Young Children Spontaneously Appreciate the Perspectives of their Social Partners

Anushka Laha (anushkalaha@ucsb.edu)
Department of Psychological & Brain Sciences,
University of California, Santa Barbara, CA 93106 USA

Brandon M. Woo (bmwoo@ucsb.edu)
Department of Psychological & Brain Sciences,
University of California, Santa Barbara, CA 93106 USA

Abstract

Classic research has found that young children are often egocentric when reasoning about others' visual experiences. In two experiments (total $N = 148$), we investigated 3- to 4-year-old children's abilities to reason about others' distinct visual experiences when they are engaged in social actions. Across experiments, we found that young children spontaneously oriented pictures and books so that those objects appeared upright to their social partners. These findings suggest that past research has underestimated young children's understanding of others' minds.

Keywords: mental state reasoning; perspective taking; cognitive development

Introduction

When people interact with others, they need to represent the perspectives of their social partners. For example, when seated across a friend at a table, a picture lying flat on the table that you experience as upright would instead be experienced as upside down by your friend. We investigated whether young children are sensitive to others' visual experiences when sharing pictures with others.

Children's Understanding of Others' Distinct Visual Experiences

A large body of research indicates that young children often struggle to understand how others' visual experiences can be different from their own. In a classic study, Masangkay et al. (1974) found that it is not until four years of age that children appreciate, in a verbal task, that pictures that are upright to them are upside down to an actor whose perspective is opposite theirs. Three-year-old children instead say that pictures that are upright to them are also upright to an actor, even when the actor's perspective is opposite that of the children. In simplified tasks, young children have difficulty in reasoning about how others experience objects (Flavell et al., 1981). Young children appear egocentric, focused on their own experience. Some have described these and related findings as a limit to early mental state reasoning (e.g., Apperly & Butterfill, 2009; Spelke, 2022; Woo et al., 2024). But is this limit a genuine one?

It is possible that verbal tasks introduce additional demands (e.g., language processing) that obscure early capacities for mental state reasoning. Some work suggests that 3-year-olds are able to understand others' visual experiences in tasks with lower cognitive demands (Moll & Meltzoff, 2011; Moll et al., 2013). Developmental psychologists have also made such arguments regarding false-belief understanding: the ability to reason that a person's beliefs are inconsistent with reality (e.g., believing that an object is in one location, while it has actually been moved elsewhere). There is evidence that false-belief understanding develops in tandem with an understanding of others' visual experiences (Birch & Bloom, 2004): Children verbally demonstrate sensitivity to others' false beliefs by around 4 years of age (Wellman et al., 2001), the same age at which children verbally demonstrate sensitivity to others' visual experiences. Some research suggests that infants and children may be more sensitive to others' false beliefs in nonverbal contexts (Onishi & Baillargeon, 2005; Scott & Baillargeon, 2017). However, multiple labs have failed to replicate such findings (Phillips et al., 2021); these failures suggest that early false-belief understanding may be fragile.

Woo et al. (2024) probed whether 14- to 15-month-old toddlers, in a nonverbal task, would demonstrate sensitivity to an actor's experiences of pictures (e.g., as upright or upside down). Although the task was nonverbal, the toddlers nevertheless appeared egocentric in their processing. Thus, it is not enough that a task is nonverbal for children to succeed at understanding others' visual experiences.

Here, we examine another possibility for why toddlers and young children have not demonstrated sensitivity to others' visual experiences in past research: that researchers have only studied toddlers' and children's reasoning in minimally social situations (see Woo et al., 2023). In past research, participants have been either passively observing an actor (Woo et al., 2024) or answering questions about what an actor sees (Masangkay et al., 1974). But perspective-taking is critical to communication, collaboration, and teaching (Woo et al., 2023). Children may better represent others' minds when engaged in more active social interaction.

There is relevant evidence in the false-belief literature. Although children do not demonstrate false-belief reasoning on verbal tasks until 4 years of age (Wellman et al., 2001), Buttelmann et al. (2009) found that 18-month-old toddlers consider others' false beliefs when helping them. When an actor last saw a desired object in a particular box, but the object moved, 18-month-old toddlers spontaneously directed the actor's attention to the object's current location. There is also evidence that 12- and 18-month-old infants and toddlers point to communicate information to others (see Liszkowski et al., 2006; Liszkowski et al., 2008). There has since been mixed success in replicating the work of Buttelmann et al. (2009), however (see Crivello & Poulin-Dubois, 2018;

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Powell et al., 2018), as well as a lower-level account of the findings (Priewasser et al., 2018). The present experiments therefore serve as a further test of the possibility that children are sensitive to others' minds when engaged in social actions.

The Present Research

In the present experiments, we developed a novel measure of perspective-taking: We asked children to show an experimenter and their caregivers pictures and books. We investigated whether children consider the visual experiences of other people, or if they prioritize their own experience, when showing others pictures and books. In addition to our task, we sought to replicate findings by Masangkay et al. (1974) that 3-year-old children are egocentric when verbally reasoning about others' visual experiences. We chose to test 3- to 4-year-old children for this study because Masangkay et al. (1974) found that children's understanding of others' visual experiences changes over this age range.

If 3-year-old children appreciate the experiences of their social partners when engaged in interaction, then they should orient the pictures and books so that they are upright to the experimenter and their caregivers. They may nevertheless be egocentric, however, when answering questions about an actor's experience.

Alternatively, if capacities for perspective-taking do not differ when engaged vs. not engaged in social actions, 3-year-old children may still be egocentric when sharing pictures and books with others, presenting those items so that they are upside down to others but upright to the children themselves.

Experiment 1

In Experiment 1, we sought (i) to examine whether 3- to 4-year-old children appreciate others' experiences when sharing pictures and books and (ii) to attempt to replicate findings by Masangkay et al. (1974). We asked children to show a picture or a book to another person (an experimenter or the child's own caregiver), who faced them such that they had opposite perspectives on the picture or book.

To replicate the findings of Masangkay et al. (1974), we presented children with an animated character, whose perspective differed from that of the child's. The character looked at a picture that was either upright or upside down to them, and we asked children to identify the orientation of the picture relative to the animated character.

Method

Hypotheses, methods, and analyses for Experiment 1 were preregistered on the Open Science Framework. The preregistrations, stimuli, data, and code are hosted at: https://osf.io/7hfsn/

Participants Sixty-nine 3- to 4-year-old US American children (mean age = 3.49 years, range = 3.04 to 4.99 years, 36 girls and 33 boys) were tested online over video calls. We recruited participants through our lab database and ChildrenHelpingScience.com (Schulz & Scott, 2017). Our sample size was based on a power analysis, using pilot data (n = 25) and the data from 3-year-old participants of Masangkay et al. (1974) (n = 12). We had full data from 64 participants; 5 participants contributed data only towards part of the experiment. Four additional participants' data were excluded due to fussiness and inattentiveness.

Procedure The procedure consisted of a verbal response phase and an action phase, with the order of phases counterbalanced across participants. The verbal response phase sought to replicate the findings of Masangkay et al. (1974), and the action phase involved asking children to show objects to the experimenter or their caregiver.

The verbal response phase consisted of an understanding check, warm-up trials, character familiarization trials, and test trials. For the understanding check, we asked whether children knew the terms "upright" and "upside down". If they did not, the experimenter defined these words. To check all children's understanding, the experimenter presented a stick figure that was either upright or upside down and asked if the figure was "upright or upside down" to the child. One child answered incorrectly, and we excluded their data for the verbal response phase.

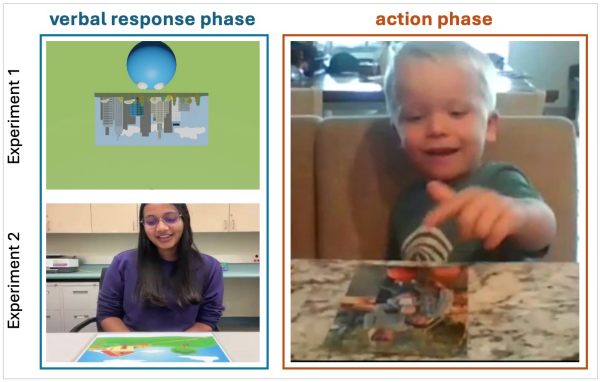
We then presented children with warm-up trials, in which the experimenter presented children with more pictures and asked whether the pictures were "upright or upside down" to the children. Each child completed two sets of warm-up trials, with one set including a picture of a house and the other set including a picture of a skyline. One child refused to answer the warm-up trials for one of the pictures, and we excluded their data from the verbal response phase for that picture.

Next, we familiarized children to four videos depicting an animated character (a blue ball), who was positioned in a different location (left, right, top, or bottom) in each video, always facing the center. The experimenter prompted the children to look at the character's eyes to familiarize children with the character as well as the motion of the camera, which would later be the same in the test trials.

Finally, in the test trials for the verbal response phase, the blue character was again in the four different locations, facing the center, but this time with a picture in the center (either the skyline or the house from the warm-up trials). The picture was either upright or upside down to the blue character, and we asked children whether the picture was upright or upside down to the blue character. The key test trial for this phase involved the character's perspective being opposite that of the children, as in Masangkay et al. (1974). In our results below, we analysed the data from the key test trial.

In the action phase, we asked children and their caregivers to get a picture (e.g., a drawing by the child, a birthday card, or a framed picture) and a picture book. This phase included four trials, in which the experimenter asked the child to show a recipient (either the experimenter or the child's caregiver) the picture or book. In each trial, the experimenter asked children to put the object flat on a table in front of them and look at the picture, as the recipient for that trial is facing the child. The experimenter then asked the children to show the picture to either the experimenter or the caregiver. The

(A) Examples of the trials in the verbal response phase and the action phase



(B) A child who oriented a book so that it was upright to the experimenter

Figure 1: Example trials for each phase of the experiment (A) and example of a child who was coded as having been sensitive to the experimenter's visual experience in the action phase (B)

experimenter recorded whether the child presented the picture so that it is upright or upside down to their social partner. Between trials, the experimenter asked the child to reset the object flat on the table, flipping to a new page for each trial including the book, and positioning it so that they could look at it. After receiving these instructions, children usually spontaneously oriented the picture or book so that it was upright to them. For 17% of the action phase trials, children did not reset objects to be upright to them before the trial; we excluded the data from these trials.

Counterbalancing We counterbalanced which phase was first (verbal response vs. action), the order in which children saw upright pictures in the warm-up trials, the sides that the pictures faced in the test trials, and the first recipient in the action phase (the experimenter vs. the caregiver).

We made it so that when pictures were presented as upright first in the warm-up trials, the test trials that involved the animated character at the top and the bottom sides of the screen occurred first in the verbal response phase's test trials. When the upright pictures were instead second, the top and bottom trials occurred second in the test trials (after the left and right trials). The left trial always occurred before the right trial, and the top trial always occurred before the bottom trial.

For the action phase, the picture was always in the first pair of trials, and the picture book was always in the second pair of trials. There were 16 resulting versions of the study, and we randomly assigned children to one of the 16 versions.

Results

Comparing Children's Performance in Each Phase We first examined whether children's sensitivity to others' visual experiences (i) differed between the phases and by age. For the verbal response phase, we only examined children's performance on the test trial in which the picture was opposite the child's perspective because it matched the perspective of the child's social partners in all trials of the action phase.

We conducted a preregistered logistic mixed-effects model, appropriate for binomial data. The dependent variable was whether a child was sensitive to the other individual's experience: whether the child correctly answered the question about the character's experience in the verbal response phase, and whether the child oriented pictures so that they were upright to their social partners in the action phase. The fixed effects were the phase (verbal response, action-caregiver, action-experimenter), age as a continuous variable, and the resulting interaction. We included participant ID as a random effect. We used dummy coding, with the verbal response phase as the reference group.

The interaction between the child's age and the phase was not significant, both when the child was showing the object to their experimenter (b = 0.52, 95% CI of b [-1.37, 2.41], z = 0.54, p = .591) and when they were showing it to their caregiver (b = -0.18, 95% CI of b [-2.08, 1.72], z = -0.19, p = .853). The phase predicted whether children were sensitive to others' experiences. Children were least sensitive to others' experiences in the verbal response phase (mean = 18%, SD = 39%); their performance in that phase was significantly lower than their performance in the action phase, both when they showed an object to the experimenter (mean = 85%, SD = 36%) (b = 4.09, 95% CI of b [2.96, 5.23], z = 7.06, p < .001) and when they showed an object to their caregiver (mean = 86%, SD = 34%) (b = 4.24, 95% CI of b [3.06, 5.41], z = 7.05, p < .001).

Because there were no interactions with age, we examined all the data together, and we report differences from 50% (chance performance) separately by age in Figure 2.

Children's Performance in Each Phase Separately We investigated whether children understood that when the animated character faced them in the verbal response phase, they would have different perspectives on the picture. We conducted a preregistered binomial test to determine whether children demonstrated sensitivity to the character's visual experience above chance. We found that children did not demonstrate sensitivity to the animated character's distinct experience of the picture (12/69 children correctly identified the character's experience; p < .001, relative risk = 0.34).

We then investigated whether children were sensitive to the visual experiences of the experimenter and the caregiver respectively when asked to show them a picture or book in the action phase. We calculated the proportion of trials, for

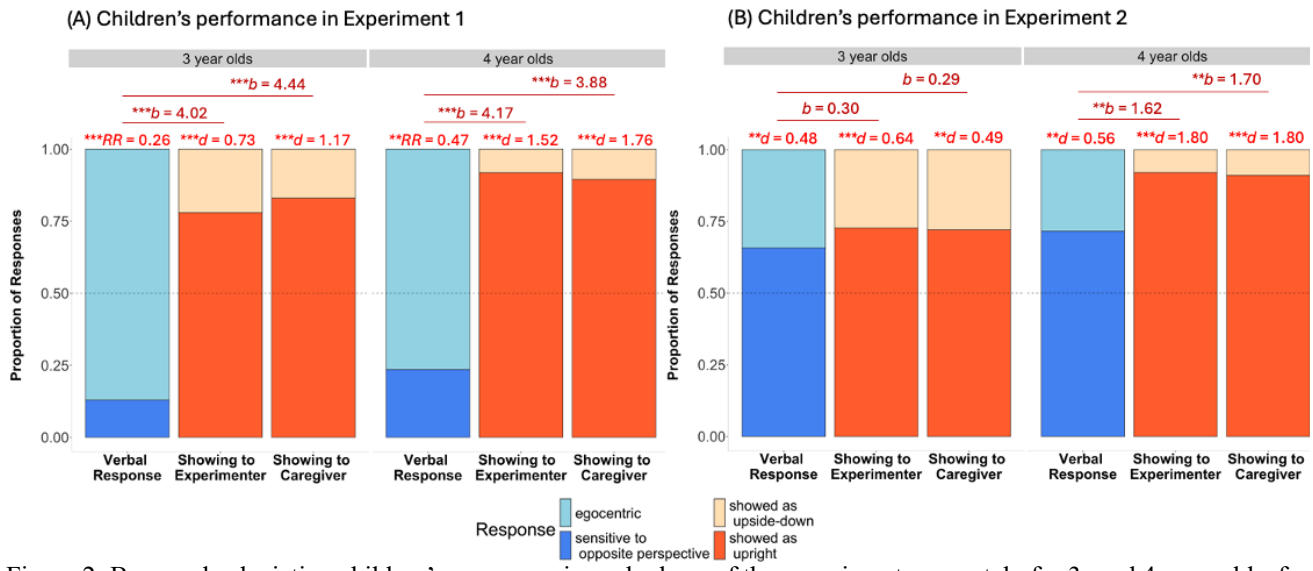


Figure 2: Bar graphs depicting children's responses in each phase of the experiment, separately for 3- and 4-year-olds, for Experiment 1(A) and Experiment 2 (B). *b* indicates regression coefficients, *RR* indicates relative risk, *d* indicates Cohen's *d*, and the asterisks indicate significant effects (*$p < .05$, **$p < .01$, ***$p < .001$).

each recipient, on which children presented pictures so that they were upright to the recipient, and we conducted one-sample *t*-tests to determine whether these proportions differed from 50% (chance). We found that children presented the objects as upright to both the experimenter (85% of children; $t(65) = 8.17$, $p < .001$, $d = 1.01$) and the caregiver (88% of children; $t(63) = 11.41$, $p < .001$, $d = 1.44$).

Discussion

Both 3- and 4-year-old children failed to appreciate the perspective of an agent who faced them when responding verbally, but appreciated the perspective of their social partners who faced them when asked to show them an object. Although these findings suggest that young children are sensitive to others' experiences when engaged in social actions, but not when answering questions about others' experiences, there are at least two limitations. First, whereas the verbal response phase involved an animated character, the action phase involved live people. It is possible that children may be better at reasoning about the visual experiences of real people. Second, although children rotated pictures that were upside down so that they would be upright to others, it is unclear if they did so because they appreciated others' experiences, or because they were just accustomed to rotating pictures and books. Children may have seen their caregivers engage in such behaviors, and so, the children may themselves engaged in them, without considering how such rotation would impact others' visual experiences. We conducted Experiment 2 to test these alternative explanations for our findings.

Experiment 2

In Experiment 2, we again asked whether children consider the visual experience of their social partner when engaged in social actions. We also sought to address the limitations of Experiment 1. To address the possibility that children struggle to reason about animated characters' experiences, in Experiment 2's verbal response phase, we asked children about the experiences of the human experimenter.

Additionally, to address the possibility that children rotated pictures and books without considering their social partners' visual experiences, we included trials in the action phase in which the picture and book were already upside down to the child and upright to their social partners. If children rotated pictures and books in Experiment 1 without considering their social partners' visual experiences, then they may do so in Experiment 2, even when pictures and books are already upright to their social partners.

Method

Hypotheses, methods, and analyses for Experiment 2 were also preregistered on the Open Science Framework.

Participants Eighty 3- to 4-year-old US American children (mean age = 3.46 years, range = 3.03 to 4.94 years, 42 girls and 38 boys) were tested online over video calls, with sixty-six of them completing both phases of our study. Our sample size was based on a statistical power analysis, using Experiment 1 data. We had full data from 66 participants, with 14 participants contributing data only towards one phase.

Procedure The general method and design remained the same as Experiment 1, with a few exceptions. First, we decided to use the term "right side up" instead of "upright" in the verbal response phase to more closely follow the methods of Masangkay et al. (1974). Second, the verbal response phase involved the child answering questions about the experience of a person (the experimenter), instead of an

animated character; here, the experimenter's perspective was always opposite that of the child's. Third, we included trials in the action phase in which the picture or book was already upright to the experimenter or caregiver.

Six children incorrectly answered the understanding check, and four children incorrectly answered the warm-up trials; we excluded their data from the verbal response phase.

The action phase consisted of eight trials, with the first four trials being the same as the trials of Experiment 1. In the last four trials, the experimenter asked caregivers to put the object flat on a table in front of the child such that it was upside down to the child and upright to the recipient for that trial who faced the child. The experimenter again asked the children to show the picture or book page to the recipient for that trial and recorded whether the child presented the picture or book page so that it was upright or upside down to the recipient. Between trials, the experimenter asked the child, or the caregiver in the last four trials, to reset the object. For 17% of all trials in the action phase, the objects were not reset correctly; we excluded the data from these trials.

Counterbalancing As in Experiment 1, we counterbalanced which phase was first (verbal response vs. action), the order in which children saw upright pictures in the warm-up trials (first vs. second for each picture), and the first recipient in the action phase (the experimenter vs. the caregiver). We also counterbalanced the order in which the picture was upright to the experimenter in the test trials of the verbal response phase (first vs. second).

For the action phase, the picture was always in the first pair of trials, and the picture book was always in the second pair of trials. The trial in which the caregiver read the book to the child always came after the verbal response phase and the action phase. There were 16 resulting versions of the stimuli, and we randomly assigned children to one of the 16 versions.

Results

Comparing Children's Performance in Each Phase As in Experiment 1, we examined whether children's sensitivity to others' visual experiences differed between the phases and by age. For the action phase, we only included data from trials in which the picture or book was initially upright to the child.

We conducted a model like the preregistered logistic mixed-effects model of Experiment 1, except that the individual in the verbal response phase was now the experimenter. The interaction between the child's age and the phase was not significant, both when the child was showing the object to their experimenter (b = 1.25, 95% CI of b [-0.09, 2.58], z = 1.83, p = .067) and when they were showing it to their caregiver (b = 1.32, 95% CI of b [-0.06, 2.70], z = 1.88, p = .060). The phase again predicted whether children were sensitive to others' experiences. Children were least sensitive to others' experiences in the verbal response phase (mean = 69%, SD = 47%); their performance in that phase was significantly lower than their performance in the action phase, both when they showed an object to the experimenter (mean = 82%, SD = 39%) (b = 0.79, 95% CI of b [0.16, 1.41], z = 2.47 p = .013) and when they showed an object to their caregiver (mean = 81%, SD = 39%) (b = 0.76, 95% CI of b [0.13, 1.38], z = 2.38, p = .018).

Because there were no interactions with age, we examined all the data together, and we report differences from 50% (chance performance) separately by age in Figure 2.

Children's Performance in Each Phase Separately We first calculated the proportion of trials in the verbal response phase in which each child understood that the experimenter sitting opposite the child had a different visual experience of a picture, and we conducted a one-sample t-test to determine whether this proportion differed from 50%. We found that children demonstrated sensitivity to the experimenter's visual experiences in their verbal responses (69% of children; $t(72) = 4.45$, $p < .001$, $d = 0.52$).

We then investigated whether children were sensitive to the visual experiences of their social partners in the action phase. For the trials in which pictures were initially upside down to the recipient, we calculated the proportion of trials, for each recipient, in which each child oriented pictures so that they were upright to the recipient, and we conducted one-sample t-tests to determine whether these proportions differed from 50%. We found that children presented the objects as upright to both the experimenter (82% of children; $t(70) = 8.43$, $p < .001$, $d = 1.01$) and to their caregiver (80% of children; $t(74) = 7.30$, $p < .001$, $d = 0.85$).

For the trials in which pictures were initially upright to the recipient, we calculated the proportion of trials, for each recipient, in which each child presented pictures so that they were still upright to the recipient. We conducted one-sample t-tests to determine whether these proportions differed from 50%. We found that children presented the objects as upright to both the experimenter (91% of children; $t(76) = 14.76$, $p < .001$, $d = 1.69$) and to their caregiver (92% of children; $t(75) = 16.68$, $p < .001$, $d = 1.93$).

Discussion

In Experiment 2, 3- and 4-year-old children were sensitive to others' visual experiences, both when asked to show objects to their social partners and when asked questions about the experimenter's visual experiences. Moreover, as a group, children were especially sensitive to others' visual experiences when showing objects to their social partners. The findings in 3-year-old children stand in contrast with classic research (Masangkay et al., 1974), which has found that 3-year-old children are usually egocentric when verbally reasoning about others' visual experiences.

Taken together with Experiment 1's findings, Experiment 2's findings suggest that both 3- and 4-year-old children appreciate the visual experiences of live people more than they do those of animated characters.

Experiment 2's findings also provide evidence that children's act of rotating pictures in the action phase reflected a sensitivity to others' visual experiences. Children did not rotate the picture when it was already upright to their social partners.

General Discussion

In the present experiments, we found evidence that 3- and 4-year-old children appreciate their social partner's visual experiences when sharing pictures and books with them. Specifically, children spontaneously oriented pictures and books to be upright to others. Children appeared more sensitive to others' visual experiences when showing them pictures and books than when they were answering questions about others' visual experiences. Notably, children only rotated the picture or book while sharing it with others when it was upright to themselves (and upside down to their partner) at first; children instead simply lifted the object when it was already upright to their partner. These findings suggest that children's acts of orienting the pictures and books indeed reflected children's appreciation of their social partners' visual experiences, rather than some idea that people should rotate pictures and books (regardless of their final orientation) when sharing them with others. Thus, children appear to reason about others' visual experiences when they are engaged in social actions.

Together, the present findings contribute to a large body of research on infants' and children's abilities to reason about others' minds. Previous research has found that young children are egocentric when reasoning about others' visual experiences, and these findings have been taken to reflect a limit to early mental state reasoning. Our findings suggest that this limit is not genuine. When young children engaged in social actions in our experiments, they were not egocentric: They demonstrated sensitivity to their social partners' distinct visual experiences.

The present findings advance debates concerning whether children are better able to reason about others' mental states when engaged in active social actions, such as helping them. Although Buttelmann et al. (2009) found evidence that children consider others' beliefs when helping them, there has since been mixed success in replicating these findings and an alternative explanation that made these findings unclear (Crivello & Poulin-Dubois; Priewasser et al., 2018). Here, we provide evidence that children consider a related kind of mental state, the visual experiences of others, when showing objects to others.

The verbal response phases of our experiments also served to attempt to replicate classic findings by Masangkay et al. (1974): that 3-year-old children are egocentric when verbally reasoning about others' experiences. We replicated these findings in Experiment 1's verbal response phase, involving an animated character who was looking at pictures, but we did not replicate these findings in Experiment 2, involving a live person. Instead, 3-year-old children correctly answered questions about the visual experiences of the experimenter who faced them. Taken together, the present findings suggest (i) that children are more sensitive to the experiences of people than they are to those of animated characters and (ii) that young children are more sensitive to others' visual experiences than classic findings would suggest. It remains unknown as to what may have caused this change in children's perspective-taking in the 50 years since the work of Masangkay et al. (1974). Future work should systematically study young children's understanding of the experiences of people and animated characters.

It also remains unknown as to how children's experiences with the objects in the present experiments influenced their responses in the action phase. That is, the pictures and books were all objects that children had at home and therefore likely had previous experience with. Are the present findings limited to objects that children have experience with, or might they extend to novel pictures or books that children have never interacted with? We see an in-person, controlled experiment, with a standardized set of pictures, as a key next step to addressing this limitation.

In sum, whereas classic research has found that young children are egocentric when reasoning about others' visual experiences, the present experiments provide evidence that young children spontaneously reason about others' distinct visual experiences when they are engaged in social actions. From 3 years of age, children orient pictures and books so that they are upright, not to themselves, but to their social partners. These findings may shed light on the purpose of mental state reasoning: to support social interactions. Children may better represent the mental states of their social partners: the targets of their communication and cooperation. We look forward to research that continues to explore children's reasoning about the minds of others within social interactions.

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