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Puppet studies present clear and distinct windows into the child's mind

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ABSTRACT

Puppet use is a popular research tool in developmental studies. Despite this popularity, however, the method has rarely received systematic discussion regarding its theoretical foundations. The present paper addresses a number of fundamental questions concerning puppets use in research, with the hope of contributing initial steps towards such a theoretical foundation. First, why use puppets at all? Here, cases where puppet use is convenient are distinguished from those where it is inevitable. Second, why should puppet use be a valid method to study real social cognition? The basic argument here will be that puppet use is not categorically different from using other symbolic props (pictures, narratives, movies) in most of psychological research. Even if it taps children's thinking in pretend or simulation mode, it still presents a window into how children think, which concepts they use, which inferences they draw. Finally, the scope and limits of the method are discussed.

1. Introduction

Puppets are a popular research tool in developmental cognitive science with children. Despite this popularity, however, puppets are mostly used on practical and intuitive grounds. The method as such has rarely received systematic discussion regarding its potential theoretical foundations – much in contrast, for example, to the way in which looking time and other habituation techniques have been put on solid theoretical grounds in recent decades. At the same time, nagging doubts are widespread as to whether children's perception of and responses to puppets yield valid insights into their social cognition vis-à-vis the real world. Against this background, the present paper discusses a number of fundamental questions regarding puppet use as a research tool, with the hope of contributing to first steps towards a theoretical foundation of this method: First, why use puppets as research tools at all? Second, why should puppet use be a valid window into real social cognition? Third, what are the limits of the method?

2. Why use puppets?

There are two quite different reasons why puppets are used as research tools in developmental studies with children. In one class of cases, puppets are chosen for largely practical reasons – because, for example, staging a puppet show is much more manageable and less costly than arranging real-life scenarios. Many studies in Theory of Mind research, for instance, fall into this class. In standard false belief and related tasks, children witness a series of events staged with toy figurines or puppets of some sort (Wellman, Cross, & Watson, 2001; Wimmer & Perner, 1983). Here, it would theoretically be possible to confront the child with real-life versions of the scenarios (played by actors, for example). But this would often be quite complicated and expensive; and the assumption – sometimes empirically corroborated (e.g. Wellman et al., 2001 for various Theory of Mind tasks), sometimes implicitly and intuitively held in the background – is that the type of props (real persons vs. puppets) does not make a difference. Whether and when this is true – if and

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when puppets are as good a window into real-life cognition as real social stimuli – is, of course, a fundamental question in its own right to which we will turn below.

The second class of cases in which puppets are chosen is quite different. These are cases in which, given current constraints, we *must* use puppets in order to address certain research questions. Take, for example, research in which we want to study children's horizontal interactions with other agents as a window into their developing intuitions about normativity: how do children conceptualise and enforce various types of social norms? With young children, most informative here are measures of spontaneous behaviours vis-à-vis others who follow or violate the norms, such as critique, protest or teaching (Rakoczy, 2008; Rakoczy & Schmidt, 2013; e.g., Rakoczy, Warneken, & Tomasello, 2008; for an overview, see Schmidt & Rakoczy, 2018). What such studies require are interaction partners who need to be programmable (behave in certain ways according to experimental protocol when following/breaking the norms) but at the same time cannot be adult authority figures. Given current technological limitation (we do not yet have sufficiently sensitive robots at hand) and ethical restrictions (in most cases, we cannot train peers to do the job), human hand-operated puppets are still the only viable solution. This method has proven highly successful in many types of studies on social-cognitive development in the sense that, with the right kind of setting and staging, children spontaneously engage in all kinds of rich interactions with puppets.

Another example from non-social cognition comes from studies on infant categorisation. When we are interested in the question how infants categorise, for example, different types of animals, it is often impossible to confront them with the real things. Very productive methods, instead, present 3D animal figurines to infants, and take sequential manual exploration times (do they sequentially touch all mammals, for example, and then all fish) as crucial measures for categorisation (Mandler & McDonough, 1993). In such contexts, if we wanted to investigate how infants perceive and classify lions, say, it would be practically impossible and ethically out of the question to have children sequentially touch *real* lions.

So, puppet use is widespread in developmental research – sometimes because it is convenient, sometimes because there is currently no alternative. But is it warranted? This is the question to which we turn next.

3. Is the use of puppets as a research tool warranted?

At first sight, if we are interested in children's developing cognitive and social capacities in the real world, in how they perceive people and animals, it may appear ridiculous to study their interaction with puppets. After all, puppets aren't real agents and children are perfectly well aware of this. So, the worry goes, puppets may be appropriate to study children's fictional or narrative development specifically (how do they perceive fictional agents?), but not their *real* cognitive and social development more generally (how do they perceive agents?). In response, I will argue that in this categorical form the worry is ill-founded and unjustified.

3.1. Dual orientation towards puppets in pretend mode is a manifestation of a widespread phenomenon

The first thing to notice by way of a response is that children's attitudes towards and interaction with puppets is an instance of a much broader phenomenon that has long been discussed in philosophy and aesthetics under the rubric of "paradoxes of fiction" (Radford & Weston, 2015; Walton, 1978): a subject simultaneously, in some sense, *really* reasons about and engages with fictional characters while at the same time fully aware that they are not really real. We all know this from our everyday life, when we suffer with heroes on the screen, are moved by the fate of the protagonists in a novel, or get annoyed by the move of a virtual opponent in a computer game. This phenomenon has also been known and capitalised on for a long time in psychological research. In their seminal studies in the 1940s, Heider and Simmel documented for the first time that we almost automatically see subjectivity and intentionality in mere geometric figures if they are arranged and move in certain (e.g., systematic and contingent) ways (Heider & Simmel, 1944). If you look at the animated videos,¹ you cannot help but perceive and describe them in terms like "the large triangle was mean and started to chase the small triangle. The circle then tried to help the small triangle". But of course you are not confused for a second about the ontological status of the geometrical figures. It would be a joke to ask you "So, do you then think the small triangle *really* was thinking something?" Of course not, and this is common knowledge. No one expects movie heroes to step from the screen into the cinema, no one expects circles to really think, and no one expects puppets to be real persons.

We will see later on how this strange dual bookkeeping (seeing the geometrical figures as intentional while at the same time fully knowing they aren't really) may be explained in cognitive terms. For the moment, though, the crucial point is simply that children's strange dual orientation towards puppets is not that special. It is just one instance of a very general and widespread phenomenon.

This phenomenon has laid the basis for much developmental research, in particular with very young children. The Heider and Simmel approach has directly motivated many infancy studies on social perception and social cognition. Gergely, Csibra and colleagues, for example, have shown in an influential series of studies that infants make use of a systematic framework of rational action explanation and prediction when trying to make sense of the movements of Heider and Simmel-like geometrical figures (for review, see Gergely & Csibra, 2003). Similarly, a series of studies by Kuhlmeier, Hamlin, Bloom, Wynn and colleagues suggests that infants apply dispositional state ascriptions and perhaps even proto-moral evaluations to such geometrical objects (e.g., Hamlin, Wynn, & Bloom, 2007; Kuhlmeier, Wynn, & Bloom, 2003).

¹ E.g. <https://www.youtube.com/watch?v=VTNmLt7QX8E>.

3.2. Puppets are not qualitatively different from other types of stimuli in adult psychological research

Now, one objection may be along the following lines: “Okay, I get the point that the way children treat puppets (or geometrical figures) is not that special, but an instance of something much more general. But that does not mean that capitalising on this phenomenon, however general it is, constitutes a suitable research strategy. No one in serious psychological studies (with adults) would ever think of using such strange methods”.

This, however, is simply not true. Most of adult social and cognitive psychology operates with symbolic or fictional stimuli of sorts, and the differences to puppet use are gradual rather than categorical. Empirically, when we study, say, spatial cognition in adults, we usually do not have them run around and forage in the wild; but we have them navigate in virtual environments and realities (Hardless, Meilinger, & Mallot, 2015). Similarly, when we study adult perspective-taking, we hardly ever confront them with real other people, but usually use computer-animated others (e.g., Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010).

Theoretically, it has long been argued in the philosophy of fiction and arts that thinking and interacting in pretend or simulation or imaginative² mode is a much more pervasive phenomenon than meets the eye (Walton, 1990). Any kind of interaction with symbolic artefacts, pictures, replicas, stories, artworks, movies, animations, virtual realities or stages. involves a specific pretend or make-believe mode: Whenever you see a picture of a lion, a lion replica, a lion art sculpture, the movie “King of the Lions”, a lion cartoon animation, a virtual lion in a VR environment, or a person dressed up as a lion on stage in a musical, say, you engage in some lion-related make-believe. You pretend that there is a lion, that you see a lion, that you interact with a lion and so forth – all the while fully aware of the fact that you do not need to be afraid of any real lion-related dangers. The pretence is often very intuitive, no big reflection needed. In the case of pictures, animations, sculptures, for example, you “see right through” to what is depicted rather than first seeing some marks on paper, appearances on a screen or a 3D-object, and then inferring that the marks, appearances of objects point beyond themselves, depict something else in addition to what they are.

Now, of course, the specific kind of pretence involved in such different cases as viewing pictures, hearing stories, acting on stage or navigating through a VR environment differs along many dimensions. The pretence involved in a 90-minute blockbuster is much more coherent, elaborate and lively than the pretence in watching a single drawing, for example. Perhaps most relevant for current purposes, different types of cases differ massively in how active the pretence is – or, more specifically, how much activity on the part of the subject the content of the pretence involves: whether one pretends merely that something is the case or that one sees or witnesses something (like in watching a movie) or whether one pretends to act oneself (like in participating in a play or navigating in a VR scenario). Having children interact with puppets in developmental studies may appear radically different from most of the methods used in “serious” adult cognitive and social psychology mainly because it involves pretend activity. But with the distinctions introduced above at hand, we can see, first, that this is merely a gradual difference in the degree of activity in pretence between different kinds of methods (responding to pictures, animations, movies, VR environments, puppets...): Interacting with puppets involves simply more active pretence than most methods used with adults. Second, however, while this may be true generally, there are some methods used with adults that seem on a par even with respect to the degree of active pretence with puppet studies, namely those that involve virtual environments. Here, adult subjects pretend to navigate in virtual worlds and to interact with virtual agents in much the same way as children pretend to interact with puppets.

3.3. Treating puppets in pretend mode presents a valid window into the conceptual structure of the mind

We have thus seen, so far, that children’s interaction with puppets capitalises on a widespread phenomenon (dual bookkeeping); and that it is qualitatively on a par with most serious research in adult cognitive science: they all use, in one form or another, stimuli (pictures, drawings, movies, animations, puppets) that need to get processed in pretend mode. But this all still leaves open a dramatic possibility: perhaps, then, developmental studies that use puppets and adults studies that use movies or animations are all flawed alike. They may be informative when we want to know very specifically about children’s or adults’ representations of and interactions with fictional worlds and agents. Yet they may be useless when we want to know, more generally, how people represent and navigate the real world.

Fortunately, there are good reasons to assume that things aren’t that bad at all. Here, theoretical and empirical considerations from philosophy and cognitive science regarding the workings of simulation are key (Gordon, 1986; Harris, 2000; Leslie, 1987, 1988; Nichols & Stich, 2000, 2003; Walton, 1990). Even if we study cognition and interaction in pretend or simulation mode (as we always do to some degree when pictures, narratives, movies, computer or other games are involved), we do get valid windows into the child’s mind: even if what we see is their thinking and acting in simulative or off-line mode, quarantined from their serious actions, we see *how* they reason, *which concepts* they use, *which types of inferences* they draw and consider valid.

To eventually get to this crucial point, let us start with the following example and intuition pump: You are interested in the development of numerical concepts and capacities. So, you test how children of varying ages and adults compare set sizes and engage in addition and subtraction in terms of speed and accuracy. To this end, you present them with, say, sets of depicted food items in drawings, movies or animations shown on a computer screen. Now, what about the objection “But there aren’t any real food items, or any kind of real objects, for that matter. So you cannot really find out about how people really count or add”? This “objection” sounds

² Following widespread use, I will use “pretend mode“, “simulation mode“ and “imaginative mode“ all interchangeable here. It is a mode of thinking in which we imagine/simulate/pretend that something is the case and reason from there within the given format (story, movie, animation, narrative, play etc.) without drawing any real-life consequences.

like a joke. Why? Well, because we all know that people can and do use their numerical (and all other kinds of) concepts in pretend or simulation mode – knowing perfectly well that, strictly speaking, there are no real food items there, but making use of their real conceptual and inferential apparatus all the same.

Slightly more technically, two ways of getting at the underlying point are the following: First, thinking in the pretend mode about some imaginative realm and thinking in the serious belief mode about the real world *share the same code* (Nichols, 2004). Both when we seriously count and compare sets of real carrots in the garden and when we pretend-count and pretend-compare sets of imaginative carrots on a computer screen, we make use of the same concepts (“1”, “2”, “3”) governed by the same conceptual and inferential relations and structures (“ $2 > 1$ ”, “ $1 + 2 = 3$ ” etc.).

Second, another way of working towards the crucial point uses so-called boxological metaphors. A popular framework of describing the abstract structure of the mind, in particular, the different types of propositional attitudes such as believing on the one hand, and desiring on the other, builds on functional box-metaphors: beliefs are propositional representations (e.g. “there are 3 carrots on the plate”) stored in a belief box. The belief box is characterised by a certain functional profile. Belief box representations get usually tokened in response to perception, testimony, inference and so forth (when you see or hear or infer that there are three carrots, under normal circumstances you come to believe so); such representations are systematically related to other representations in the same box via inferential connections in theoretical reasoning (e.g., when you believe that there are three carrots on the plate, you can infer that there are three objects, three vegetables on the plate, that the plate is not empty); and they are systematically related to representations in other boxes and to action (if you desire to eat some vegetables), that is, you have a representation with the content (“I eat some vegetables”) in your desire box, the contents of the belief (“there are three carrots”) and the desire box (“I eat some vegetables”) can combine in practical reasoning and lead you to perform a rational action (eating the carrots). Similarly, the desire box is characterised by its functional role in practical reasoning and action control. Generally speaking, the two central boxes, the belief and the desire box, are functionally characterised by opposite directions of fit (Anscombe, 1957; Searle, 1983): Beliefs have mind-to-world direction of fit. Their job is, so to speak, to align the mind with the world, to represent the world truthfully and accurately. Desires, in contrast, have world-to-mind direction of fit. Their job, so to speak, is to make the world align with the mind, to make it as we like it.

Now, from such a boxological point of view, how is the pretend or simulation mode to be characterised? One suggestion is that there is a separate pretend (or “possible world”) box that works like the belief box in some ways (shares the same conceptual and inferential structure), but radically differently in others (Nichols & Stich, 2003). Most notably, pretend box representations have neither mind-to-world nor world-to-mind direction of fit, and the pretend box is functionally separated from the belief box and from real serious action planning. This is crucial since otherwise chaos and confusion would reign. If the contents of the pretend box could sneak into your belief box and serious action planning, this would end in disaster. You would come to believe, for example, that from a train station platform in London you can enter parallel worlds by running at full speed into a cement pillar and act accordingly – with all the fatal consequences. The pretend box thus has to be “quarantined” (Leslie, 1987) from reality and the belief box. Its operations need to be run “offline”, as it were. But the operations themselves – the concepts used, the inferences drawn — are analogous to those in the belief box.

Applying this to the depicted-food-items-on-the-screen example from above, the situation looks like this: the subject is confronted with the depiction of, say, three imaginary carrots on an imaginary plate on the screen. She thus tokens in her pretend box the content “there are 3 carrots on the plate”. From there she can reason theoretically (“If another one gets added, there will be 4”) and practically (“If I want to make carrot soup, I could use these ones”) in pretend mode. This potentially yields other pretend-mode contents (“there are now 4 carrots”) and pretend-actions (if this scenario is embedded in a computer game, the agent may pretend-cook some carrot soup in the game). Again, what is crucial is the twofold structure: on the one hand, the agent is not confused about the reality-status of the carrots. Neither does she really think there are three carrots, nor will she seriously try to cook them. On the other hand, however, the agent brings to bear her serious and real conceptual structures, uses concepts like “carrot” or “3” with their regular meaning and uses her regular reasoning capacities – just run offline.

The worry that using fictional scenarios is, in principle, not suitable for tapping into real conceptual structures and capacities is thus unwarranted. What you get when you use fictional scenarios is reasoning with regular concepts in a special mode (the pretend mode), not reasoning with special concepts in a regular mode. Puppets can thus, in principle, provide a valuable window into the mind and its conceptual structures – much like the use of drawings, videos, animations, virtual realities and similar props can.

4. What are the scope and limits of puppet use as a research tools?

The foregoing considerations yielded a conclusion much like a proof-of-concept study: using puppets can *in principle* be a valuable and appropriate research tool to investigate the developing mind. There are no a priori reasons why studying children in interaction with puppets should be less clear a window into the mind than, say, studying adults’ processing of videos, animation or drawings. But that leaves open, of course, many crucial questions regarding the scope and limits of puppet methods: Under which conditions are such methods suitable? For which age groups? And what may be principled limits? Clearly, we currently do not have anything like conclusive answers to such questions. But in the following I would like to gesture towards some ways in which we might make progress in trying to address them.

4.1. Under which conditions is puppet use a valid method?

Even though there is no principled reason why interactions with puppets should be, conceptually, much different from other forms of engagement (with drawings, videos, animations etc.) in the pretend mode, it certainly is a much more fragile and sensitive measure.

You have to be, basically, in the right kind of mood and mindset to actively engage in pretend-mode actions. This is quite different from more passive engagement in pretend mode in, say, parsing narratives or following a movie plot. Everyone who has tried to engage students spontaneously in role play in class without appropriate stage setting, for example, knows the difference. From a practical point of view, this makes interactive engagement with puppets a challenging measure. The context and setting have to be right so that children feel comfortable, overcome shyness, fear of embarrassment and stage fright and freely dare to criticise, reproach or teach the puppets. From the experience in our own lab this requires, most of all, an appropriate warmup and familiarisation phase in which children get used to the puppet and the setting. One unfortunate consequence of this general fragility of puppet use as a method pertains to an asymmetry in how positive and null findings can be interpreted: positive findings (e.g., to the effect that children apply a given norm or engage in a given form of social evaluation, as indicated in their spontaneous sanctioning behaviour towards puppets) are informative. They *prima facie* suggest that children make use of certain concepts and engage in certain inferences. Negative findings, though, are more ambiguous. Take, for example, the finding that in some studies 3-year-olds spontaneously criticised, in a social game, norm-violations by puppets whereas 2-year-olds did not (e.g., Rakoczy et al., 2008). Does this mean that 3-year-olds do, but 2-year-olds don't have concepts of social norms that they spontaneously apply? Possibly. But this finding taken by itself could also simply be due to the fact that the 2-year-olds felt less comfortable with the puppets than the 3-year-olds. This is why in such studies we ideally need independent baseline checks to make sure children are sufficiently engaged with the puppets, talk to them in other tasks etc. (for such approaches, see, e.g., Rakoczy et al., 2008).

In addition to this specific and practical point, there are more general and theoretically taxing questions with regard to the conditions under which puppet use is a valid method. The background here is the following: It is a common and plausible assumption about the pretend mode, that as a default, all contents of the belief box are copied into the pretend box *unless stated otherwise*. Here is an example to illustrate the point. Assume you hear the following fictional vignette: "Sherlock Holmes stumbled and could not keep hold of his pen anymore", and are asked "Where is the pen now?" On the floor, isn't it? You would assume so *unless* you had information that the fictional world in which Sherlock Holmes lives is radically different in terms of its physics from the real world. In other words, the premise "gravity holds and unsupported objects tend to fall down" is copied from the belief box to the pretend box. Now, contrast this with two other examples: "The alien on Alpha Centauri stumbled and could not keep hold of his pen anymore. Where is the pen now?", and "The alien on Beta Centauri, a strange planet where gravity is reversed and things, when unsupported, fall upwards, stumbled and could not keep hold of his pen anymore. Where is the pen now?" The answer in the latter case ("somewhere up, in the sky...") is clear since here the default premise ("unsupported things fall down") has been explicitly over-written for Beta Centauri. The former scenario is an illustration of a borderline case. We're not quite sure what to say. Basically, it is difficult to judge just how different Alpha Centauri is from the real world.

This point is critical for present purposes in the following way: only if we are sure that children accept certain default premises in their pretend-reasoning, can we draw any inferences about their conceptual capacities and structures. To stick with the present example: assume we confront children with a fictional scenario (say, in an animation or puppet show) in order to probe their naïve physics. It turns out that they seem not to engage in the same kinds of gravity reasoning as adults. Do they thus not have a concept of gravity? This is one possibility. But another one is that they see this fictional world as we see the Beta Centauri case: they consider it to be radically different from our real world and thus fail to copy some basic premises from their belief box into the corresponding pretend box. The big challenge, then, is that we do not currently know how to make sure that children indeed construct a fictional world and operate in the corresponding pretend-mode in such a way that default premises are imported from the real world unless stated otherwise. From practical experience, it seems that often children do follow these principles (e.g., they treat puppets like rational agents that are subjects to norms and conventions, potential recipients of arguments and critique); but theoretically it is well imaginable that children would think that once stuffed furry objects are made to talk, everything is possible and you simply cannot know what is the case in such strange fictional worlds. This, again, affects the way in which positive and negative findings can be interpreted. Positive findings (e.g., that children form expectations as to how puppets will rationally act or criticise them for irrational or otherwise norm-violating acts) suggest both that children apply certain concepts (e.g. of rationality or norms) and have accepted the requisite background premises (here, regarding what agents are). Negative findings (e.g., that children do not form such expectation *vis-à-vis* the puppets), in contrast, are more ambiguous: it could be that children lack the concepts in question; or it could be that they simply have not imported some background premises from the belief into the pretend box. What this then requires, ideally, is some independent manipulation check. Independently from the crucial target measure (e.g. action prediction or spontaneous critique), do we have evidence that children accept the relevant background premises? While this requisite strategy is clear in principle, it will often be quite difficult to realise in practice.

4.2. *Is the same method the same method for different age groups?*

The plea in this paper for puppets use as a valid research tool crucially builds on the premise that children treat puppets like adults treat all kinds of fictional props (pictures, movies, animations, virtual realities): with some kind of dual orientation. Seeing, on the one hand, through the prop right into what is fictionally depicted; whereas, on the other hand, we are at the same time fully aware that what is depicted is not really real. While this is certainly the case for somewhat older children –say, from the second year on when we do have solid evidence that they are capable of such dual pretence orientation– (Harris & Kavanaugh, 1993; Rakoczy, Tomasello, & Striano, 2004), it is not clear whether it also holds for younger children. One possibility is that infants, like older children and adults, do apply certain concepts when confronted with, say, animated geometrical figures or dolls. They see, for example, the animated Heider and Simmel-style figures as acting in goal-directed ways (Gergely & Csibra, 2003) or as helpful (Kuhlmeier et al., 2003) in the same way as older children do. In contrast to older children, however, they do not yet see them in pretend mode and dual orientation. Rather,

they only have a single orientation and see the figures simply as *really* acting towards goals and *really* being helpful – in what, from our perspective, is a kind of ontological confusion. In a certain sense, this would not compromise the general method (puppet use) as a window into the conceptual structure of the infant mind. Paradoxically, even though infants would in one sense view the props very differently from us – lacking an awareness of their fictional character, they would mistakenly take them for real—they would see them just like we do in another sense: as props to which the concepts in question (such as goal-directed action) apply. It is just that they would apply the concepts literally rather than in pretend mode. On the one hand, such a possibility may appear compatible with what we know about very young children's emerging dual orientation towards pictures and other visual props: infants seem not to represent pictures yet in this dual way as 2D-objects that depict 3D-targets (DeLoache, Pierroutsakos, Uttal, Rosengren, & Gottlieb, 1998). On the other hand, however, more recent research suggests that from their second year on, at the latest, children do not confuse depicted and real objects any longer (Revenu & Csibra, 2021). Future research will thus need to clarify when exactly in development and under which conditions children begin to operate in dual operation and pretend mode towards puppets. But even if they apply concepts, in a kind of ontological confusion, literally to puppets before, this still presents a potentially informative window into the conceptual structure of the infant mind.

4.3. What are the limits of puppet use as a research method?

The basic plea of the present paper up to this point was that how children perceive and interact with puppets presents an informative and valid window into their mind: which concepts and representational structures they use, which inferences they make and consider valid. This is because even though children are well aware of the fictional nature of the puppets, they, like adults, engage in dual orientation, pretend mode reasoning and action with the puppets in which they make off-line usage of their normal conceptual repertoire. But clearly, this method has its limits. Not any kind of psychological process can be studied in valid ways in pretend mode.

For example, it may well be valid to study children's categorisation of animals by having them touch and sort replica animals (Mandler & McDonough, 1993). But when it comes to children's motivational stance towards predators, say, it is probably not all too informative to study how they touch replica lions or snakes. In a similar vein, children may well engage in pretend intentionality ascription towards geometrical figures, but without the same (pretend) emotional implications (e.g., empathy, compassion, anger) as towards real agents. Relatedly, though from a very different field: in research on economic decision-making, similar questions regarding scope and limits of studying decision in pretend ("hypothetical") mode have long been discussed (Kühberger, Schulte-Mecklenbeck, & Perner, 2002; Vlaev, 2012). When trying to find out how people gamble in risky situations, or how they strategically behave in certain games (e.g. prisoner's dilemma), most laboratory studies engage subjects in pretend mode: tell them to imagine they were in such and such a gamble, played against another player with such and such payoff structure, and then ask them how they *would* decide. How do such measures fare in relation to real-life games and decisions? The empirical picture from studies that compared hypothetical (pretend mode) and real decisions is complex: while the two kinds of measures converge in some cases, hypothetical tasks fail to tap into crucial cognitive processes (in particular, biases) that real decision tasks uncover.

Coming back to puppets, similar systematic studies are needed that stringently compare real and pretend mode tasks. It is obvious and to be expected that tasks with puppets, as tasks in the pretend mode more generally, will have clear limits as valid windows into certain psychological processes. But what we need for future research is a more systematic taxonomy regarding which type of task is a suitable method for tapping into which type of psychological process.

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