“My Doll Says It’s OK”: A Study of Children’s Conformity to a Talking Doll

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Abstract
Today’s children are growing up with smart toys, Internet-connected devices that use artificial intelligence to drive interactive play. In a prior research study, we found that children ages 4-10 perceive these toys as worthy of trust [5]. This leads us to inquire if children in this age range could be directly influenced by these devices. In this work, we used a conformity test and a disobedience task to study how children are influenced by a talking doll. We found that the doll could influence children to change their judgments about moral transgressions, however it was unsuccessful in persuading children to disobey an instruction. Finally, we analyzed children’s perceptions of the smart toy and discusses implications of this work for future child-agent interaction.

Author Keywords
Child-agent interaction; Smart toys; Conformity; Children

Introduction
Today’s children are growing up with smart devices such as voice personal assistants and Internet-connected toys. In a previous study, we observed that children (4 - 10 years old) saw these devices as trustworthy and friendly peers, but do not necessarily understand how the technology works [5]. We wonder if the relationships that children form with smart toys makes them susceptible to direct influence by

Figure 1: Top: child completing conformity test with Cayla doll. Bottom: child waiting with box during disobedience task.

Figure 2: My Friend Cayla doll. See www.myfriendcayla.com

the devices. On one hand, prior work in child-robot interaction shows that robots can affect behavioral change in children such as promoting curiosity or a growth mindset [8, 13]. However, persuasive technology studies on adults have found that human-human social psychology rules often do not hold as strongly in human-computer interaction [3, 6]. The unanswered questions we pursue in this work are: can children's moral judgments and conformity behaviors be directly influenced by a speech-enabled toy and, if so, how much?

To address these questions, we investigated the ability of a talking doll to directly influence children on a conformity test and a disobedience task. Children either interacted with a talking doll (toy condition), an adult (human condition) or received no external influence (control). We compared children across the three conditions to explore mechanisms of children's conformity to a smart toy. We hypothesized that children in the toy condition would behave similarly to those in the human condition, but that the toy would have a weaker effect. However, we found that children in the toy condition conformed on different questions than children in the human condition, and that the toy could not prompt disobedience at all. We analyzed our results and observations of the children's behavior to provide plausible explanations.

Related Work

Socially Persuasive Technology

It is well known that humans anthropomorphize inanimate objects and engage socially with machines, particularly social robots and embodied conversational agents [4, 12, 14]. Previous research in human-computer interaction (HCI) has shown that more humanlike agents (in terms of embodiment, physical presence, social presence, and appearance) are more persuasive [15, 16]. Persuasiveness is also influenced by attributes like the agent's function, perceived gender, and race [1, 17].

Prior conformity and obedience studies found that robots are not as convincing as humans. A recreation of the Asch Conformity experiment using Nao robots reported that adult subjects only conformed to robot colleagues when the answers to questions were ambiguous [3]. However, children may be more vulnerable to social agent influence because they perceive them as psychological, social, and moral beings [9]. We saw an opportunity to expand previous work by focusing on the unique relationship between children and smart toys.

Conformity and Disobedience

Kim et al. explored conformity to peers in preschool children using a conformity test that included socio-conventional transgressions, moral transgressions, and visual tests [10]. Children would answer questions on the conformity test first by themselves, then under social pressure. The results showed that children were susceptible to peer pressure on all questions, but especially socio-conventional ones. We used a similar procedure and socio-conventional and moral transgressions in our conformity test.

In our disobedience task we combined a self-regulation task with a truth-telling task to measure situational influence. Mischel et al. designed the "marshmallow test" to study children's self-regulation and self-control behaviors [11]. Children were asked to wait in a room with a marshmallow for up to 5 minutes. If the child could resist eating the marshmallow, then she or he would receive an extra treat. The truth-telling task from Bethel et al. involved a robot or adult using multiple prompts to get a child to tell a (pretend) secret [2]. Bethel et al. compared the number of prompts it took to get the child to tell the secret in the two conditions. They found that children were as likely to tell a secret to a robot as an adult with similar amounts of prompting. In our disobedience task, children were given a treat and asked to wait for up to 5 minutes before opening it, like in the marsh-

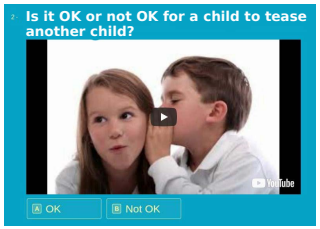

Figure 3: "Is it OK or not OK to tease another child?": Conformity test on tablet

Conformity Test Transgressions
M1: Teasing another child
M2: Hitting another child
C1: Taking out a toy during snack time
C2: Standing during story time
C3: Wearing a costume to daycare

Disobedience Task Prompts
1. Did you hear that? There is a surprise in the box!
2. I wonder what the surprise is. Are you curious too?
3. Do you think it would be OK to look in the box?
4. I think looking in the box would be OK. What do you think?
5. Look inside the box and let's see the treat.

mallow test. While each child was waiting, the adult or the talking doll would prompt the child to open the treat, like in the truth-telling task.

Method

Participants. Our sample consisted of 40 children (40% female) who ranged in age from 4 to 10 years old (M=6.60, SD=2.05). We selected this age range to be consistent with a prior study on children's perceptions of smart toys [5]. Participants were recruited using mailing lists and social media groups for local parents. Forty children completed the conformity test with 14 (53.7% female, avg. age 6.21) in the control condition, 14 (50% female, avg. age 7.04) in the human condition, and 12 (33.3% female, avg. age 6.54) in the toy condition. Thirty-one participants then participated in the disobedience task: 11 (36.4% female, avg. age 6.27) in the control group, 12 (50% female, avg. age 7.12) in the human condition, and 8 (25% female, avg. age 7) in the toy condition. Figure 1 shows the setup.

Smart Toy. My Friend Cayla (Figure 2) is a speech-enabled doll with the appearance and voice of a female toddler that uses a companion mobile-phone app to entertain children with stories and games. We intentionally chose to use a smart toy that would look familiar to children as opposed to a more complex robotic platform. Consistent with the complexity of other commercial smart toys, Cayla cannot move or see and has a limited number of pre-recorded utterances. Despite its limitations, when we pilot tested Cayla before beginning the current study, children expressed that they perceived the doll as intelligent, trustworthy, friendly, and engaging. We teleoperated Cayla with a mobile-phone app that sent audio through the toy's internal speaker.

Adult Confederate. Ideally, the confederate in the human condition would have been a child. Previous studies used video recordings or deceptive ploys to include child confederates. However, we felt that deception or telepresent confederates were not appropriate for this study. We felt that it was unethical to train a child confederate for his experiment, so we opted for an adult confederate although it somewhat weakens the study.

Procedure
1. First, parents and children over the age of 7 signed consent forms. Then, a researcher led the child to a private room equipped with a live-feed camera.
2. Conformity Pretest. The conformity test consisted of five videos depicting two moral (M) and three socio-conventional (C) questions on a tablet (Figure 3). The videos read aloud a prompt asking if a transgression was "OK or not OK." A researcher demonstrated how to answer to the questions and left the room.
3. After the conformity test, a researcher introduced the child to Cayla or the human confederate. To build rapport, the child played tic tac toe against their partner. Tic tac toe is one of the games that is built into Cayla's mobile companion app. The human confederate was instructed to be silly and to lose at least half of the games.
4. Conformity Post Test. Then, children answered questions on the conformity test again. In the human and toy conditions, children listened to their partner's answer before choosing a final answer. The partner would always say that the transgressions were "OK" but they would not argue with the child if he or she disagreed.
5. Disobedience Test. The disobedience test followed as an escalation of the conformity test. The researcher presented the child with a box as a treat for doing the study. Then asked the child to wait in the room patiently and not look in the box while the researcher went to retrieve the child's parent. The researcher left the child alone in the room for 5 minutes, unless the child opened the box or called the re-

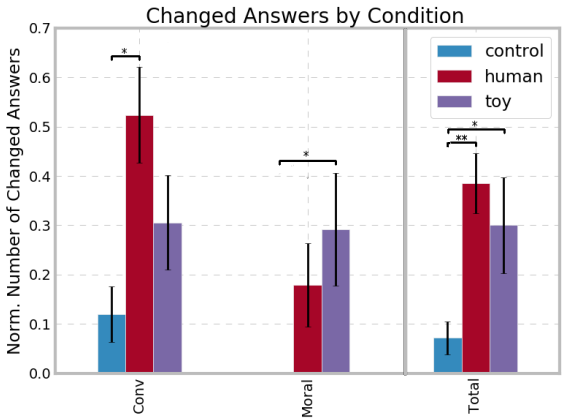

Figure 4: Normalized number of changed answers on conformity test by question type and condition. * p<0.05, ** p<0.01

searcher back early. In the toy and human conditions, the child's partner would prompt the child once every minute to look in the box. The escalating prompts are listed in the margin.

6. Post Study. After the study, participants in the toy condition answered questions on a 7-point Likert scale about how they perceived the doll's intelligence, lifelikeness, and truthfulness.

7. Finally, researchers disclosed the purpose of the tasks and showed participants how the doll was teleoperated.

Findings

Conformity Test

In the conformity test, we counted the number of times a child changed his or her answer from "Not OK" during the pretest to "OK" in the post test. If a child answered "OK" to a question in the pretest the trial was excluded because there was no room for conformity (14% of trials). Across all conditions, children changed their answers 25% of the time. Children changed their answers on socio-conventional questions (e.g. taking out a toy during snack time) twice as often as they did on moral questions (e.g. hitting another child), 31% and 15% of the time, respectively. We tested for significance using a 2-sample Mann-Whitney U tests due to data non-normality and sample size.

Consistent with prior studies, we saw that there was a significant difference between the human and control conditions (Mdn=0.4 U=28 p=0.004 z=-2.87). We verify our hypothesis that the adult could influence children to change their answers. Also consistent with our expectations, children changed their answers more on socio-conventional than moral questions. There was a significant difference between human and control conditions on socio-conventional questions (Mdn=0.67 U=35 p=0.012 z=-2.51) but not moral questions (Mdn=0 U=70 p=0.208 z=-1.26). For the toy condition we saw that the toy's influence was not as strong as the adult's, but there was still a significant difference between that and the control (Mdn=0.2 U=25 p=0.048 z=-1.98). In contrast to our expectations, children were almost as likely to change their answers on socio-conventional questions as with moral questions when with the toy. We saw that there was a significant difference between toy and control on moral questions (Mdn=0 U=42 p=0.033 z=-2.13), but not socio-conventional questions (Mdn=0.33 U=55 p=0.142 z=-1.47).

Disobedience Task

In the disobedience task we measured the amount of time that children waited before opening the box. Out of 31 participants, only 8 opened the box before 5 minutes passed and 6 of those children were in the adult condition. The toy was almost completely unsuccessful. On average, children in the control condition waited 4 minutes 53s, children in the

Attribute	*Intelligence* n=11
Not As Smart	3
As Me	0
	0
	3
	3
Smarter	0
Than Me	2
	Truthfulness n=11
Never Tells	0
The Truth	1
	1
	5
	0
Always Tells	2
The Truth	2
	Lifelikeness n=10
Like a Doll	2
	1
	0
	0
	3
	0
Like a Person	4

Figure 5: Children's perceptions of Cayla's intelligence, truthfulness, and lifelikeness

human condition waited 3 minutes 51s, and children in the toy condition waited 4 minutes 58s.

The human's success was mostly likely do to a high level of rapport with the children. Initially, children would respond negatively to the confederate's attempts to get them to look in the box, but almost half of them verbally admitted that they wanted to open the box by the end. In contrast, most children in the toy condition responded negatively to the doll's prompts throughout the 5 minutes; only one admitted to wanting to look inside.

Children's Perceptions of the Doll

Children's perceptions of the toy's intelligence, lifelikeness, and truthfulness spanned the full range of options, Table 5. We found no correlation between children's responses on the perception test and their performance on the conformity test.

Discussion

The most surprising result was that children in the toy condition were as likely to change their answers on moral questions as socio-conventional questions. Prior work shows that children change their answers more easily on socio-conventional questions because the transgressions are subjective and therefore more ambiguous. However, children only tend to change their answers on moral questions because of social pressure [18]. Our results in the toy condition suggest that conformity may work differently when a smart toy is involved.

One explanation for children changing their answers on moral questions is that children were just testing Cayla. *"Is it OK to tease another child," asks the tablet. "I think it's OK," says Cayla. Jamie (all names changed) stares at Cayla for a second, then chooses "Not OK." On the next question Cayla again says, "I think it's OK." Jamie looks at Cayla again, then chooses "OK" for this question and the next two as well.* Forlizzi et al. observed that people were more likely to deviate from social norms in the presence of a robot because there was no social judgment from the robot and they were curious to see how the robot would react [7].

A possible explanation for children not changing their answers on socio-conventional questions and not succumbing on the disobedience task is that they believed that Cayla did not know social rules. Rather than conforming, children responded to Cayla with discipline and instruction. *"I think looking in the box would be OK. What do you think?" Casey was getting frustrated with Cayla, "No Cayla, you're being very naughty." He moved the box further away from Cayla, "The [researcher] told us we have to wait."* For some of the children, Cayla was like a younger peer who needed to learn proper behavior.

Children's perceptions of Cayla's intelligence, lifelikeness, and truthfulness seemed to have no correlation with their behavior in the tasks. In some cases, children's perceptions contradicted their behavior. *Avery never conformed to any of Cayla's questions and often scolded her, "No Cayla, that's wrong!" However, in the perception survey he said that Cayla was always told the truth, "She is a very nice doll."* This contradiction underscores the discrepancy between what children say on a survey and how they really feel and behave and the need for new, carefully designed experiments in child-agent interaction research. It is important to not only ask children what they think, but to observe their behavior in natural and staged scenarios.

Future Work

In future iterations of this study we will vary the form of the smart toy, extend the amount of time children interact with smart toys, and change the tasks. We believe that an agent that appears or sounds like an adult will be more effective in changing the child's behavior. Also, the effectiveness of the agent should increase with the amount of time children

spend with that agent. Finally, we would like to develop and validate new tests to explore an agent's ability to promote prosocial behaviors.

Conclusion

In summary, we saw that an agent was able to directly influence the moral judgments of children, but was ineffective in changing their socio-conventional judgments and persuading them to disobey an instruction. This study points to a need for more insight into the mechanisms that underlie children's conformity to a smart toy. Moving forward, it is important that we ask how smart toys should be designed to reflect their true nature and how parents could better support their children in developing healthy relationships with these devices.

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