



# Pretend play

Deena Skolnick Weisberg\*

Pretend play is a form of playful behavior that involves nonliteral action. Although on the surface this activity appears to be merely for fun, recent research has discovered that children's pretend play has connections to important cognitive and social skills, such as symbolic thinking, theory of mind, and counterfactual reasoning. The current article first defines pretend play and then reviews the arguments and evidence for these three connections. Pretend play has a nonliteral correspondence to reality, hence pretending may provide children with practice with navigating symbolic relationships, which may strengthen their language skills. Pretend play and theory of mind reasoning share a focus on others' mental states in order to correctly interpret their behavior, hence pretending and theory of mind may be mutually supportive in development. Pretend play and counterfactual reasoning both involve representing nonreal states of affairs, hence pretending may facilitate children's counterfactual abilities. These connections make pretend play an important phenomenon in cognitive science: Studying children's pretend play can provide insight into these other abilities and their developmental trajectories, and thereby into human cognitive architecture and its development. © 2015 John Wiley & Sons, Ltd.

#### How to cite this article:

WIREs Cogn Sci 2015. doi: 10.1002/wcs.1341

## INTRODUCTION

An 18-month-old picks up a television remote, puts it to his ear, and says, 'Ring! Ring!' A 3-year-old says she wants some ice cream, so she opens an imaginary container, picks up some leaves and stuffs them into her fist, and mimes licking the 'cone.' A group of 6-year-olds engage in a mock battle on a playground, first by arguing about who gets to be the good guys, then by flailing sticks as though they were swords and dramatically falling over when they have been 'injured.' These episodes all provide examples of *pretend play*: one of the hallmarks of early childhood and a fascinating window into many aspects of development.

This review begins by defining pretend play and distinguishing it from other playful activities in childhood. Then, it considers pretend play's connections to the development of several cognitive and social skills.

Many researchers have proposed that pretend play shares underlying mental structures with other capacities, including language, social-cognitive skills like theory of mind, and counterfactual reasoning. This means that the study of pretend play can shed light on the operation of these abilities and the nature of our cognitive architecture, and can give a unique perspective on whether a broad representational ability underlies all of them. In addition, the presence of these connections implies that intervening to improve or increase children's pretend play may have a similar positive effect on these other abilities.

This article will consider the nature of these links and the evidence for them, and will discuss how pretend play might contribute to the development of these other important cognitive and social skills. It is important to note that this article will not present an exhaustive review of all the other mental operations to which pretend play has been linked. Rather, it will focus on a few key connections between pretend play and other mental skills that have been the subjects of particularly active discussion in the cognitive science literature: symbolic understanding (primarily language), theory of mind, and counterfactual reasoning. Importantly, these three skills are related to each other as well as

\*Correspondence to: deena.weisberg@psych.upenn.edu

Department of Psychology, University of Pennsylvania, Philadelphia, PA, USA

Conflict of interest: The author has declared no conflicts of interest for this article.

to pretend play. Studying them together and in conjunction with pretend play can thus shed important light on human cognitive architecture, especially issues of which of these skills might be causally necessary for the development of others and of how our capacities to create all types of representations function and develop. This review will first highlight these relationships and will then consider two additional issues: how pretend play may be an important tool for learning and the nature of cross-cultural and cross-species variation in pretending.

## THE NATURE OF PRETEND PLAY

### An Issue of Definitions

Play is notoriously difficult to characterize, as it takes many forms and varies widely across children and across cultures.<sup>1,2</sup> But its main defining feature is that it is a noninstrumental activity—it has no proximal purpose and serves no immediate goal other than enjoyment. As such, it encompasses a large range of behaviors that occur throughout the lifespan, including gaming, physical play, word play, construction play, and so on.

It is relatively easier to distinguish pretend play, a subtype of play, from other playful activities. Unlike other forms of play, pretend play crucially involves some form of representation or acting-as-if, such that the behaviors or actions that take place in a pretend game are not meant to literally reflect reality.<sup>2,3</sup> This is often easiest to see with object-substitution pretence, in which one object is used as a stand-in for another: the classic banana-as-telephone scenario, or cases in which a child interacts with a stuffed toy or doll as if it were a baby. In both of these cases, actions directed towards the object do not have a real effect on it. They take place within the context of a *pretend frame* or *pretend world*, which is separate from reality.<sup>4–8</sup>

Even with this seemingly straightforward requirement, it is sometimes difficult to draw sharp lines between episodes of pretend play and other types of play. Are children engaged in rough-and-tumble play just interacting physically, or are they pretending to be superheroes in a fight? Is a child who stacks blocks just manipulating these objects according to their physical properties, or is she pretending to create a fortress? Even though some kind of imaginative or nonliteral quality is necessary for an action to count as pretence, the presence of this quality is not always immediately apparent to an outside observer, as it is part of the child's internal state. Furthermore, this quality may not occur throughout the entire episode—the children may be more or less focused on their superhero roles during the play fight—which

technically means that the activity switches back and forth between being physical play and pretend play. Researchers struggle with such questions of delineation whenever pretend play is studied.

### Forms of Pretend Play

Developmentally, pretend play activities generally begin to appear around 18 months. The earliest form of pretending is object substitution, as described above, in which one object is used as if it were something else.<sup>9–12</sup> Later, in the early preschool years, children begin to pretend with invisible objects, in which the pretence occurs entirely in the child's imagination. This is a more complex form of pretending, as it lacks physical props to give the pretend objects some real-world basis.<sup>13</sup> Around this age, children also begin to differentiate between enactment play (e.g., dressing up as daddy and cooking with plastic food in a child-scale play kitchen) and replica play (e.g., using a doll or other avatar in a small-scale toy kitchen; see Ref 14 for review).

Another prominent form of pretend play is a particularly dramatic one: imaginary companions (for reviews, see Refs 15 and 16). These differ from other forms of play in that they involve the child engaging with the same imaginary entity over an extended period of time—weeks, months, or even years. This phenomenon can take several forms. The imaginary companion can be an entirely invisible entity who exists only in the child's mind, or it can be an embodied object that is imbued with a personality (as with the tiger Hobbes in the *Calvin & Hobbes* comic strips). Estimates of the prevalence of this phenomenon vary, depending on the interview technique and on whether embodied objects are included, but somewhere between about one third of children to about two-thirds of children under the age of 7 have some form of imaginary companion. A related phenomenon is that of impersonated characters, in which a child pretends to be someone (or something) else for an extended period of time.<sup>17</sup> And some older children create paracosms: imaginary worlds occupied by many pretend entities and subject to their own internal rules.<sup>18</sup> While these companions, personas, and worlds are more extreme forms of plays in that they are extended in time and consistent across time, they do not appear to be fundamentally different from the sorts of one-time pretend games in which nearly all children engage at some point.

All of these forms of pretend play appear most prominently between the age of 3 and 5, the so-called 'high season' of imaginative play.<sup>19</sup> Although pretending appears to peak during this period, pretending in

some form tends to continue throughout childhood and into adolescence and even adulthood.<sup>20</sup> However, the current review will focus on the preschool period, as it is during this time that pretending is most common, and because the cognitive and social skills that have been linked to pretend play are developing most rapidly during this period.

### Pretend/Reality Distinction

As far as we can tell, children do not generally confuse pretence and reality. At least by age 4, and probably younger, children can explicitly report that what happens in the context of a pretend game is not real (see reviews in Refs 21 and 22). Children also do not believe that what has happened in a pretend episode affects how things work in the real world ('quarantining'<sup>23</sup>), such that children in the banana-as-telephone game do not end up with mistaken beliefs either about bananas' communicative abilities or the edibility of telephones.

There are occasional instances when children may react to pretend events as though they were real, as when children are genuinely afraid of monsters under their beds. Although such instances have led parents and some researchers to worry that children do not appreciate the difference between pretence and reality, these appear to be largely issues of emotional contagion rather than a general metaphysical confusion.<sup>24,25</sup> Another case in which children may have temporary difficulty with the difference between pretence (or representation) and reality can be seen in toddlers' attempts to genuinely pick up objects in pictures or to interact in a realistic way with doll-sized toys ('scale errors'<sup>26,27</sup>). But such errors occur relatively infrequently, even in toddlers, and fade rapidly through the early preschool years. Even those children with imaginary companions, with whom they spend a lot of time and in whom they invest a good deal of emotional energy, are not confused about their companions' reality status.<sup>28</sup>

Having established what pretend play is and is not, as well as the important fact that children themselves understand that what is pretend and what is not, this article will now examine several other mental capacities which may be linked with or bolstered by pretend play: symbolic understanding, theory of mind, and counterfactual reasoning. For all three of these abilities, this review will outline how they are related to pretend play as well as suggest fruitful avenues for future research into the nature of these relationships. As noted in a recent review, while pretend play may be causally necessary for the development of other skills, it may also be merely facilitative or even

epiphenomenal.<sup>29</sup> Definitive evidence is lacking in all three cases, and indeed may be impossible to obtain, due to the practical and ethical difficulties in constructing 'no-play' control groups, and doing so over a sufficient period of time to observe meaningful differences. Further complicating these issues is the fact that these other skills are related to each other; e.g., language skills predict theory of mind ability.<sup>30</sup>

Nevertheless, studying pretend play may be beneficial in determining whether and the extent to which these various cognitive capacities depend on each other in development. For instance, children vary in their inclinations to engage in pretend play, and these differences may predict differences in their levels of the other skills. In addition, the emergence of pretend actions is developmentally prior to fully fledged symbolic, theory-of-mind, and counterfactual reasoning skills. Pretend play can therefore provide researchers with a laboratory to observe how early pretend skills might predict later cognitive and social achievements.

### SYMBOLIC UNDERSTANDING

One of the most striking features of pretend play is its symbolic nature. In pretend play, behaviors do not have their typical effects in reality, and objects may not have their typical properties. Instead, as described above, pretend games take place in the context of pretend frames, which map onto reality but which do not reflect the literal truth of reality. Even though the banana is not actually a telephone, picking up the banana in real life means that one is picking up the telephone in the game, because the physical action in reality has a correspondence to what is happening in the pretence.

These arguments in favor of the symbolic nature of pretend play are not uncontroversial, however. One longstanding debate in the field concerns the issue of whether pretence should be properly defined as behavioral or as mentalistic (for review, see Refs 31 and 32).

The first view holds that pretend play, at least in children and possibly in general, is a form of behavior. When pretending that a banana is a phone, one behaves as if the banana was a phone and performs actions with the banana that would be appropriate if the banana was a phone. No mentalizing is necessary for the game to proceed, as the pretence is connected primarily to behaviors and not necessarily to mental states or intentions.<sup>3,33–37</sup>

This view finds support from studies showing that children claim mental states are unnecessary for pretending.<sup>38</sup> In this study, 4- and 5-year-old children were shown a character who was hopping like a

kangaroo, but were told that the character does not know what a kangaroo is and has never heard of kangaroos. When asked whether the character was pretending to be a kangaroo, children tended to say 'yes,' indicating that they do not believe that knowledge is a necessary prerequisite for pretending. However, more recent variations on this task indicate that children may have a more mature understanding of how knowledge bears on pretence,<sup>39,40</sup> and, in general, these results bear more on the issue of how children conceptualize pretence, rather than on the issue of whether pretence genuinely is mentalistic or behavioral.

The second view holds that pretend play is indeed symbolic and essentially mentalistic: Engaging in an episode of pretend play crucially requires understanding something about the mental states involved, so that one is aware of what is intended in the game. On this view, playing the banana-as-telephone game requires knowing that one's partner (or oneself) intends the banana to represent a telephone.<sup>23,32,41,42</sup> This view finds support from research showing that children can navigate multiple episodes of pretend play with different partners, an ability which depends on keeping track of these partners' beliefs about what the props represent in the game (see also Weisberg, Wang, and Leslie, unpublished data).<sup>43–46</sup> For example, children protest when an action partner uses a prop according to its literal nature rather than according to its pretend identity (e.g., writing with a pen instead of using the pen as a toothbrush), but only when that individual was present when the pretence was established. That is, if someone does not know that the pen now represents a toothbrush, they should not be expected to act according to this pretend stipulation.<sup>45</sup>

Some new evidence that bears directly on this debate suggests that the behavioral view may not adequately capture children's understanding of pretence.<sup>41</sup> This study relies on the observation that many actions which children readily produce and comprehend in pretence would not make sense if pretence were behaving-as-if. For example, when one is pretending that a pen is a car, one pushes the pen along the table, saying 'vroom vroom' or 'beep beep.' But if one were truly behaving as if the pen were a car, one would sit quietly and pretend to look out a window. The fact that children understand these kinds of pretend actions implies that pretence should be seen as a form of representation, taking place in a pretend world that has some symbolic connection to reality, rather than as a form of behavior.

While the weight of the evidence thus far is on the side of pretence being mentalistic, more work

needs to be done on this topic. An especially fruitful avenue to pursue might be the issue of whether pretending has a necessary link to other types of symbolic understanding. Along these lines, many researchers have suggested that engaging pretend play can bolster children's developing language skills (e.g., Refs 47–50). Words, like objects in pretence, are symbolic—they refer to objects in the world and bear some connection to them without necessarily sharing features with their referents. Pretend play may thus provide children with the opportunity to practice navigating these kinds of symbolic relationships, which in turn may encourage faster or easier language acquisition. Some studies have indeed shown a correlation between symbolic play and language skills in toddlers (e.g., Refs 52 and 53), and some researchers have suggested that complex syntactic forms are more likely to appear in play.<sup>53</sup> But these studies do not make clear whether it is the play that influences the language, or vice versa, or whether this relationship is due to a third variable (see Ref 29 for review). Nevertheless, the fact that there is some association between pretence and language in development suggests that these two symbolic activities may be mutually reinforcing or stem from the same underlying ability.<sup>54</sup> Although it appears unlikely that pretence is strictly necessary for language development, play may provide an especially facilitative environment for children to experiment with new syntactic constructions.<sup>55</sup> Observational studies, using time-lagged designs and paying particular attention to children's language use in play and nonplay contexts, could help to arbitrate this issue.

Language is not the only symbolic skill that children acquire. They also learn to interpret printed words<sup>56</sup> and reason with maps and scale models,<sup>57</sup> and pretending is related at least to this latter form of symbolic cognition.<sup>54</sup> This result suggests that a single representational capacity underlies all of these cognitive skills, as well as theory of mind and counterfactual reasoning, as will be discussed below. More work remains to be done to determine the precise nature of this representational capacity and what role it plays in development, but the existing literature supports the view that it is implicated in a variety of cognitive skills.

## THEORY OF MIND

One of the most commonly discussed connections between pretend play and other social/cognitive skills involves theory of mind.<sup>37,58–62</sup> This link, first articulated by Leslie,<sup>23,42</sup> concerns the parallels between the mental processes involved in playing pretend games and inferring others' mental states.

As noted above, pretending appears to involve some kind of representation of one's pretend partner's (or one's own) mental states. In order to understand what is going on in an episode of pretence, one must interpret actions as being representational, not literal—the banana is not actually a telephone, but mom pretends that it is. Pretence is thus meta-representational; it involves representing someone's representation of a state of affairs. Without the ability to meta-represent, one would see pretence actions as nonsensical and quarantining would break down: Is Mom holding that banana to her ear and talking into it because that is what one should do with bananas?

The same meta-representational process is necessary for understanding others' beliefs or other propositional attitudes. This parallel is most easily explored using the classic Sally-Anne false belief task, which involves an object changing location in a character's absence, leading to her having a false belief about where the object is currently located. In both a pretend game and this false-belief story, there is a true state of affairs that the child knows: the banana is really a banana, and the ball is really in the box. However, thinking about this true state of affairs will lead to the wrong expectations about someone's behavior in this situation. If the banana is just a banana, one should eat it, not talk into it. If the ball is really in the box, then Sally should look there, not in the basket where she left it. To interact properly with both scenarios requires decoupling: leaving the true state of affairs behind, creating a representation of someone's mental states (a meta-representation), and responding to the situation based on this meta-representation. So Mom should talk into the banana because, according to her mental state (pretence), it is a telephone. Similarly, Sally should look in the basket because, according to her mental state (false belief), that is where the ball is.

Because both pretending and false-belief understanding require decoupling and meta-representation, some researchers have argued that the same mental capacity underlies both activities, as well as the other representational abilities reviewed here. This analysis additionally lends weight to the pretence-as-mentalistic view described above, as it highlights the general representational abilities that underlie both pretending and understanding others' mental states. Leslie puts this in terms of a module, positing that there is a theory of mind mechanism (ToMM) that enables children both to pretend and to understand others' beliefs.<sup>42</sup> It may be this mechanism that is damaged in autism spectrum disorder (ASD), explaining why children with ASD have deficits in both pretending and social cognition

(see Box 1). However, it is not strictly necessary to conceptualize this connection in terms of a module in order to acknowledge the important parallels between pretending and theory of mind reasoning.

## BOX 1

### AUTISM SPECTRUM DISORDER AND PRETENSE

Autism spectrum disorder (ASD) is characterized by a variety of deficits, particularly in the domain of social cognition. Notably, children with ASD tend to fail false-belief tasks long after their typically developing peers succeed.<sup>110</sup> Furthermore, while adults with ASD often respond correctly to explicit questions on false belief tasks, their eyegaze patterns to nonverbal analogues of these tasks reveal that they do not spontaneously attribute mental states.<sup>111</sup> Such results strongly suggest that individuals with ASD have a different understanding of beliefs than typical individuals.

In addition, children with ASD demonstrate marked deficits in pretend play behavior in childhood.<sup>112–115</sup> Many researchers have taken this co-occurrence of deficits to indicate that there is a strong connection between theory-of-mind abilities and pretence (e.g., Ref 42). However, lack of pretend play in children with ASD could be due to a lack of motivation to pretend or to other factors that would not indicate a strict inability to pretend.<sup>116</sup> Some researchers have argued that the deficits in both theory-of-mind and pretence are due to a more general deficit, for example in executive function.<sup>117,118</sup> Given that the nature of the link between pretending and theory of mind is not yet clear, studying children with ASD can help to reveal the nature of both abilities, as well as their connections and dissociations.

In support of these parallels, a handful of studies have found correlations between some aspect of theory of mind understanding and pretending<sup>13,63–65</sup> (see also citations in Ref 29). For example, recent work has found that a preference for engagement with fantasy scenarios predicts improvement in preschoolers' theory of mind abilities over a 7-month period.<sup>66</sup> In addition, a small body of literature has found that children perform better on false-belief tasks when they are either couched in terms of a fictional story or acted out with invisible pretend objects rather than physical toys.<sup>67,68</sup> Work on adults has also suggested that

reading fiction, which serves as a parallel to pretence, might lead to improvements in some theory-of-mind skills.<sup>69</sup> Although these data lend support to the idea that pretending and theory-of-mind understanding are deeply connected, nearly all of the extant studies have been correlational. Training studies or time-lagged designs would be helpful in assessing whether pretence and theory of mind understanding involve exactly the same underlying mechanism or have some other relationship. Furthermore, explicitly understanding symbol-referent relationships, such as those in pretence, may also draw on children's meta-representational abilities. Future work should thus aim to investigate the relations among pretence, theory-of-mind abilities, and linguistic or symbolic abilities.

## COUNTERFACTUAL REASONING

Pretend play has also been strongly linked to counterfactual reasoning.<sup>70–75</sup> The logic behind this connection is that both pretending and counterfactual reasoning consider states of affairs that do not actually obtain, whether these are strict counterfactuals that involve reasoning about potentially real events that did not happen or more general hypothetical scenarios that involve reasoning about a wider variety of nonreal scenarios. In pretending, children appear to be engaging with or embodying counterfactual or hypothetical statements: What if this banana were a telephone? Both counterfactual statements and pretend stipulations are not true in reality, but in a separate pretend or possible world.<sup>76,77</sup> Furthermore, children may be using pretend games to explore alternatives to reality, as philosophers do with thought experiments.<sup>34</sup>

Although this connection appears apt, one potential problem with it is that young children have great difficulty in reasoning counterfactually.<sup>78–80</sup> For example, Beck et al. (2006) presented 3- through 5-year-olds with an event that could have two outcomes: a toy mouse traveling down a forked slide. Children performed well with hypothetical questions about the situations ('what if next time he goes the other way, where will he be?'). But their performance was much poorer when given counterfactual questions ('what if he had gone the other way, where will he be?'), and poorer still with questions about the outcome that were posed before the mouse went down the slide, which necessitated the visualization of both options as possible outcomes.

Children also perform poorly when asked to solve counterfactual syllogisms: All cats bark; Fluffy is a cat; does Fluffy bark?<sup>71,81</sup> Preschoolers in such tasks tend to respond with conclusions that are in

line with their real-world knowledge, rather than taking the counterfactual premise into account. These and similar results suggest that young children might lack the capacity to engage in genuine counterfactual thinking. In turn, this suggests that pretence and counterfactual reasoning do not rely on the same mental operations, because pretence develops early and easily while counterfactual reasoning develops later and more effortfully.

However, this body of work shows that children lack an *explicit* capacity to reason in terms of counterfactual scenarios. When they are pretending, by contrast, they appear to be engaging an implicit or intuitive sense of counterfactual reasoning that allows them to consider alternative states of affairs. Evidence for this position comes from work showing that preschoolers' performance on counterfactual syllogisms improves markedly when the counterfactual premise is couched in terms of pretence rather than simply stated as part of the problem.<sup>71,81</sup> In addition, children's performance on closely matched counterfactual and pretence-based questions are yoked, even when controlling for executive function abilities.<sup>82</sup>

Such results have led some researchers to argue that the function of pretend play in development is precisely to practice counterfactual reasoning and to prepare children for the kind of 'serious' counterfactual and hypothetical reasoning that is used in planning for the future and reasoning scientifically (e.g., Ref 75). If this connection does exist, then increasing children's engagement in pretend play has the potential to bolster these other skills. But more work is needed to establish this connection, particularly a direct demonstration of a training effect of pretend play on other types of reasoning. Such a study would provide strong evidence that pretend play is a form of counterfactual reasoning and that children can improve their counterfactual reasoning skills through play. As with the case of symbolic development, while children may be capable of reasoning counterfactually regardless of their engagement in pretence, pretence could provide a particularly helpful laboratory for exploring this mode of thought. Indeed, this role for pretence appears somewhat more necessary for counterfactual reasoning than for symbolic development, because the parallels between pretending and reasoning counterfactually are much more direct. Studies of children with lesser inclination or ability to pretend, perhaps even children with ASD (see Box 1), would be helpful in determining whether this is the case.

Furthermore, while studies of theory of mind abilities and counterfactual reasoning often take language skills into account, studies of theory of mind

abilities generally do not consider children's counterfactual reasoning abilities, and vice versa. This means that the relation between theory of mind abilities and counterfactual reasoning is not yet clear, making it difficult to determine how pretend play contributes to the development of both or either of these skills. One possibility is that both counterfactual reasoning and theory of mind are each connected to pretend play, but are independent of each other. That is, the commonalities between pretend play and counterfactual reasoning may draw on a different aspect of the underlying representational capacity than the commonalities between pretend play and theory of mind. This relative independence of counterfactual reasoning and theory of mind could be due to differences in how they recruit social-cognitive skills: Theory of mind specifically involves representing others' psychological states, while counterfactual reasoning can operate on any type of premise. Future studies should focus more specifically on social and nonsocial scenarios in order to determine the nature of these inter-relationships.

## LEARNING

In order to pretend productively and without confusion, children should understand that there is a boundary between pretence and reality. If children truly did not realize that pretend scenarios are separate from reality, as Piaget feared,<sup>83</sup> they would risk blurring what is true in the pretend world with what is true in the real world, and would potentially end up with lots of false ideas about reality. A failure to maintain a strict boundary between pretence and reality could lead to a failure to believe that pretend stipulations are true only in the pretend world, not in reality.

Luckily, as noted above, children do quarantine appropriately and separate pretence from reality. As far as we can tell, they are not generally confused about the fact that pretend-world stipulations should not hold true in reality: Children who play or observe the banana–telephone game do not learn false facts about either bananas or telephones from this experience.<sup>22</sup>

However, although some aspects of pretend games should surely remain quarantined, some of the information in a pretend game could productively be exported from the game or story into reality. That is, one should be able to learn true facts from pretend scenarios. The utility of this process is perhaps easier to see with fictional stories. For example, one is licensed to form true beliefs about what circuses were like in the 1920s based on the novel *Water for Elephants*, even though the characters and events depicted are fictional. Likewise, children playing pretend games can

and should take certain inferences drawn within the context of a pretend game to hold true in real life, and not just in the game. For example, a child might play a game with an older sibling in which the sibling pretends to be a tiger by growling and trying to scare the child. From this episode, the child could productively learn that tigers growl and can be scary. Quarantining should thus not be absolute. Without maintaining a somewhat porous boundary between pretending and reality, learning from pretence would be impossible.

A small but growing body of research has begun to investigate what and how children learn from pretend scenarios<sup>84–86</sup> and fictional stories.<sup>87–92</sup> For example, Sutherland and Friedman<sup>85</sup> presented 3- and 4-year-olds with information about a new animal in the context of a pretend scenario by pretending with a puppet and some props. Children in this study readily generalized the information from the scenario to a real-world instance of the animal but not to a different animal. Although there is still much to investigate with respect to this question, these results and others make it clear that children can learn true facts from pretend scenarios, hence that pretence could be an effective teaching tool.

Indeed, the view that pretending shares much of its cognitive structure with counterfactual reasoning relies on this being the case. The utility of counterfactual reasoning, both in development and at maturity, is that it provides a safe way to explore possible paths of action without the risk involved in actually taking the action. But once one has reached a conclusion about what one should do, one must be able to export this conclusion back into reality—that is, to learn from the counterfactual scenario and not to keep this information strictly quarantined. If counterfactuals and pretence are to play this sort of role for children, there must be some sense in which quarantining is flexible. But more research is required to determine what types of information children will export from pretence into reality and under what circumstances.

## PRETENDING ACROSS CULTURES AND SPECIES

### Cross-Cultural Research on Pretend Play

Most of what we know of pretend play comes from studies of so-called 'WEIRD' cultures (Western, educated, industrialized, rich, and democratic<sup>93</sup>), primarily the United States, the United Kingdom, and Canada. What does pretence look like in other cultures? Does it exist at all, or is this phenomenon specific to WEIRD cultures? If it does exist, does it exhibit the same features as play in WEIRD cultures?

Research conducted in response to these questions suggests that pretend play of some form is universal (see review in Ref 14). It occurs in roughly the same developmental sequence in a variety of cultures,<sup>94</sup> though culture affects the amount of time children spend engaged in play as well as the themes on which their play focuses. For example, American children's play has a higher degree of fantasy content than that of Chinese children.<sup>95</sup> Even within American culture, some children are more or less fantasy-oriented and will be more or less likely to engage with fantasy themes in their play.<sup>13,96</sup> In addition, and unsurprisingly, parental encouragement of play and the extent to which parents see pretence as a positive activity affects the extent to which children pretend,<sup>19,97</sup> which may lead to apparent differences in play based on socio-economic variables.<sup>98,99</sup> As an extreme example of this kind of influence, children in fundamentalist Christian communities are often discouraged from pretending or communicating with imaginary others for fear that they are being influenced by the Devil or malevolent spirits.<sup>100</sup> The fact that some children in these cultures still engage in various forms of pretend play testifies to the power and universality of pretending in development.

However, cultural influence can also change the shape of this phenomenon altogether. One interesting example of this type of influence comes from an Indian culture where children think of aspects of their pretence as memories of past lives<sup>101</sup> (cited in Ref 16, p. 58–70). That is, children in this culture interact with what we would call pretend entities as if they were real, because that is the type of framing for this activity that their culture provides. On the assumption that resurrection does not actually happen and that ghosts and spirits do not actually exist, how should we view this activity? Should we say that these children are pretending but failing to make an appropriate distinction between pretence and reality? Or should we say that they are not confused about the difference between pretence and reality in general, but are mis-categorizing this particular activity? Or should our definition of pretence change depending on the culture in which it is being applied? There is no one right answer to these questions, but such issues must be considered whenever conducting cross-cultural research in order to respect both local and global aspects of this phenomenon.

### Human and Nonhuman Play

It is undeniable that nonhuman animals engage in play—baby chimpanzees swing through trees, wolf pups have play fights, dolphins surf waves merely

for the apparent enjoyment of it—but do nonhuman animals engage in *pretend* play? The answer to this question is controversial. Most researchers in the area acknowledge that pretend play crucially involves representation or imagination, so that one's actions in a pretend episode do not take place in the real world but in a pretend world. Pretend actions and objects within pretend games do not have their usual meaning, but rather, stand in for actions in reality. Thus, in order to say that animals pretend, one would have to determine whether their actions in the course of their play have this representational character.

It appears obvious to many that this kind of representational ability is beyond the capacity of animals. True pretend play involves quarantining at least some aspects of an action within a pretend frame (separating reality from pretence), using these symbols appropriately within the game, and interpreting others' actions as occurring in the game and not in reality. Although animals can be taught to use symbols and even some aspects of language, this kind of representation may be too complex.<sup>102,103</sup>

However, some aspects of these capacities may be present in nonhuman animals in some form. For instance, scrub jays who cache food may have something like episodic memory, which also requires the quarantining of an event sequence from reality and the manipulation of a representation—in this case of an event that really happened, but nevertheless something that is not currently present<sup>104</sup> (see Ref 105 for review). In addition, birds in the corvid family are capable of planning complex sequences of actions in order to reach a goal<sup>106</sup> (see Ref 107 for review), implying that they have some ability to visualize potential actions and choose among them on the basis of their real-world consequences. Furthermore, nonhuman primates appear to have some ability to lie or deceive. For example, chimpanzees and some species of monkeys will emit alarm calls when there is no predator present as a way to distract a conspecific pursuer.<sup>108</sup> These studies suggest that primates can engage in behaviors that are do not fully reflect the current state of reality, potentially similarly to human pretend behavior.

More directly, looking closely at play behavior in animals suggests that their actions may have something like the symbolic character observed in human children. When play-fighting, e.g., dogs maintain a certain posture that is different from true fighting posture. And dogs at play do not really bite each other; they nip. These actions resemble human children's exaggerated or scaled-back behaviors within a pretend context, where they do not really eat the play-dough cookies but make a big show of chewing with the

cookie near their mouths. One could describe the dogs as using these signals to set up a frame around their play behavior, as children do, indicating that what happens within that context is not meant to be taken seriously.<sup>4,109</sup> These are merely behavioral parallels and more careful work needs to be done here, but this analysis begins to suggest that at least some aspects of pretend play may not be uniquely human.

What is more likely to be uniquely human is the range of circumstances in which this kind of representational capacity is used. The human capacity for representation is highly flexible; human pretend play scenarios can accept almost any theme or content. Nonhuman animals, even if they exhibit some pretend or pretend-like behaviors, most likely only do so for a highly proscribed set of activities, likely ones with obvious survival value, such as food-caching and play fighting. Nevertheless, the presence of these behaviors indicates that some aspects of a general capacity for representational cognition are present in nonhuman animals. Studying exactly how these capacities manifest themselves, especially in our closest primate relatives, can help to answer some of the questions about relationships among these abilities. It may well be that counterfactual-like abilities or theory-of-mind-like abilities are present in nonhuman primates in the absence of pretend-like behaviors, or vice versa, which would suggest that there may be no necessary connection among these abilities. Conversely, it may be that a version of each of these types of abilities appears whenever one of them is present, which would lend weight to the argument that they all draw upon a single underlying representational capacity.

## CONCLUSION

It can be tempting to dismiss pretend play as merely a childhood activity, one which fades with growing maturity and which hence should not garner much attention from cognitive scientists. But the research

reviewed above demonstrates that this view is mistaken. Specifically, pretend play has been theorized to share some of its cognitive structures with some of our most important cognitive and social abilities, including symbolic understanding, theory of mind, and counterfactual reasoning. These connections point to the existence of a single representational capacity, which underlies all of these abilities and which may hold the key to explaining how pretend play might support and be supported by these other abilities in development.

Although each of these interconnections between pretend play and other abilities that rely on mental representation has some empirical support, much research remains to be done in order to fully flesh them out (e.g., Ref 54). A particularly fruitful avenue for future research would be to study several of these abilities in conjunction in order to clarify the links among them. The field would also benefit from carefully designed studies that intervene to increase pretend play in order to directly observe the effects of engaging in pretence on children's other cognitive and social abilities. In addition, cross-cultural research is currently somewhat lacking. Additional data on how and when children play in a variety of cultures would also help to determine to what extent pretending is a necessary component of the other cognitive and social abilities described here. Finally, new research is beginning to harness the power of pretend play as a teaching tool, and further work in this area could provide important insights into how to reshape young children's classroom experiences in order to maximize their success both at learning content and at developing mature cognitive capacities. These efforts share important links with work on adults' learning from fictional sources and, more generally, the role that activities focusing on nonreal scenarios can play in mature cognition.<sup>75</sup> Future work on children's pretend play can thus illuminate questions about cognitive architecture, the development of cognition, and the nature of both children's and adults' mental lives.

## REFERENCES

- Burghardt GM. Defining and recognizing play. In: Pellegrini A, ed. *Oxford Handbook of the Development of Play*. New York: Oxford; 2011, 9–18.
- Garvey C. *Play*. 2nd ed. Cambridge, MA: Harvard University Press; 1990.
- Lillard AS. Pretend play skills and the child's theory of mind. *Child Dev* 1993a, 64:348–371.
- Bateson G. *A Theory of Play and Fantasy: Steps to an Ecology of Mind*. Chicago, IL: University of Chicago Press; 1972.
- Bretherton I. Pretense: the form and function of make-believe play. *Dev Rev* 1989, 9:383–401.
- Gendler T. Imagination. In: Zalta EN, ed. Available at: <http://plato.stanford.edu/archives/fall2013/entries/>

- imagination/. *The Stanford Encyclopedia of Philosophy*, 2013. (Accessed December 9, 2014).
7. Skolnick D, Bloom P. The intuitive cosmology of fictional worlds. In: Nichols S, ed. *The Architecture of the Imagination: New Essays on Pretense, Possibility, and Fiction*. New York: Oxford University Press; 2006, 73–86.
  8. Walton KL. *Mimesis as Make-Believe*. Cambridge, MA: Harvard University Press; 1990.
  9. Bosco FM, Friedman O, Leslie AM. Recognition of pretend and real actions in play by 1- and 2-year-olds: early success and why they fail. *Cogn Dev* 2006, 21:3–10.
  10. Fein GG. Pretend play in childhood: an integrative review. *Child Dev* 1981, 52:1095–1118.
  11. Nicolich LM. Beyond sensorimotor intelligence: assessment of symbolic maturity through analysis of pretend play. *Merrill-Palmer Q* 1977, 23:89–99.
  12. Onishi KH, Baillargeon R, Leslie AM. 15-Month-old infants detect violations in pretend scenarios. *Acta Psychol (Amst)* 2007, 124:106–128.
  13. Taylor M, Carlson SM. The relation between individual differences in fantasy and theory of mind. *Child Dev* 1997, 68:436–455.
  14. Lillard AS, Pinkham AM, Smith E. Pretend play and cognitive development. In: Goswami U, ed. *Handbook of Childhood Cognitive Development*. 2nd ed. London: Blackwell; 2011, 285–311.
  15. Gleason T. Imaginary relationships. In: Taylor M, ed. *The Oxford Handbook of the Development of Imagination*. New York: Oxford University Press; 2013, 251–271.
  16. Taylor M. *Imaginary Companions and the Children Who Create Them*. New York: Oxford University Press; 1999.
  17. Carlson S, Taylor M. Imaginary companions and impersonated characters: sex differences in children's fantasy play. *Merrill-Palmer Q* 2005, 51:93–118.
  18. Root-Bernstein MM. The creation of imaginary worlds. In: Taylor M, ed. *The Oxford Handbook of the Development of Imagination*. New York: Oxford University Press; 2013, 417–437.
  19. Singer DG, Singer JL. *The House of Make-Believe: Children's Play and the Developing Imagination*. Cambridge, MA: Harvard University Press; 1990.
  20. Smith ED, Lillard AS. Play on: retrospective reports of the persistence of pretend play into middle childhood. *J Cogn Dev* 2012, 13:524–549.
  21. Bouchier A, Davis A. Children's understanding of the pretence–reality distinction: a review of current theory and evidence. *Dev Sci* 2002, 5:397–413.
  22. Weisberg DS. Distinguishing imagination from reality. In: Taylor M, ed. *The Oxford Handbook of the Development of Imagination*. New York: Oxford University Press; 2013, 75–93.
  23. Leslie AM. Pretense and representation: the origins of “Theory of Mind.” *Psychol Rev* 1987, 94:412–422.
  24. Gergely G. Some confusion about pretence–reality confusions. *Dev Sci* 2002, 5:417–419.
  25. Ruffman T. Pretence–reality confusions in children and adults. *Dev Sci* 2002, 5:416–417.
  26. DeLoache JS, Pierroutsakos SL, Uttal DH, Rosengren KS, Gottlieb A. Grasping the nature of pictures. *Psychol Sci* 1998, 9:205–210.
  27. DeLoache JS, Uttal DH, Rosengren KS. Scale errors offer evidence for a perception–action dissociation early in life. *Science* 2004, 304:1027–1029.
  28. Taylor M, Shawber AB, Mannering AM. Children's imaginary companions: what is it like to have an invisible friend. In: Markman KD, Klein WMP, Suhr JA, eds. *Handbook of Imagination and Mental Simulation*. New York: Psychology Press; 2009, 211–224.
  29. Lillard AS, Lerner MD, Hopkins EJ, Dore RA, Smith ED, Palmquist CM. The impact of pretend play on children's development: a review of the evidence. *Psychol Bull* 2013, 139:1–34.
  30. Astington JW, Jenkins JM. A longitudinal study of the relation between language and theory-of-mind development. *Dev Psychol* 1999, 35:1311–1320.
  31. Friedman O. How do children represent pretend play? In: Taylor M, ed. *The Oxford Handbook of the Development of Imagination*. New York: Oxford University Press; 2013, 186–195.
  32. Friedman O, Leslie AM. The conceptual underpinnings of pretense: pretending is not ‘behaving-as-if’. *Cognition* 2007, 105:103–124.
  33. Currie G, Ravenscroft I. *Recreative Minds: Imagination in Philosophy and Psychology*. New York: Oxford University Press; 2002.
  34. Lillard AS. Pretend play as twin earth: a social-cognitive analysis. *Dev Rev* 2001, 21:495–531.
  35. Lillard AS, Flavell JH. Young children's understanding of divergent mental states. *Dev Psychol* 1992, 28:626–634.
  36. Nichols S, Stich SP. *Mindreading: An Integrated Account of Pretense, Self-Awareness, and Understanding Other Minds*. New York: Oxford University Press; 2003.
  37. Perner J. *Understanding the Representational Mind*. Cambridge, MA: MIT Press; 1991.
  38. Lillard AS. Young children's conceptualization of pretense: action or mental representational state? *Child Dev* 1993b, 64:372–386.
  39. Aronson JN, Golomb C. Preschoolers' understanding of pretense and presumption of congruity between action and representation. *Dev Psychol* 1999, 35:1414–1425.
  40. Sobel DM. Enabling conditions and children's understanding of pretense. *Cognition* 2009, 113:177–188.

41. Friedman O, Neary KR, Burnstein CL, Leslie A. Is young children's recognition of pretense metarepresentational or merely behavioral? Evidence from 2- and 3-year-olds' understanding of pretend sounds and speech. *Cognition* 2010, 115:314–319.
42. Leslie AM. Pretending and believing: Issues in the theory of ToMM. *Cognition* 1994, 50:211–238.
43. Gopnik A, Slaughter V. Young children's understanding of changes in their mental states. *Child Dev* 1991, 62:98–110.
44. Weisberg DS, Bloom P. Young children separate multiple pretend worlds. *Dev Sci* 2009, 12:699–705.
45. Wyman E, Rakoczy H, Tomasello M. Normativity and context in young children's pretend play. *Cog Dev* 2009a, 24:146–155.
46. Wyman E, Rakoczy H, Tomasello M. Young children understand multiple pretend identities in their object play. *Br J Dev Psychol* 2009b, 27:385–404.
47. Hirsh-Pasek K, Golinkoff RM, Berk L, Singer DG. *A Mandate for Playful Learning in Preschool: Presenting the Evidence*. New York: Oxford University Press; 2009.
48. McCune L. A normative study of representational play in the transition to language. *Dev Psychol* 1995, 31:198–206.
49. Miller E, Almon J. *Crisis in the Kindergarten: Why Children Need to Play in School*. College Park, MD: Alliance for Childhood; 2009.
50. Vygotsky LS. Play and its role in the mental development of the child. *Soviet Psychol* 1967, 5:6–18.
51. Laakso ML, Poikkeus AM, Eklund K, Lyytinen P. Social interactional behaviors and symbolic play competence as predictors of language development and their associations with maternal attention-directing strategies. *Infant Behav Dev* 1999, 22:541–556.
52. Tamis-LeMonda CS, Bornstein MH. Specificity in mother-toddler language-play relations across the second year. *Dev Psychol* 1994, 30:283–292.
53. Bruner J. *Child's Talk: Learning to Use Language*. New York: Norton; 1983.
54. Lillard AS, Kavanaugh RD. The contribution of symbolic skills to the development of an explicit theory of mind. *Child Dev* 2014, 85:1535–1551.
55. Weisberg DS, Zosh JM, Hirsh-Pasek K, Golinkoff RM. Talking it up: play, language, and the role of adult support. *Am J Play* 2013, 6:39–54.
56. Bialystok E. Symbolic representation across domains in preschool children. *J Exp Child Psychol* 2000, 76:173–189.
57. DeLoache JS. Becoming symbol-minded. *Trends Cogn Sci* 2004, 8:66–70.
58. Flavell JH. The development of children's knowledge about the mind: from cognitive connections to mental representations. In: Astington JW, Harris PL, Olson DR, eds. *Developing Theories of Mind*. New York, NY: Cambridge University Press; 1988, 244–267.
59. Ferguson L, Gopnik A. The ontogeny of common sense. In: Astington JW, Harris PL, Olson DR, eds. *Developing Theories of Mind*. New York, NY: Cambridge University Press; 1988, 226–243.
60. Harris PL. From simulation to folk psychology: the case for development. In: Davies M, Stone T, eds. *Folk Psychology*, vol. 3. Cambridge: Blackwell; 1995, 207–221.
61. Leslie AM. Some implications of pretense for mechanisms underlying the child's theory of mind. In: Astington JW, Harris PL, Olson DR, eds. *Developing Theories of Mind*. New York, NY: Cambridge University Press; 1988, 19–46.
62. Moses L, Chandler M. Traveler's guide to children's theories of mind. *Psychol Inq* 1992, 3:286–301.
63. Goldstein TR, Winner E. Engagement in role play, pretense, and acting classes predict advanced theory of mind skill in middle childhood. *Imagin Cogn Pers* 2010, 30:249–258.
64. Schwebel DC, Rosen CS, Singer JL. Preschoolers' pretend play and theory of mind: the role of jointly conducted pretense. *Br J Dev Psychol* 1999, 17:333–348.
65. Youngblade LM, Dunn J. Individual differences in young children's pretend play with mother and sibling: links to relationships and understanding of other people's feelings and beliefs. *Child Dev* 1995, 66:1472–1492.
66. Dore RA, Lillard AS. Theory of mind and children's engagement in fantasy worlds. *Imagin Cogn Pers* 2014. In press.
67. Cassidy KW. Preschoolers' use of desires to solve theory of mind problems in a pretense context. *Dev Psychol* 1998, 34:503–511.
68. Wellman HM, Cross D, Watson J. Meta-analysis of theory-of-mind development: The truth about false belief. *Child Dev* 2001, 72:655–684.
69. Kidd DC, Castano E. Reading literary fiction improves theory of mind. *Science* 2013, 342:377–380.
70. Amsel E, Smalley JD. Beyond really and truly: children's counterfactual thinking about pretend and possible worlds. In: Mitchell P, Riggs KJ, eds. *Children's Reasoning and the Mind*. Hove: Psychology Press; 2000, 121–147.
71. Dias MG, Harris PL. The influence of the imagination on reasoning by young children. *Br J Dev Psychol* 1990, 8:305–318.
72. Gopnik A. *The Philosophical Baby: What Children's Minds Tell Us about Truth, Love, and the Meaning of Life*. New York: Farrar, Straus, and Giroux; 2009.
73. Gopnik A, Walker CM. Considering counterfactuals: the relationship between causal learning and pretend play. *Am J Play* 2013, 6:15–28.

74. Harris PL. *The Work of the Imagination*. Oxford: Blackwell; 2000.
75. Weisberg DS, Gopnik A. Pretense, counterfactuals, and Bayesian causal models: why what is not real really matters. *Cognit Sci* 2013, 37:1368–1381.
76. Currie G. *The nature of fiction*. Cambridge: Cambridge University Press; 1990.
77. Lewis D. Truth in fiction. *Am Philos Q* 1978, 15:37–46.
78. Beck SR, Robinson EJ, Carroll DJ, Apperly IA. Children's thinking about counterfactuals and hypotheticals as possibilities. *Child Dev* 2006, 77:413–423.
79. Rafetseder E, Cristi-Vargas R, Perner J. Counterfactual reasoning: developing a sense of “nearest possible world.” *Child Dev* 2010, 81:376–389.
80. Robinson EJ, Beck S. What is difficult about counterfactual reasoning? In: Mitchell P, Riggs KJ, eds. *Children's Reasoning and the Mind*. Hove: Psychology Press; 2000, 101–119.
81. Scott FJ, Baron-Cohen S, Leslie A. ‘If pigs could fly’: a test of counterfactual reasoning and pretence in children with autism. *Br J Dev Psychol* 1999, 17:349–362.
82. Buchsbaum D, Bridgers S, Weisberg DS, Gopnik A. The power of possibility: causal learning, counterfactual reasoning, and pretend play. *Philos Trans R Soc B* 2012, 367:2202–2212.
83. Piaget J. *Play, Dreams, and Imitation in Childhood*. New York, NY: Norton; 1962.
84. Hopkins EJ, Dore RA, Lillard AS. Do children learn from pretense? *J Exp Child Psychol* 2015, 130:1–18.
85. Sutherland SL, Friedman O. Preschoolers acquire general knowledge by sharing in pretense. *Child Dev* 2012, 83:1064–1071.
86. Sutherland SL, Friedman O. Just pretending can be really learning: children use pretend play as a source for acquiring generic knowledge. *Dev Psychol* 2013, 49:1660–1668.
87. Ganea PA, Canfield CF, Ghafari KS, Chou T. Do cavies talk? The effect of anthropomorphic books on children's knowledge about animals. *Front Psychol* 2014, 5:283.
88. Ganea PA, Pickard MB, Deloache JS. Transfer between picture books and the real world. *J Cogn Dev* 2008, 9:46–66.
89. Richert RA, Shawber AB, Hoffman RE, Taylor M. Learning from fantasy and real characters in preschool and kindergarten. *J Cogn Dev* 2009, 10:41–66.
90. Richert RA, Smith EI. Preschoolers' quarantining of fantasy stories. *Child Dev* 2011, 82:1106–1119.
91. Van de Vondervoort JW, Friedman O. Preschoolers can infer general rules governing fantastical events in fiction. *Dev Psychol* 2014, 50:1594–1599.
92. Walker CM, Ganea PA, Gopnik A. Learning to learn from stories: children's developing sensitivity to the causal structure of fictional worlds. *Child Dev* 2014. In press.
93. Henrich J, Heine SJ, Norenzayan A. The weirdest people in the world? *Behav Brain Sci* 2010, 33:61–83.
94. Eibl-Eibesfeldt I. *Human Ethology*. New York: Aldine de Gruyter; 1989.
95. Haight WL, Wang XL, Fung HHT, Williams K, Mintz J. Universal, developmental, and variable aspects of young children's play: a cross-cultural comparison of pretending at home. *Child Dev* 1999, 70:1477–1488.
96. Sharon T, Woolley JD. Do monsters dream? Young children's understanding of the fantasy/reality distinction. *Br J Dev Psychol* 2004, 22:293–310.
97. Tamis-LeMonda CS, Bornstein MH, Cyphers L, Toda S, Ogino M. Language and play at one year: a comparison of toddlers and mothers in the United States and Japan. *Int J Behav Dev* 1992, 15:19–42.
98. McLoyd VC. Social class differences in sociodramatic play: a critical review. *Dev Rev* 1982, 2:1–30.
99. Karnik R, Tudge J. The reality of pretend play: Ethnic, socioeconomic, and gender variations in young children's involvement. In: Nwokah EE, ed. *Play as Engagement and Communication (Play and Culture Studies)*, vol. 10. Lanham, MD: University Press of America; 2010, 63–81.
100. Carlson SM, Taylor M, Levin GR. The influence of culture on pretend play: the case of Mennonite children. *Merrill-Palmer Q* 1998, 44:538–565.
101. Mills A. Are children with imaginary playmates and children said to remember previous lives cross-culturally compatible categories? *Paper Presented at the Annual Meeting of the American Anthropological Association*, San Francisco, CA, November, 1992.
102. Suddendorf T, Busby J. Mental time travel in animals? *Trends Cogn Sci* 2003, 7:391–396.
103. Suddendorf T, Whiten A. Mental evolution and development: evidence for secondary representation in children, great apes and other animals. *Psychol Bull* 2001, 127:629–650.
104. Clayton NS, Bussey TJ, Dickinson A. Can animals recall the past and plan for the future? *Nat Rev Neurosci* 2003, 4:685–691.
105. Suddendorf T, Corballis MC. The evolution of foresight: what is mental time travel and is it unique to humans? *Behav Brain Sci* 2007, 30:299–351.
106. Bird CD, Emery NJ. Rooks use stones to raise the water level to reach a floating worm. *Curr Biol* 2009, 19:1410–1414.
107. Taylor AH. Corvid cognition. *WIREs Cogn Sci* 2014, 5:361–372.
108. Whiten A, Byrne RW. Tactical deception in primates. *Behav Brain Sci* 1988, 11:233–244.

109. Bekoff M. Social communication in canids: evidence for the evolution of a stereotyped mammalian display. *Science* 1977, 197:1097–1099.
110. Baron-Cohen S, Leslie AM, Frith U. Does the autistic child have a “theory of mind?” *Cognition* 1985, 21:37–46.
111. Senju A, Southgate V, White S, Frith U. Mindblind eyes: an absence of spontaneous theory of mind in Asperger syndrome. *Science* 2009, 325:883–885.
112. Bigham S. Impaired competence for pretense in children with autism: exploring potential cognitive predictors. *J Autism Dev Disord* 2010, 40:30–38.
113. Baron-Cohen S. Autism and symbolic play. *Br J Dev Psychol* 1987, 5:139–148.
114. Hobson JA, Hobson RP, Malik S, Bargiota K, Caló S. The relation between social engagement and pretend play in autism. *Br J Dev Psychol* 2013, 31:114–127.
115. Wulff SB. The symbolic and object play of children with autism: a review. *J Autism Dev Disord* 1985, 15:139–148.
116. Jarrold C, Boucher J, Smith P. Symbolic play in autism: a review. *J Autism Dev Disord* 1993, 23:281–307.
117. Lewis V, Boucher J. Spontaneous, instructed and elicited play in relatively able autistic children. *Br J Dev Psychol* 1988, 6:325–339.
118. Scott FJ. The development of imagination in children with autism. In: Taylor M, ed. *The Oxford Handbook of the Development of Imagination*. New York: Oxford University Press; 2013, 499–515.

## FURTHER READING/RESOURCES

Astington JW, Harris PL, Olson DR. *Developing Theories of Mind*. New York, NY: Cambridge University Press; 1988.

Roth I. *Imaginative Minds: Concepts, Controversies and Themes*. Oxford: Oxford University Press; 2007.

Taylor M. *The Oxford Handbook of the Development of Imagination*. New York: Oxford University Press; 2013.