speech and did not realize in the case of the visible WoZ that he used his laptop to control the robot. While it was predicted that the traditional WoZ would cause more anthropomorphic inferences, the opposite was the case. Children in an experiment session with a visible WoZ drew more anthropomorphic inferences. Moreover, the intentional interaction of the robot with the interviewer did not increase the anthropomorphic perception of a social robot. Children did not mention the robot-intended interaction in the interviews and there was no evidence that the independent variable had any kind of effects on the children. Both research hypotheses could not be confirmed, so that no generalized conclusions on the research question can be drawn from these results.

Several trends were identified that could have affected the number of anthropomorphic characteristics per experimental group. Girls on average gave the social robot more anthropomorphic qualities than boys did. Participants with the highest number of anthropomorphic inferences in their answers were girls. This result is similar to the outcome of a study by Tung [13]. According to Tung, girls are more social and physical attracted to human-like robots than boys. It is possible that girls assigned more anthropomorphic characteristics to the Robokind Zeno R25 because they built a stronger social and emotional relationship with the robot. Tung also concluded that there is no significant age-related factor in the perception of social robots. Similar results were obtained from this study. There was no difference in the perception of the robot by children of different ages. In addition, children who were familiar with robots assigned fewer anthropomorphic characteristics to the robot than unfamiliar children. It is likely, that experienced children have a more realistic view of robots and their functionality. It is noticeable, however, that these children on average still drew anthropomorphic inferences from 4.86 out of 9 questions.

In particular, two children showed striking findings in regard to the attribution of machine-like characteristics to the robot. The boy with the lowest score in anthropomorphic inferences said he knew robots from television and called the robot "Robot that can do everything". He answered several questions by referring to the robot's ability to do "everything". Instead of projecting human characteristics onto the Robokind Zeno R25, it seems that the child projected the characteristics of fictional robots that it knew from television. In his view, robots have greater abilities than humans. The other participant who distinguished herself from the group was the autistic child. The girl answered with more thoughts compared to the other children. She had the lowest score in answering questions with "yes". She also had a comparably low level of anthropomorphic inferences. The girl seemed to have a more realistic understanding of the social robot. However, she drew anthropomorphic conclusions from three affective questions (e.g. stating that the robot was a "good friend"). This finding may indicate that children with autism have a different perception of robots than non-autistic children. They might have a more rational and less anthropomorphic view of robots. Yet, like non-autistic children, they seem to attribute affective attributes like emotions to the robot.

On average, children assigned anthropomorphic characteristics to the robot in more than half of the questions. There was a trend for children to attribute anthropomorphic characteristics to affective questions in particular. In their study of how children perceive robots, Beran et al. had similar findings to this research. Children assigned many anthropomorphic abilities to the robot but ascribed more affective than cognitive or behavioural characteristics [2]. Almost every participant of this research thought that it was liked by the robot and that the robot would feel left out when the child would play with another friend. The children tended to use their personal experiences to explain themselves. For example, one child stated that she does not want the robot to feel left out because no one likes to be alone. According to the psychologist Sherry Turkle, children project their own understanding and experience of the world already after minimal interaction onto robots [2, 15]. It is possible that the children projected their understanding on the Robokind Zeno R25 rather than trying to understand the technical behaviour of the robot. The results also indicate that children think robots can experience emotions like grief and kindness. An interesting finding in this context is that four children referred to the stories the robot told in describing the robot's characteristics (e.g. the child would play together with the robot with a space shuttle). It indicates that children perceive the robot as an individual that experiences and feels things.

In terms of the robot's cognitive abilities, the majority of children considered the robot intelligent. Some children referred to the robot's ability to tell stories or the look of the robot. However, other children stated that the robot was not smarter than themselves. This finding suggests that children attribute a human-like intelligence to the robot, but are aware that the robot does not have as much knowledge as humans. Half of the children stated that the robot would remember them. Some children said the robot "saw her" and "knows the child now". This indicates that the children believe the robot uses its eyes and memory to recognize them. It could also be an indication that the physical appearance of Zeno might increase anthropomorphic inferences. These findings are in line with Tung's research, which suggests that using human features in the appearance of a robot can make the robot more socially acceptable and visual [14]. The majority of children that did not think the robot would remember them argued that after a long duration the robot would most likely forget them. Again, they based their argument on their personal experience of forgetting people.

In addition to affective and cognitive, the behavioural characteristics of the social robot were evaluated. The children were asked if the robot was a good playmate. Half of the children agreed. This result is lower compared to the study by Beran et al, where most of the children thought the robot was capable of playing various games [2]. The children, who disagreed that the robot was a good playmate, mainly referred to the fragile construction and physical limitations of the robot. The children, who saw a good playmate in the robot, mentioned a variety of games, including football and Nintendo. It seems that these children have projected their personal interest onto the robot, which may indicate that they are open to including the robot in their world [2].

One of the description questions asked for the robot's name. Five children gave the robot a human name and four children were not sure about a name but would have given a male one. In total, 10 out of 12 children thought the robot was male. This outcome is consistent with the study by Cameron et al. who discovered that the Robokind Zeno R25 was perceived as being a mix of person and machine, but also strongly as a male figure [5]. Children seem to have an ambivalent perception of the robot. Children can distinguish the robot from humans. For example, they seemed to be aware of the physical limitations of the robot. Nevertheless, most children attribute affective characteristics such as emotions to the robot.

Finally, the experiment has given indications at the applicability of a semi-autonomous robot controlled by a traditional WoZ. During the sessions, unforeseen events occurred that were more difficult for the interviewer to handle when the robot was controlled by the traditional WoZ. It is likely that the therapist will experience similar events in a real therapeutic setting. The use of a traditional WoZ requires more physical space, extra preparation and, according to this investigation, was detrimental during the session. It is therefore recommended to use a semi-autonomous approach with a visible WoZ.

To conclude, the experiment results did not confirm 1) that children have more anthropomorphic inferences on a social robot when it is controlled by a traditional WoZ, and 2) that additional robot-initiated interaction increases the anthropomorphic perception of a social robot when it is controlled by a traditional WoZ. Therefore, no generalized conclusions regarding the research question could be drawn from these research results. The results, however, indicated differences in the perception of a social robot based on the gender and the child's familiarity with a robot. In addition, it has been shown that children generally use anthropomorphic inferences to a high degree. This is especially true for affective questions. The general high use of anthropomorphic inferences may explain why there was not much difference between the experimental groups.

4.1 Limitations

There are some limitations that may have distorted the results of the experiment. The children who participated in the experiment were children of a daycare centre at the University of Twente. Some of these children already participated in previous experiments with social robots. They knew more about robots than other unfamiliar children. In addition, many children at the daycare centre have parents with academic backgrounds. This may indicate that children have better technical knowledge than others. It is therefore recommended to use children who have not participated in previous experiments and to select children from parents with a different socio-demographic background.

The group of participants did not consist of a uniform number of boys and girls. They were therefore not evenly distributed among the groups. Studies have shown that girls and boys perceive social robots differently. Therefore, it seems appropriate to have the same number of boys and girls in each experimental group in future studies.

There might also be limitations due to the formulation of interview questions. The interview contained six closed questions. Children tend to respond to close questions with "yes". Therefore, the question may need to be worded differently in the future to avoid this trend. The questions also included expressions like "feel" and "like". It is possible that children were affected by the wording of the questions, and accordingly associated anthropomorphic characteristics.

4.2 Future Work

The aim of this research was to identify the effects of a visible WoZ on the anthropomorphic characteristics of a social robot. The conducted experiment showed trends in how children perceive social robots. On average, more than half of children's interview answers found anthropomorphic inferences. An important question that arises from this finding is why so few children considered the technical aspect of a social robot. In the information session after the interviews, no children seemed to really understand how a social robot works. However, the information session was not a part of the research measure. It is therefore recommended to actively ask children about the functionality of the robot, in order to gain a better understanding of their actual knowledge and their anthropomorphic view.

In addition, the participants in this study were mainly non-autistic children. Because autistic children seem to have a different perception of social robots, future research suggests focusing mainly on autistic children. This study also recommends focusing in the future on a semi-autonomous approach with a visible WoZ only.

The robot-initiated interaction showed no differences in the perception of the social robot. It is possible that other variables, such as reaction time, influence the perception of social robots. Currently, the robot reacts directly to the therapist's interface command. This makes it easier for the child to understand the relationship between the therapist and the robot. If the execution of a command were time-delayed, the correlation could be less obvious. An experiment with several independent variables, which are investigated with regard to the perception of a semi-autonomous robot, would be conceivable.

This study leads to another important question. If autistic children would be informed about the functionality of a social robot in RAT, would they perceive the robot differently with that knowledge? Is a WoZ and thus the deception of children required for effective RAT? In this study, we considered that children in a visible WoZ approach would more quickly recognize the correlation between the interviewer and the robot. However, most of the children did not seem to notice the existence of the visible WoZ during the experiment. It is strongly recommended to study the effects of educating autistic children on the functionality of social robots. Avoiding the deception of autistic children would simplify the use of social robots in RAT and would also have a high ethical value.

5. ACKNOWLEDGEMENTS

My special thanks go to the children, parents and teachers of the Kinderdagverblijf De Vlinder. This research would not have been possible without their support. I would also like to thank my supervisor Bob Schadenberg, PhD Candidate in the Department Human Media Interaction, for sharing his expertise and the valuable guidance and encouragement throughout the research.

6. REFERENCES

[1] T. Belpaeme, P. Baxter, J. de Greeff, J. Kennedy, R. Read, R. Looije, M. Neerincx, I. Baroni, and M. C. Zelati. Child-robot interaction: Perspectives and challenges. In *ICSR: International Conference on Social Robotics*, volume 5, pages 452–459, October 2013.

[2] T. N. Beran, A. Ramirez-Serrano, R. Kuzyk, M. Fior, and S. Nugent. Understanding how children understand robots: Perceived animism in child-robot interaction. *International Journal of Human Computer Studies*, 69(8):539–550, July 2011.

[3] G. M. Breakwell, S. Hammond, C. Fife-Schaw, and J. A. Smith. *Research Methods in Psychology*. Sage Publications, 2006.

[4] J.-J. Cabibihan, H. Javed, M. A. Jr., and S. M. Aljunied. Why robots? a survey on the roles and benefits of social robots in the therapy of children with autism. *International Journal of Social Robotics*, 5(4):593–618, November 2013.

[5] D. Cameron, S. Fernando, A. Millings, M. Szollosy, E. Collins, R. Moore, A. Sharkey, and T. Prescott. Congratulations, it's a boy! Bench-marking children's perceptions of the robokind Zeno-R25. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 9716:33–39, 2016.

[6] DE-ENIGMA. Project overview. http://de-enigma.eu/features/. Accessed: 2018-05-02.

[7] L. Fortunati, A. Esposito, M. Sarrica, and G. Ferrin. Childrens knowledge and imaginary about robots. *International Journal of Social Robotics*, 7(5):686–695, November 2015.

[8] C. A. G. J. Huijnen, M. A. S. Lexis, and L. P. de Witte. Matching robot kaspar to autism spectrum disorder (asd) therapy and educational goals. *International Journal of Social Robotics*, 8(4):445–455, July 2016.

[9] B. Martin, B. Hanington, and B. Hanington. *Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions*. Rockport Publishers, 2012.

[10] V. Ng-Thow-Hing and S. Okita. Playdates with robots. *Computer*, 45(8):73–75, August 2012.

[11] E. Senft, P. Baxter, J. Kennedy, and T. Belpaeme. When is it better to give up? *Proceedings of the Tenth Annual ACM/IEEE International Conference on Human-Robot Interaction Extended Abstracts*, pages 197–198, March 2015.

[12] A. Speaks. CDC increases estimate of autism prevalence by 15 percent, to 1 in 59 children. https://www.autismspeaks.org/science-news/cdc-increases-estimate-autisms-prevalence-15-percent-1-59-children, 2018, April. Accessed: 2018-06-15.

[13] F.-W. Tung. Influence of gender and age on the attitudes of children towards humanoid robots. In *Human-Computer Interaction. Users and Applications*, pages 637–646, Berlin, Heidelberg, 2011. Springer Berlin Heidelberg.

[14] F.-W. Tung. Child perception of humanoid robot appearance and behavior. *International Journal of Human-Computer Interaction*, 32(6):493–502, 2016.

[15] S. Turkle. *Life on the Screen: Identity in the Age of the Internet*. Simon and Schuster, 1995.

[16] T. Wallbaum, S. Ananthanarayan, S. S. Borojeni, W. Heuten, and S. Boll. Towards a tangible storytelling kit for exploring emotions with children. pages 10–16, 10 2017.

[17] Z. Warren, Z. Zheng, S. Das, E. M. Young, A. Swanson, A. Weitlauf, and N. Sarkar. Brief report: Development of a robotic intervention platform for young children with asd. *Journal of Autism and Developmental Disorders*, 45(12):3870–3876, December 2015.

[18] J. Złotowski, D. Proudfoot, K. Yogeeswaran, and C. Bartneck. Anthropomorphism: Opportunities and challenges in human robot interaction. *International Journal of Social Robotics*, 7(3):347–360, November 2014.

APPENDIX

A. EXPERIMENT SCRIPT

Event	Interface	Verbal interaction	Actor	Follow-up event
Intro 1		Hé, het is heel leuk je te ontmoeten. Heel erg bedankt voor uw deelname aan ons experiment. Mijn naam is Arthur en dit is Hanna. Wij zijn studenten van de Universiteit Twente en doen ons afstudeerproject voordat we in de zomer afstuderen. Het project gaat over deze kleine robot. We zullen u eerst enkele algemene vragen stellen.	Interviewer	GQ 1
GQ 1		Hoe oud ben je?	Interviewer	GQ 2
GQ 2		Heb je deze robot al eerder gezien?	Interviewer	GQ 3
GQ 3		Heb je ooit al met een robot gespeeld?	Interviewer	IQ 1
IQ 1		Welke naam zullen we de robot geven?	Interviewer	Intro 2
Intro 2		Dat is een goede keuze. [Gekozen naam] wordt gebruikt voor kinderen die moeite hebben met het begrijpen van emoties. Hij is als een trainer voor hen. Voordat we met deze kinderen gaan testen, willen we graag zien of kinderen, zoals jij, die goed zijn in het lezen van emoties, begrijpen welke emoties [gekozen naam] wordt weergegeven. [Gekozen naam] vertelt u vier korte verhalen. Na elk verhaal zal hij je vragen hoe je denkt dat hij zich in het verhaal voelde. Als je het niet weet, is dat geen probleem. We zullen ook helpen als dat nodig is. Na de verhalen, zal ik je wat meer vragen stellen over wat je van [gekozen naam] vindt. Is dat goed voor jou?	Interviewer	ECR 1 or ACR 1
ECR 1		Ja.	Child	IR 1
ACR 1		Nee / ik weet het niet.	Child (Interviewer)	The interviewer has to convince the child that listening to the robot is a lot of fun. After the child is convinced -> IR 1
IR 1		Oké, [gekozen naam] we zijn klaar om je te ontmoeten.	Interviewer	BI 1
BS 1	Intro	Hallo, het is zo leuk om je te ontmoeten. Ik will je grag vertellen wat er gisteren is gebeurde. Ben je klaar om het te horen?	Robot	ECR 1 or ACR 1
ECR 1		Ja.	Child	BS 2
ACR 1		Nee / ik weet het niet.	Child (Interviewer)	The interviewer has to convince the child that listening to the story is a lot of fun. After the child is convinced -> BS 2
BS 2	Story 1	Oke. Ik speelde in mijn kamer met al mijn speelgoed. Ik heb super leuk speelgoed, maar ik zou graag een ruimteschip willen hebben om mee te spelen. Het kan zo leuk zijn. Dus ging ik naar mijn moeder en vroeg haar of ik een ruimteschipt kon krijgen om mee te spelen. Maar ze zei dat het erg duur is en ik moet eerst wat geld sparen om het te krijgen. Ze zei dat ik het misschien over een paar weken zou krijgen. Maar ik wil niet zo lang wachten. Ik schreeuwde dat ik het echt, echt wilde nu. Hoe denk je dat ik me voelde toen mijn moeder zei dat ik het ruimteschip nog niet kon hebben?	Robot	ECR 2 or ACR 2.1 or ACR 2.2
ECR 2		Je was boos.	Child	BG 1
ACR 2.1		Child states other emotion.	Child	BG 2
ACR 2.2		Ik weet het niet.	Child	BG 3
BG 1	That's correct	Dat is correct, goed gedaan!	Robot	BS 3

BG 2	Almost correct	Bijna correct. Zal ik je vertellen hoe ik me voelde?	Robot	If yes: BS 3 If no: Interviewer has to help child to find right solution -> BG 1
BG 3	I'll tell you	Geen probleem, ik zal het je vertellen!	Robot	BS 3
BS 3	Story 1 Solution	Ik was echt boos op mijn moeder.	Robot	IR 2
IR 2		Goed gedaan. Laten we horen wat er vervolgens gebeurt.	Interviewer	BS 4
BS 4	Story 2	Ik was zo boos dat ik besloot om een wandeling door het bos te maken. Toen ik aan kwam in het bos was het heel mooi en zonnig. Ik ontmoette een super vriendelijke eekhoorn die me opvrolijkte en me een paar hazelnoten aanbood. Hoe denk je dat ik me op dat moment voelde?	Robot	ECR 3 or ACR 3.1 or ACR 3.2
ECR 3		Jij was blij.	Child	BG 1
ACR 3.1		Child states other emotion.	Child	BG 2
ACR 3.2		Ik weet het niet.	Child	BG 3
BG 1	That's correct	Dat is correct, goed gedaan!	Robot	BS 5
BG 2	Almost correct	Bijna correct. Zal ik je vertellen hoe ik me voelde?	Robot	If yes: BS 5 If no: Interviewer has to help child to find right solution -> BG 1
BG 3	I'll tell you	Geen probleem, ik zal het je vertellen!	Robot	BS 5
BS 5	Solution Story 2	Ik was heel blij, ik hou van hazelnoten.	Robot	IR 3
IR 3		Goed gedaan. Laten we horen wat er vervolgens gebeurt (Only for group without interaction-stimuli).	Interviewer	BS 7
BS 6	Do you like hazelnuts?	(Only for group with interaction-stimuli) Hé Arthur, hoe zit het met jou? Houd je ook van hazelnoten?	Robot	IR 4
IR 4		Nee, helaas kan ik ze niet opeten want ik ben allergisch.	Interviewer	BG 4
BG 4	That's horrible, so sorry!	Ooh, dat is vreselijk, sorry om te horen!	Robot	IR 5
IR 5		Nee, dat is oke, ik kan in plaats daarvan amandelen eten. Dus wat gebeurde er daarna?	Interviewer	BS 7
BS 7	Story 3	Terwijl ik door het bos liep, ontmoette ik ook nog drie apen. Ik dacht dat het geweldig zou zijn om met ze te spelen. We zouden van boom naar boom kunnen springen en zoveel plezier hebben. Maar de apen wilden niet met me spelen. Ze dachten dat ik er grappig uitzag en gooiden eikels naar me. Hoe denk je dat ik me op dat moment voelde?	Robot	ECR 4 or ACR 4.1 or ACR 4.2
ECR 4		Je was verdrietig.	Child	BG 1
ACR 4.1		Child states other emotion.	Child	BG 2
ACR 4.2		Ik weet het niet.	Child	BG 3
BG 1	That's correct	Dat is correct, goed gedaan!	Robot	BS 8
BG 2	Almost correct	Bijna correct. Zal ik je vertellen hoe ik me voelde?	Robot	If yes: BS 8 If no: Interviewer has to help child to find right solution -> BG 1
BG 3	I'll tell you	Geen probleem, ik zal het je vertellen!	Robot	BS 8
BS 8	Story 3 Solution	Ik was echt verdrietig dat ze zo gemeen tegen me waren!	Robot	IR 6
IR 6		Goed gedaan. Laten we horen wat er vervolgens gebeurt.	Interviewer	BS 9
BS 9	Story 4	Nadat ik weggelopen was bij de apen, werd het bos donkerder en kouder en was het moeilijk om mijn weg naar huis te vinden. In de verte, kon ik wolven horen huilen. Hoe denk je dat ik me voelde?	Robot	ECR 5 or ACR 5.1 or ACR 5.2
ECR 5		Je was bang.	Child	BG 1
ACR 5.1		Child states other emotion.	Child	BG 2
ACR 5.2		Ik weet het niet.	Child	BG 3
BG 1	That's correct	Dat is correct, goed gedaan!	Robot	BS 9
BG 2	Almost correct	Bijna correct. Zal ik je vertellen hoe ik me voelde?	Robot	If yes: BS 9 If no: Interviewer has to help child to find right solution -> BG 1

.

BG 3	I'll tell you	Geen probleem, ik zal het je vertellen!	Robot	BS 9
BS 9	Story 4 Solution	Ik was erg bang op dit moment! Gelukkig vond ik mijn weg naar huis en ik was zo blij om mijn moeder weer te zien.	Robot	IR 7
IR 7		Je deed het echt geweldig, dat was een leuk verhaal, toch?	Interviewer	BS 10
BS 10	Ending	Bedankt dat je zooo goed naar me geluisterd hebt. Het verhaal vertellen was erg vermoeiend voor mij. Ik zou nu graag een dutje willen doen! Doei!	Robot	IR 8
IR 8		Goed gedaan, laten we verder gaan met het korte interview.	Interviewer	

Other Generic Buttons			
BG 4	Lets ask Arthur	Dat weet ik niet zeker. Laten we het Arthur vragen!	Robot
BG 5	yes	Ja.	Robot
BG 6	No	Nee.	Robot
BG 7	What do you think?	Wat denk jij?	Robot
BG 8	Thats awesome	Dat is geweldig!	Robot
BG 9	Thats nice	Oh wat leuk!	Robot
BG 10	Neutral	Neutral expression	Robot

Abbr.	**Definition**
ACR	Alternative child response
BG	Button Generic
BS	Button Storytelling
ECR	Expected child response
GQ	General questions
IQ	Interview question
I R	Interviewer response

.

B. EVALUATION OF INTERVIEW QUESTIONS

Q1: Which name should we give the robot?			Children
Human name			9
	*Link**	*1*	
	*Alex**	*1*	
	*Jimmy**	*1*	
	*Lucas**	*1*	
	*Joris**	*1*	
	*Not sure, but male name**	*4*	
Robot name			2
	Robo	*1*	
	The robot that can do everything	*1*	
Fictive name			1
	Robin	*1*	

Q2: How old do you think is the robot?			Children
< 3			1
	*Visual appearance**	*1*	
between 3-5			2
	*Visual appearance**	*1*	
	*Sounds young**	*1*	
between 6-8			5
	*Visual appearance**	2	
	*Story content related**	2	
	*Not sure why**	*1*	
>8			2
	*Visual appearance**	*1*	
	*Not sure why**	*1*	
Not sure			2
	When robot was built	*1*	
	Robots don't always have an age	*1*	

. *Answers that contain anthropomorphic inferences

Q3: What do you think of the robot?			Children
Nice			10
	Talks and moves	*2*	
	Cool robot	*1*	
	Tells stories	*3*	
	Looks nice / cute	*2*	
	Reacts to speech	*1*	
	Can do everything	*1*	
Brave			1
	*Brave for telling stories**	*1*	
Funny			1
	Moves his mouth	*1*	

Q4: Do you think the robot is intelligent?			Children
Yes			8
	*Looks intelligent**	*1*	
	*Tells great stories**	*1*	
	*Story content related**	*1*	
	*But not as intelligent than me**	*2*	
	*Still young and needs to learn things**	*1*	
	Not sure why	*2*	
No			3
	*Story content related**	*2*	
	*Good storyteller**	*1*	
Not sure			1
	Just told stories, has no real (school) knowledge	*1*	

.

Q5: If you saw the robot again, could the robot remember you?			Children
Yes			6
	*In case of short period of time**	*1*	
	*Saw me**	*1*	
	*Knows me now**	*2*	
	Robots don't forget anything	*1*	
	Not sure	*1*	
No			4
	Computers are not smart on long term	*1*	
	*After a long period of time people forget**	*2*	
	*Forgets while getting older**	*1*	
Not sure			2
	Not sure if robots remember that long	*2*	

**Answers that contain anthropomorphic inferences*

Q6: Does the robot like you?'			Children
Yes			11
	*(Would not have) told story **	*2*	
	*He is sweet / nice to me**	*3*	
	*I was nice to him**	*1*	
	*Did a lot together**	*1*	
	*Finds me sweet**	*1*	
	Not sure	*3*	
A bit			1
	*Needs to get to know her better**	*1*	

Q7: Do you think the robot is a good playmate?			Children
Yes			6
	Fun to make robot move	1	
	Because it's a robot / could play soccer	1	
	*Space shuttle (story content related)**	1	
	*Nintendo**	1	
	*Train & blocks**	1	
	*Quartet**	1	
No			5
	Fragile construction	1	
	Not sure why	1	
	Physical limitations	3	
Maybe			1
	If resistant to sand	1	

Q8: If a friend came over and you were playing with your friend, would the robot feel left out?			Children
Yes			10
	*Would feel jealous**	*1*	
	*Would feel alone**	*3*	
	*Could not play with me anymore**	*4*	
	*You should always let others participate**	*1*	
	Not sure	*1*	
No			2
	*Robot is not my friend yet**	*1*	
	*Robot is good friend, knows that he does not need to be jealous**	*1*	

Q9: Do you think the robot is my (the interviewer's) friend?		Children
Yes		12
	*Know each other**	3
	*Otherwise interviewer would not be here**	1
	*They are here together**	2
	*Same hair**	1
	Robot was build by interviewer, knows robot bes	1
	Not sure	4