Cognitive Development 63 (2022) 101202

Contents lists available at ScienceDirect

Cognitive Development

journal homepage: www.elsevier.com/locate/cogdev

Pretending at hand: How children perceive and process puppets☆

Angeline S. Lillard [1,*]

University of Virginia, United States

ARTICLE INFO

Keywords:
Pretend
Puppets
Theory of mind

ABSTRACT

Scientists have long employed puppets in research with young children; this essay explores the validity of this practice. After considering what puppets are, their main types and history, I note the different ways puppets have been employed in research. One of these uses raises the issue of whether and when children apply their theory of mind to puppets. After exploring this issue, I consider if children believe puppets actually are animate and sentient, like humans, and whether children participating in experiments with puppets are *pretending* (in the sense of pretend play) that puppet stimuli are human. Children aged three years and older and infants are discussed separately, as different definitions of puppets have been used in the research across these age levels and different patterns of results have been obtained. I end with ideas regarding further research.

1. Introduction

Puppets are frequently used in experiments with children, but until recently (Packer & Moreno-Dulcey, 2022), their use was rarely questioned. Yet using puppets as stand-ins for humans raises many issues fundamental to developmental psychology. In this essay, I will first consider puppets generally: what puppets are and their prevalence across human cultures. Then I examine their use in research, and zero in on some issues pertinent to one type of use: to study children's interpretations of mental states and processes. I consider how children construe puppets, in particular whether children (at some ages) actually see puppets as animate and sentient, and whether children are pretending (in the sense of pretend play) when they participate in experiments with puppets. I note that studies with children aged three years and older, versus with infants, differ both in the extension of "puppets" employed and in the consistency of results obtained. The essay ends with suggestions regarding research.

2. What are puppets? Reflections

Puppets are inanimate objects that are made to seem animate (like people, animals, or monsters, for example), through their body structure, movement, and purported expression, the latter two of which are controlled contemporaneously by a human puppeteer. Puppets typically have eyes and a mouth, and sometimes also have hands, arms, and legs that are made to move in animate-like ways,

☆ I have no conflicts of interest to disclose. Support while writing this article was provided by grants from Wend and the Wildflower Foundation to the author and Institute of Education Sciences, U.S. Department of Education, through Grant R305A180181 to the American Institutes for Research. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

* Corresponding address: Department of Psychology, University of Virginia, P.O. Box 400400, Charlottesville, VA 22904, United States.
E-mail address: lillard@virginia.edu.
[1] ORCID: 0000-0001-9697-6611.

https://doi.org/10.1016/j.cogdev.2022.101202
Received 2 October 2021; Received in revised form 16 May 2022; Accepted 2 June 2022
Available online 9 June 2022

carrying out actions. Puppets are often made to appear to say things and emote, for example to laugh and to cry. In these ways they are similar to model animals and human-like dolls that are employed in pretense scenarios. In my analysis, what distinguishes puppets from dolls or other model creatures is that to some degree they appear to move and/or talk *on their own*, whereas if a doll is animated, the person responsible for the animation is usually obvious. The illusion of auto-movement is accomplished because the human hand that animates a puppet is typically at least somewhat hidden. Thus, a puppet seems self-animated. This juxtaposition of the appearance of independent agency against a backdrop of clear human control is captivating. For adults at least, there is a shared understanding between audience and puppeteer: Although the puppet "appears" to be self-controlled, it is actually controlled by the puppeteer. When children come to share that understanding is an important question regarding how children interpret puppets.

In addition to being distinct from role-playing stuffed animals and dolls, by virtue of their controller being at least partially occluded, puppets are also distinct from wind-up toys and animated pictures, like cartoons; in these cases the distinction is by virtue of the source of the movement and the temporal relation between the source instigating the movement and the movement itself. For puppets, there is a transfer of energy from a human puppeteer to the puppet's movement. For both wind-up toys and animated pictures, the eventual source of the movement is a human, but the human engineering occurred at some point in the past and is indirectly related to the movement. The most immediate human cause of a wind-up toy or animated picture's movement occurs seconds before the movement (during the winding, or when pressing the play button). For puppets, the movement occurs immediately. Puppets are also distinct from both wind-up toys and animated pictures in how they move: Wind-ups and cartoon images move in a single, pre-established, and purely mechanical way, whereas puppets can move in a wide variety of ways at the controller's discretion. Further distinguishing puppets from animated pictures is the fact that puppets are three-dimensional, and pictures are two-dimensional.

Across cultures there are many types of puppets; in my experience five basic and familiar types are the finger puppet (usually a cloth placed over a finger that moves as if it were a creature); the hand puppet, in which an entire hand and wrist fill a container (e.g., a sock, sewn cloth, a paper sack) that portrays the creature; the rod puppet, in which case the creature is at the end of a rod, which is made to move; the shadow puppet, where an object casts a shadow representing the creature on to a wall; and the marionette puppet, where the puppet creature's appendages are attached to strings, and a human manipulates the appendages by pulling the strings, making the marionette puppet move as if animate. In all cases the owner of the finger or hand that manipulates a puppet also expresses its emotions and speaks for it, and this conflux creates an illusion that it is alive—but not so perfect an illusion that observers would actually be duped (although the question arises as to whether very young children are). Puppets typically stay well outside of the "uncanny valley," where an inanimate object or face seems almost but not quite human, which produces feelings of revulsion (Seyama & Nagayama, 2007). Regardless, puppets are captivating and engaging, which explains their popularity.

3. Uses of puppets

Puppets have been created and used in many civilizations, extending back at least to the Ancient Greeks (Speaight, 2021). Puppets are used to put on plays and enact vignettes, for both adult and child audiences (Jurkowski, 2014). Popular puppets in recent times appeared in television shows like *The Muppets* and *Sesame Street* (like Bert and Ernie). Puppets have also been used in psychotherapy at least since the 1930s to act out vignettes, with a purpose of eliciting children's memories, thoughts, and feelings (Bender & Woltmann, 1936). In experimental research, puppets are employed in two basic ways.

3.1. Puppets as objects

A first and very basic use of puppets in developmental psychology research studies is as mere objects. In one such use, puppets—most often hand puppets—are employed as attention getters, as in the head-turn procedure (Werker et al., 1997). In this procedure, a puppet attracts infants' attention so they will look straight ahead; this allows the experimenter to clearly detect a child turning away from one stimulus towards another. Another case in which puppets are used as objects is when puppets serve as things on which to demonstrate behaviors, for example, in studies of imitation (Hayne et al., 1997). The likely reason experimenters choose puppets as objects, rather than say a shoe or a plant, is presumably due to a belief (which could be based on observation) that puppets particularly engage children.

3.2. Puppets as human stand-ins

In the second broad class of use, puppets are stand-ins for humans. An even more common case where an object is used as a stand-in for humans occurs with *images* of *animals*, like Arthur the Aardvark, the Berenstain Bears, and animals in Richard Scarry books; I will consider them first as an analogy for puppets, and then discuss how puppets are used as stand-ins for humans. In the case of animal images standing in for humans, the animals are like humans in terms of their lifestyles—what and how they eat, their shelters, their clothing, and their transportation. In their behaviors as well, like going to school or work, they are also often more like humans than animals. And, if a psychology is portrayed for these animal images, it is a human psychology. Thus, for all intents and purposes, these depicted animals are humans in animal bodies.

When puppets are used in experiments, it is most often to play this standing-in role, like images of animals often do. One class of standing-in uses occurs when puppets are used to present experimental vignettes to children. In one such study (Belsky et al., 1996), puppets enacted events while child participants were occasionally distracted from observing the enactments; at issue was which events children later remembered. In such paradigms, there is an implicit understanding that one is to regard the puppets as if they were

human, but there is no direct probing of the puppets' minds or mental states.

In other cases, the puppets present experimental stimuli and are themselves part of the experiment. For example, in the Berkeley Puppet Interview, puppets are used to elicit self-concepts of preschoolers (Measelle et al., 1998). Children are familiarized with two hand puppets who appear to utter statements about themselves, and children are asked which puppet they are more like.

It seems children accept the puppets as stand-ins for humans because such studies get reliable and valid data. For example, in the Berkeley interview, the puppets do elicit self-descriptions from 4- to 6-year-olds that converge with teacher and parent report (Measelle et al., 1998). If a rock were made to utter statements instead of a puppet, children might have been confused, unless they were to readily accept rocks as stand-in for humans as well. If they were to really saw the rock as having mental states, they would be expressing animism—an issue going back to the studies of Jean Piaget (1929) and Margaret Mead (1932) that is beyond the scope of this essay. Suffice it to say that in some cases, a puppet is used in experiments as a stand-in for a human, but children are not asked to explicitly consider or to reason about the puppets' psychology.

Researchers go beyond puppets being merely stand-ins for humans when they directly probe how children conceptualize puppets, for example when they use puppets to directly examine theory of mind. Here the puppets are not only standing in for humans, but also children are explicitly *asked to reason about or respond to them* as if they were human. Puppets were a mainstay in studies of children's understanding of perceptual processes (e.g., Pillow, 1989; Pratt & Bryant, 1990), and in recent years puppets have been used as subjects in social cognition research, perhaps most prominently in the laboratories of Kiley Hamlin and Michael Tomasello or their former students (e.g., Vaish et al., 2011). For puppets to be valid props, both standing in for humans and serving as models to probe psychological understandings, requires that children accept the premise that a puppet can in all important respects be viewed like a human. Do children interpret puppets as the researchers intend them to be interpreted? Are children willing to take an intentional stance to puppets? I first consider this issue broadly with regard to experiments involving children ages 3 and older; these experiments typically use standard hand puppets. The infant literature is less clear, and is discussed separately.

4. Broad application of an intentional stance

The vast majority of humans have a strong tendency to take what Dennett (1987) called an "intentional stance": We easily, naturally project intentionality on to other objects, even inanimate ones. The term *intentional* is used here as in philosophy—not in the sense of acting on purpose, but rather referring to the quality of "aboutness" (Searle, 1983). Minds take propositions; minds involve thoughts and feelings and *re*present rather than directly present the world. Our intentional stance towards other humans is the topic of folk psychology or theory of mind (Wellman, 2014). The tendency to view other people as having minds is a human universal (Brown, 1991), the content of which is tweaked across cultures (Lillard, 1998). As Heider and Simmel (1944) demonstrated long ago, people automatically project their theory of mind even on to moving shapes. The tendency to take an intentional stance is thus so strong that we over-apply it.

In a sense it seems miraculous that anyone, and especially a child, applies a theory of mind to anything, as there is no concrete evidence of mental states; the concrete evidence lies in behavior, and so one might expect young children to be behaviorists (Lillard & Flavell, 1990). When it comes to *describing* themselves or others, young children have in fact been characterized as behaviorists (Shantz, 1983), although in contexts of explaining behaviors, young children do ascribe mental states to people (Bartsch & Wellman, 1995; Lillard & Flavell, 1992). Furthermore, at least by ages 2–3, children appear to be as willing to ascribe mental states to puppets as to people.

For example, O'Neill, Astington, & Flavell, 1992 used puppets to examine children's understanding of how sensory experience enables knowledge—for example, testing understanding that a puppet who could see inside a tunnel would know the color of an object deep inside the tunnel, whereas a puppet who could only feel the tunnel would not know its color. The puppets were intended to be viewed as—and in fact were even referred to—as "persons" (p. 483). Apparently no child objected that puppets cannot really see or know anything (e.g., no child was reported to say, "It's just a puppet!").

Three-year-olds appeared to lack the queried understanding about perception and knowledge, but 5-year-olds demonstrated it. Five-year-olds claimed that a puppet who was simply touching the outside of the tunnel, for example, would not know the color of an object inside. One might be concerned that 3-year-olds' problem was not with understanding perception, but was rather with applying their theory of mind to puppets. Against this, in Experiment 1 children made judgments about their own knowledge, and results were similar to those obtained with puppets.

Other studies have used human protagonists to examine children's understanding of sensory access and knowledge (Pratt & Bryant, 1990; Taylor et al., 1991), again with similar results as studies using puppets. Whether the protagonist is person or puppet, 3-year-olds equate sensory access with knowledge, and fail to acknowledge that different types of access convey different types of knowledge (Flavell et al., 1990). The same has been found for studies of false belief: A meta-analysis showed that it does not matter if the protagonist is a live person or a puppet, nor does the nature of the protagonist interact with age such that younger children perform less favorably with some types of protagonist (Wellman et al., 2001). The assumption that one can validly use puppets as protagonists in experiments probing theory of mind is thus upheld, at least by ages 3–4.

Interestingly, it appears that an important criterion for children treating a puppet as an intentional being is that an experimenter treat the puppet in that way, for example by calling it a "friend" and referring to its mental states (Asaba et al., 2019). In this study, when experimenters spoke of puppets as if they were simply objects, 4-year-olds seemed unconcerned about reputation management in front of the puppets, suggesting they failed to attribute mental states to puppets that were treated as objects.

Puppets can validly be used in experiments with preschoolers because children are clearly willing to take the intentional stance towards them if the experimenter appears to be doing the same. This raises the question of whether children are in fact duped by

puppets, and think they actually do have animacy and mental states.

5. Do children mistakenly think puppets are animate and sentient?

Bender and Woltmann (1936) relayed an anecdote about a Chinese king, Mu-Wang, who around 1000 B.C. watched a puppet show presented to his court; the puppets "could move their limbs and acted in such a natural way that the king thought they were real human beings" (p. 344) whose actions were an affront to the king; the king went to behead the puppeteer, who saved himself by taking the puppets apart, thereby proving they were just pieces of wood. When children are shown an Ernie hand puppet, or a marionette, are they duped like Mu-Wang? In my very first experiment, 3-year-olds were shown a puppet named George, and asked to tell George whether a pictured child was "wiping up his spilled milk, or feeling sad about his spilled milk" (Lillard & Flavell, 1990, p. 735). Three-year-olds looked earnestly at the blue felt puppet and said things like, "George, he's feeling sad because he spilled his milk." These 3-year-olds were certainly capable of talking to the puppet *as if* it were animate and sentient; did they *actually think* it was?

The evidence is indirect, but at least for children older than two, it does not favor what I will call the "confusion hypothesis": that children think puppets are actually sentient beings. Take, for example, Marjorie Taylor's (1999) interviews of children with imaginary companions. She noted that at a certain point in these interviews, 4-year-olds would get rather puzzled at the adult's sincere interest, and tell them, "It's not real, you know." In that study, children's imaginary companions ranged from purely imagined entities to animated stuffed animals; puppets might share the same "not-real" status as imaginary companions, although they are (at least in experiments) animated by a semi-occluded other, rather than the child themselves.

A second reason to doubt the confusion hypothesis is that children generally are adept at differentiating fantasy and reality, at least by age 3 (Woolley, 1997; Woolley & Ghossainy, 2013); they are sometimes confused, for example in emotional situations, but generally they appear to know what is pretend and what is real (Lillard, 2001). Indeed, as Leslie (1987) adeptly pointed out, if children did not maintain a real-pretend boundary, they would become very confused. Children categorize objects from an early age as pretend and real.

A third reason to doubt the confusion hypothesis is that children (even before age 3) treat humans very differently than they treat inanimates, for example, smiling, gesturing, and imitating them (for a helpful review, see Johnson et al., 2001). If a puppet were not being animated by a human puppeteer, it seems unlikely that children would engage in this way, just as 4-year-olds were unconcerned about reputation management with puppets described as physical things in the Asaba et al. (2019) study. Thus, it seems unlikely that children, at least by age three, think puppets are actually human, but this is an empirical question, worthy of investigation. How would children respond to a puppet if it were revealed that there was no puppeteer? Would they be surprised?

If it is the case that children do not mistakenly think puppets are themselves sentient and animate, a next issue is whether child participants are engaging in pretend play with the experimenter.

6. Are children pretending the puppets in experiments are real?

Given that children treat puppets in experiments as if they were sentient, animate beings, and given that it seems unlikely that they (at least by age 3) mistakenly think puppets *really* are sentient and animate, are children entering into pretend play with the experimenter, pretending the puppets are sentient and animate?

As I have contended, to pretend involves projecting a mental representation on to some alternate reality (Lillard, 2001), which child and experimenter are certainly doing when they employ and entertain puppets to act out scenarios in empirical research. In pretend play, one is also intentionally doing this projection and is aware that one is doing it. However, for an act to be pretend *play* (as distinct from mere pretense), it also must be done in a spirit of fun or amusement (Lillard, 2015). Finally, we know that when one engages in pretend play, one behaves somewhat differently than when one does things for real (e.g., Lillard et al., 2007), whereas in pretense without play, one might behave in exactly the same manner. A classic example of that is Austin (1957/1979) description of a person who is pretending to wash a window while actually spying on the inhabitants; to a viewer, if the person is pretending convincingly, the washing behaviors are the same in both cases. The primary intention is what differs.

Although I know of no formal study, these latter two characteristics (fun, and the actor altering their behavior in predictable ways) appear to not be fulfilled when children participate in experiments with puppets. First, children participating in experiments tend to seem quite serious about their activities. They do not exhibit signs that they are pretending, such as high-pitched voices, more frequent smiles, or use of the imperfect tense (e.g., Garvey & Kramer, 1989; Lillard et al., 2007; Lillard & Witherington, 2004; Nakamichi, 2015). Furthermore, since the puppeteer is by definition at least partially occluded, the puppeteer is unlikely to be emitting certain signs of pretense themselves, curtailing the ability to create a shared pretend play scenario. Although more research is needed on how children behave when they are pretending versus doing things for real, research reports nothing in children's behavior when puppets portray experimental vignettes that suggests children are themselves engaging in an act of pretend play.

This brings us to the final, and I think correct possibility: Children (at least by age 3) take an intentional stance towards puppets, understanding that they are not actually sentient and animate, but willing to project their theory of mind as if they were. I claim they are not pretending, in the sense of pretend play, that the puppets are human; they are simply letting them stand in for humans.

7. Younger infants

Thus far I have been concerned mainly with children ages three years and older. The question arises as to when infants ascribe their theory of mind (rudimentary as it may be) to puppets, such that puppets can serve as a stand in for humans in experiments with infants.

Puppets have been focal stimuli in paradigms probing infant social cognition, such as infants' preference for puppets who help over those that hinder others (Hamlin & Wynn, 2011), and their reading intention in goal-directed actions (Johnson et al., 2001). It is problematic that in the infant literature, the term "puppet" is used to explain an array of stimuli that sometimes vary considerably from the basic hand puppet. Furthermore, obtained results are not entirely consistent as to how infants interpret these stimuli.

7.1. Viewing puppets as helpers or hinderers

In one study, Hamlin and Wynn (2011) did use hand puppets; they showed hand puppets helping or hindering other hand puppets, for example helping or hindering someone who is trying to get something out of a box. Infants as young as 3 months old preferentially reached to and looked more at the helping than the hindering puppet. As Hamlin et al. discussed, this *might* suggest that the infants viewed the puppets as having traits; at the very least it suggests they are discriminating positively or negatively valenced acts as such. Importantly, a control procedure replaced the active puppet with a plastic pincer (stimuli shown in Hamlin, 2013). Under those conditions, infants did not respond more to the "helping" pincer; the differences in infant reaching for the helpful one across the two conditions is striking. It is plausible that this is because infants viewed the puppet, but not the pincer, as being under its own control, and having agency. There is no comparison study that used humans, and so it is unclear if the infants were in fact responding to the puppets as they would to a human.

Hamlin and Wynn *did* discuss the use of a puppet, and the reason for the choice of stimuli was stated to be that puppets' behaviors are considered by infants to be goal-directed, whereas mere movements of objects like pincers are not. Hamlin went on to use puppets in many more experiments probing children and infants' social cognition; in her studies, children appear to willingly ascribe agency to puppets. However, "puppet" is sometimes used liberally by Hamlin to refer to wooden shapes; although stimuli are often photographed, it is not always clear from the Methods sections whether "puppet" in her experiments corresponds to the definition herein. Interestingly, (1) cosmetic changes to the laboratory that appeared to distract infants were associated with replication failure in these paradigms (Van de Vondervoort et al., 2018); and (2) a different laboratory failed to replicate Hamlin's first study (Hamlin et al., 2007) with true puppets and 9-month-olds (Salvadori et al., 2015). These last two points suggest the understandings may be fragile, but leave open the nature of the failed understanding: that the puppets are to be interpreted as humans, that helping or hindering was occurring, that hindering is negative valenced, or what. As an aside, one study has shown that dogs do not respond differentially to wooden-shape helpers and hinderers (McAuliffe et al., 2019).

7.2. Reading puppet's goals

Two studies examining slightly older infants' attribution of goals to puppets used a paradigm pioneered by Meltzoff (1995) in which children view an actor trying unsuccessfully to carry out an act; children later carrying out that act successfully suggests they correctly interpreted the actor's goal. Children do this at least as early as 15 months when the protagonist is a human, but not when pincers replicate the human movements. Actually carrying out an action is of course more complex that simply reaching for a helper, so these studies have not to my knowledge included children younger than 10 months. Furthermore, these studies lack the moral valence of helping versus hindering; human beings seem to be particularly attuned to moral valences (Cosmides & Tooby, 2013), which might engender more sophisticated attribution of mental qualities to puppets at younger ages.

In one of the two studies, Legerstee and Markova (2008) showed 10-month-olds a series of incomplete acts enacted by different protagonists: an adult-sized stuffed dog puppet (which was very obviously not a real dog) and humans; the humans were dressed normally or in strange clothes in effort to make them more like a puppet (Legerstee & Markova, 2008). Children completed the actions in both human conditions, but not the puppet condition. This might suggest that when no moral valence is involved, 10-month-olds do not attribute what are to us at least mental qualities, like goals, to puppets, while they do attribute goals to humans. Alternately, it is possible that the stuffed dog was not viewed as a puppet, perhaps because it was so large.

In another study, with slightly older infants (15 months), incomplete acts were demonstrated by a child-sized (18 × 12 in.) stuffed orangutan, with a face, who could be made to move contingently with the participant (Johnson et al., 2001). The orangutan was modified to operate like a puppet (with an experimenter's arms fitting into its arms). In this paradigm, 15-month-old children did complete the actions when performed by the puppet; they did not do so when *pincers* replicated the motions. Thus, 15-month-olds appeared to view a child-sized stuffed orangutan puppet as a mentalistic agent (in the sense of having goals).

These two non-moral goal-attribution paradigms seem contradictory. I see three possibilities. One is purely developmental. Perhaps children under one year of age have a fragile sense of goal-directedness as applied to agents, and cannot hold in mind, interpret, and enact a goal-directed action as attributed to a puppet (as opposed to just reaching, as in the Hamlin study); by 15 months, this capacity is developed. Alternatively, perhaps in the Johnson study children thought the orangutan was a live animal or a person in strange clothes, in which case the study provides no evidence as to whether 15-month-olds infants fail to attribute goals to *puppets*. Supporting this—but also consistent with children being very engaged with a puppet—children also engaged in social gestures towards the orangutan, such as waving and asking for toys it held. The third possibility is that children were befuddled in the Legerstee study because the puppet was so large. Perhaps there is a size range within which children accept puppets as human stand-ins.

Despite inconsistency across studies, it has been claimed that in social cognition research, infants (like older children) respond similarly whether protagonists are dolls, people, or puppets (Kominsky et al., 2020). If this were the case, then we could say that young children willingly apply their theory of mind—whatever it might be at a given age—to puppets as if they were applying it to people. Interestingly, infants seem to require certain features in order to get them to regard entities as if they were human. Johnson et al. (2001) found that only contingent or face-bearing agents were responded to as if they were human in experiments with 15-month-olds;

a blob had to grow and shrink or have certain facial features before an infant would respond in experiments as though the blob has a mind (Johnson et al., 1998). This suggests young children may be more particular than adults in what they will project a theory of mind on to (since adults project on to flat shapes in Heider and Simmel arrays), but they will do so even with inanimates.

Except for the Legerstee study, in which it is unclear if the stuffed dog was interpreted as a puppet, no study has suggested there is an age at which children apply their theory of mind to people but fail to apply it to puppets; empirical research is needed to more clearly resolve this.

8. Summary

In sum, it seems that from ages three on, hand puppets can usefully be employed in research both as objects and as stand-ins for humans. As stand-ins, children can both treat the puppet as a human (so long as the experimenter treats them like one), and can answer questions about the puppet as if the puppet were human.

The question of exactly how *infants* interpret puppets is unresolved, in part because of inconsistencies in the types of entities called "puppets", in part because of inconsistent results, and (relatedly) in part because of issues related to infant research more generally. To move us forward in understanding how young children interpret puppets, I see three essential categories of information to consider in every experiment: (1) What is the age of children involved? What a 3-month-old infant understands about puppets and what a 3-year-old child understands are clearly different. (2) What features do the puppets in question have (Do they have face-like features? Is their motion "biological" (Johansson, 1973)? Is their appearance "cartoonish" or realistic-looking? How clearly do we see the human hand, or puppeteer, driving the movement and other behaviors?) And finally, (3) What understanding are we seeking information on—do we want to know if children think puppets are actually alive and self-animated, or if they think puppets have human-like minds or morals? Unfortunately if we were to make a table of these three categories of information and tried to fill it in with studies, the number of empty cells would far exceed the number in which we have information. Thus, there is presently only a small body of research from which to theorize.

More empirical study is needed to clarify how infants at different ages interpret different types of puppets. As next steps to further our understanding, in addition to bearing in mind the three considerations above, I think the following questions are especially interesting:

1. At what age do children come to understand that a puppet is controlled by a human, such that children would show surprise were the "curtain lifted" to reveal that no human was involved?
2. Do very young children think that puppets are actually animate and/or sentient? If so, then at what age do they gain the understanding that they are not, and does it come on suddenly or gradually? Does it differ for different types of puppets, or for puppets portraying different creatures? Does it differ by a child's experience with puppets?

Data Availability

No author-generated data was used for the research described in the article.

Acknowledgements

I thank Ian Becker, Corey Borgman, Christina Carroll, Natalie Evans, Jamie Jirout, and Lee Lebouef, for comments on an earlier draft of this manuscript.

References

Asaba, M., Li, X., Yow, W. Q., & Gweon, H. (2019). A friend, or a toy? Four-year-olds strategically demonstrate their competence to a puppet but only when others treat it as an agent. *Proceedings of the Annual Meeting of the Cognitive Science Society*, 98–104.

Austin, J. L. (1957/1979). Pretending. In J. O. Urmson, & G. J. Warnock (Eds.), *Philosophical Papers* (3rd ed., pp. 253–271). Oxford University Press.

Bartsch, K., & Wellman, H. M. (1995). *Children talk about the mind*. Oxford University Press.

Belsky, J., Spritz, B., & Crnic, K. (1996). Infant attachment security and affective-cognitive information processing at age 3. *Psychological Science, 7*(2), 111–114.

Bender, L., & Woltmann, A. G. (1936). The use of puppet shows as a psychotherapeutic method for behavior problems in children. *American Journal of Orthopsychiatry, 6*(3), 341.

Brown, D. (1991). *Human universals*. McGraw-Hill, Inc.

Cosmides, L., & Tooby, J. (2013). Evolutionary psychology: New perspectives on cognition and motivation. *Annual Review of Psychology, 64*, 201–229.

Dennett, D. (1987). *The intentional stance*. MIT Press.

Flavell, J. H., Green, F. L., & Flavell, E. R. (1990). Developmental changes in young children's knowledge about the mind. *Cognitive Development, 5*, 1–27. https://doi.org/10.1016/0885-2014(90)90010-Q

Garvey, C., & Kramer, T. L. (1989). The language of social pretend play. *Developmental Review, 9*, 364–382. https://doi.org/10.1016/0273-2297(89)90035-X

Hamlin, J. K. (2013). Moral judgment and action in preverbal infants and toddlers: Evidence for an innate moral core. *Current Directions in Psychological Science, 22*(3), 186–193.

Hamlin, J. K., & Wynn, K. (2011). Young infants prefer prosocial to antisocial others. *Cognitive Development, 26*(1), 30–39.

Hamlin, J. K., Wynn, K., & Bloom, P. (2007). Social evaluation by preverbal infants. *Nature, 450*(7169), 557–559.

Hayne, H., MacDonald, S., & Barr, R. (1997). Developmental changes in the specificity of memory over the second year of life. *Infant Behavior and Development, 20*(2), 233–245.

Heider, F., & Simmel, M. (1944). An experimental study of apparent behavior. *American Journal of Psychology, 57*, 243–259.

Johansson, G. (1973). Visual perception of biological motion and a model for its analysis. *Perception & Psychophysics, 14*(2), 201–211.

Johnson, S. C., Booth, A., & O'Hearn, K. (2001). Inferring the goals of a nonhuman agent. *Cognitive Development, 16*(1), 637–656.

Jurkowski, H. (2014). *Aspects of puppet theatre*. Macmillan International Higher Education.
Kominsky, J. F., Lucca, K., Thomas, A. J., Frank, M. C., & Hamlin, K. (2020). Simplicity and validity in infant research. *PsyArXiv*. https://doi.org/10.31234/osf.io
Legerstee, M., & Markova, G. (2008). Variations in 10-month-old infant imitation of people and things. *Infant Behavior and Development, 31*(1), 81–91.
Leslie, A. M. (1987). Pretense and representation: The origins of "theory of mind". *Psychological Review, 94*, 412–426. https://doi.org/10.1037/0033-295X.94.4.412
Lillard, A. S. (1998). Ethnopsychologies: Cultural variations in theory of mind. *Psychological Bulletin, 123*, 3–33.
Lillard, A. S. (2001). Pretend play as Twin Earth. *Developmental Review, 21*, 1–33. https://doi.org/10.1006/drev.2001.0532
Lillard, A. S. (2015). The development of play. In L. S. Liben, & U. Mueller (Eds.) (7th ed.,*Handbook of Child Psychology and Developmental Science: Cognitive processes* (7th ed., Vol. 2, pp. 425–468). Wiley-Blackwell.
Lillard, A. S., & Flavell, J. H. (1990). *Young children's preference for mental-state over behavioral descriptions of human action, 61*, 731–742.
Lillard, A. S., & Flavell, J. H. (1992). Young children's understanding of different mental states. *Developmental Psychology, 28*, 626–634.
Lillard, A. S., Nishida, T., Massaro, D., Vaish, A., Ma, L., & McRoberts, G. (2007). Signs of pretense across age and scenario. *Infancy, 11*(1), 1–30. https://doi.org/10.1080/15250000709336868
Lillard, A. S., & Witherington, D. (2004). Mothers' behavior modifications during pretense snacks and their possible signal value for toddlers. *Developmental Psychology, 40*(1), 95–113. https://doi.org/10.1037/0012-1649.40.1.95
McAuliffe, K., Bogese, M., Chang, L. W., Andrews, C. E., Mayer, T., Faranda, A., … Santos, L. R. (2019). Do dogs prefer helpers in an infant-based social evaluation task? *Frontiers in Psychology, 10*, 591.
Mead, M. (1932). *An investigation of the thought of primitive children, with special reference to animism* (pp. 173–190).
Measelle, J. R., Ablow, J. C., Cowan, P. A., & Cowan, C. P. (1998). Assessing young children's views of their academic, social, and emotional lives: An evaluation of the self-perception scales of the Berkeley Puppet Interview. *Child Development, 69*(6), 1556–1576.
Meltzoff, A. (1995). Understanding the intentions of others: Re-enactment of intended acts by 18-month-old children. *Developmental Psychology, 31*, 838–850.
Nakamichi, N. (2015). Maternal behavior modifications during pretense and their long-term effects on toddlers' understanding of pretense. *Journal of Cognition and Development, 16*(4), 541–558. https://doi.org/10.1080/15248372.2014.926271
O'Neill, D. K., Astington, J. W., & Flavell, J. H. (1992). Young children's understanding of the role that sensory experiences play in knowledge acquisition. *Child Development, 63*(2), 474–490.
Packer, M. J., & Moreno-Dulcey, F. (2022). Theory of puppets?: A critique of the use of puppets as stimulus materials in psychological research with young children. *Cognitive Development, 61*. https://doi.org/10.1016/j.cogdev.2021.101146
Piaget, J. (1929). *The child's conception of the world*. Routledge & Kegan Paul.
Pillow, B. H. (1989). Early understanding of perception as a source of knowledge. *Journal of Experimental Child Psychology, 47*, 116–129.
Pratt, C., & Bryant, P. E. (1990). Young children understand that looking leads to knowing (so long as they are looking through a single barrel). *Child Development, 61*, 973–982.
Salvadori, E., Blazsekova, T., Volein, A., Karap, Z., Tatone, D., Mascaro, O., & Csibra, G. (2015). Probing the strength of infants' preference for helpers over hinderers: Two replication attempts of Hamlin and Wynn (2011). *PLoS One, 10*(11), Article e0140570.
Searle, J. R. (1983). *Intentionality*. Cambridge University Press.
Seyama, J. I., & Nagayama, R. S. (2007). The uncanny valley: Effect of realism on the impression of artificial human faces. *Presence, 16*(4), 337–351.
Shantz, C. U. (1983). Social cognition. In J. H. Flavell, & E. M. Markman (Eds.), *Cognitive development* (Vol. III, pp. 495–555). Wiley.
Speaight, G. (2021). *Puppetry*. Encyclopedia Britannica. ⟨https://www.britannica.com/art/puppetry⟩.
Taylor, M. (1999). *Imaginary companions and the children who create them*. Oxford University Press.
Taylor, M., Cartwright, B. S., & Bowden, T. (1991). Perspective taking and theory of mind: Do children predict interpretive diversity as a function of differences in observers' knowledge? *Child Development, 62*(6), 1334–1351.
Vaish, A., Missana, M., & Tomasello, M. (2011). Three-year-old children intervene in third-party moral transgressions. *British Journal of Developmental Psychology, 29*(1), 124–130.
Van de Vondervoort, J. W., Aknin, L. B., Kushnir, T., Slevinsky, J., & Hamlin, J. K. (2018). Selectivity in toddlers' behavioral and emotional reactions to prosocial and antisocial others. *Developmental Psychology, 54*(1), 1. https://doi.org/10.1037/dev0000404
Wellman, H. M. (2014). Making minds: How theory of mind develops. Oxford.
Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory of mind development: The truth about false belief. *Child Development, 72*, 655–684.
Werker, J. F., Polka, L., & Pegg, J. E. (1997). The conditioned head turn procedure as a method for testing infant speech perception. *Early Development & Parenting, 6*(3–4), 171–178.
Woolley, J. D. (1997). Thinking about fantasy: Are children fundamentally different thinkers and believers from adults? *Child Development, 6*, 991–1011.
Woolley, J. D., & Ghossainy, M. E. (2013). Revisiting the fantasy-reality distinction: Children as naive skeptics. *Child Development, 84*(5), 1496–1510.