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The Impact of Guided Pretend Play on Preschool Children's Theory of Mind

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Abstract

Theory of mind is a cognitive skill that allows us to recognize that others hold representations of the world that are separate from our own. This capability is measured in children through the false belief task, which most cannot successfully complete until age four. This finding has been taken to mean that children younger than four have difficulty reasoning about the perspectives of other people, a surprising claim given that at age two they begin to partake in pretend play that appears to involve adopting the persona of invented characters. The current study investigated whether pretend play could act as a vehicle of theory of mind development leading to improved false belief performance in a short-term setting. Participants were 53 preschoolers (27 male, 26 female, M_{AGE} = 4.13 years) who were randomly assigned to one of three play conditions. Children in the Pretend Play—False Belief condition participated in a pretend play session involving both perspective-taking and false belief scenarios, children in the Pretend Play—No False Belief condition participated in a pretend play session involving perspective-taking only, and children in the Control condition participated in guided non-pretend play. Participants in all conditions were administered a false belief post-test consisting of a change of location and appearance-reality task. Results did not produce a significant main effect of condition on false belief performance (X^2= 2.383, p = .304). Additional work is needed to determine whether pretend play can act as a vehicle of theory of mind development in other contexts.

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1. The Impact of Guided Pretend Play on Preschool Children's Theory of Mind

Imagine the following scene. It is a bright and sunny day outside with not a cloud in sight when suddenly your friend brushes past you on their way to the door, dressed in a full-length raincoat, rain boots, and umbrella in hand. How do we explain this odd behavior? Rather than worrying that they have lost all sense of what is appropriate to wear on a clear day, we would most likely assume that our friend, who has been studying in their room with the blinds drawn, thinks that the morning thunderstorm is still going on. That is, we hold in our minds a representation of our friend's belief state, which both differs from our own and conflicts with reality. This ability to infer the mental states of another person is known formally as *theory of mind*, and it has important implications for human interaction, because individuals make predictions about the behavior of others, as well as decisions about their own behavior, based on their ideas about the contents of other people's minds.

1.1 Theory of Mind in Children

While this mind reading feels intuitive to us as adults, it has a more complicated developmental trajectory in children. Researchers Heinz Wimmer and Josef Perner carried out the first experimental study of theory of mind in children in 1983. Their study contained the first instance of the change of location task, which is now widely used to assess theory of mind capabilities. In Wimmer and Perner's version, children aged three to five were told a story about a boy named Maxi who puts his chocolate into a particular cupboard and then leaves the room. While he is gone, his mother takes the chocolate out of the cupboard and puts it into another one. The children are then asked where Maxi will look for his chocolate when he comes back. Wimmer and Perner found that the four- and

five-year-old children, but not the three-year-old children, were able to answer correctly that Maxi will look in the cupboard where he left the chocolate, suggesting that these older children understand that Maxi holds a false belief about the location of the chocolate since he was not present when it was moved, and that he will act according to it. Because even the children who failed the false belief questions were able to recall the content of the story, the authors take their results to mean that children become adult-like in their ability to predict people's actions based on their belief states when they are about four years old due to a fundamental, specific cognitive change rather than improvements in memory or more general cognitive development (Wimmer & Perner, 1983).

Subsequent false belief tasks that were developed in the 1980s, such as the unexpected contents task, in which children are shown a container that looks like it should contain one item but really contains something else (such as being shown a Smarties box that contains only a pencil), and the appearance-reality task in which children are shown an object that looks like one thing but is really something else (such as a sponge that looks like a rock), seem to confirm this conjecture. When asked what they thought was in the box when they first saw it, three-year-olds tended to answer that they had thought there was a pencil in it all along, even though they had clearly said that they thought there were Smarties in it. When asked what they thought the sponge had been they reply that they had always thought it was a sponge (Gopnik & Astington, 1988; Wimmer, Hogrefe, & Perner, 1988). Thus, when children are three they appear to fail theory of mind tasks requiring them to keep in mind others' or their own prior belief states, and pass them when they are four. Indeed, Wellman, Cross, and Watson found in their 2001 meta-analysis of 178 studies looking at the development of theory of mind in

children that regardless of the type of false belief task that was administered, the kinds of objects and stories that were used during the task, and the way the key questions were asked, children performed below chance when they were three and above chance when they were four (Wellman, Cross, & Watson, 2001). They concluded from these comprehensive results that children undergo a conceptual change between the ages of three and four, and that before age four they are incapable of representing and comprehending a belief state that clashes with their own current one.

The Wellman, Cross, and Watson (2001) paper, however, was not the end of the story, and work soon followed that claimed that the foundation of theory of mind forms much earlier. In 2005, Onishi and Baillargeon conducted a groundbreaking study that appeared to show that 15-month-old infants anticipated that an experimenter would perform actions that corresponded with their beliefs. When a toy was moved in the experimenter's absence, the infants looked reliably longer if the experimenter then reached for the toy in its correct location when they returned. Conversely, if the toy was moved in the experimenter's presence, infants looked reliably longer when the experimenter looked in the incorrect location (Onishi & Baillargeon, 2005). These findings challenge the theory of a major conceptual change during the preschool years that allows children to understand how belief states influence behavior for the first time (known in the literature as the conceptual growth hypothesis), because they imply that infants already have some notion that belief states and actions are connected and that belief states can differ from reality (Papafragou, 2007). The Onishi and Baillargeon (2005) study, alongside other studies (Kovács, 2010; Southgate, 2007) therefore suggests that children must have to have at least some form of early competence, which leaves us

with a lingering question. If even infants have some form of theory of mind, then why are explicit false belief tasks so difficult for three-year-olds?

1.2 The Challenge of Theory of Mind

Explanations for the discrepancy between young children's performance on implicit and explicit theory of mind tasks range from methodological concerns to hypotheses that preschool children are prevented from succeeding at explicit tasks due to the interference of other slower developing cognitive systems or from having difficulty realizing when belief states are relevant and being asked about. Each of these arguments will be addressed below.

1.2.1 Methodology. One possible theory that could account for a lag between the age when children first demonstrate implicit knowledge of mental states and the age when they are able to explicitly express that knowledge is methodological shortcomings. Perhaps there are factors about the explicit false belief task that are masking children's underlying competence. However, Wellman, Cross, and Watson (2001)'s thorough examination of hundreds of explicit theory of mind studies found that three-year-old children had consistent difficulty with false belief tasks across a significant amount of methodological variability. The uniformity in children's responses across these studies indicates that there is not one quick change that can be made to explicit false belief tasks to make them easier for children. Additionally, Harrigan (2015) compared two similarly complex mental state reasoning tasks and found that children's difficulty interpreting mental states was not global. Rather, there was something especially challenging to them about understanding belief descriptions in particular. In her study, four-year-old children had trouble correctly accepting or rejecting direct statements about the false belief state

of a character (such as “Froggy thinks that the shape is a heart!”), but were able to accurately accept or reject statements about the character’s unfulfilled desire (such as “Froggy wants it to be a heart!”). Since the children were able to successfully make judgments about sentences containing desire verbs and both the desire and belief state verbs were tested using the same type of sentence and under the same conditions of conflicting mental states, it was not the methodology that was preventing children from talking about mental states. Rather, the children were differentially successful in interpreting sentences that used belief verbs and referred to belief states compared to the sentences that used desire verbs. Therefore, something other than methodology must be responsible for children’s difficulty overriding reality in explicit false belief tasks.

1.2.2 Interaction of Theory of Mind with Other Cognitive Systems

1.2.2.1 Executive Function. According to proponents of the Performance Factors Theory, children are unable to pass false belief tasks until age four because their other cognitive systems that are necessary for success are still immature (Leslie, 1987). Researchers differ in their opinions on what exactly these necessary cognitive systems are. For instance, the connection between executive function and theory of mind has been remarked on frequently, although the direction of the relationship is still unclear. A longitudinal study conducted by Hughes et al. in 1998 found that children’s performance on an executive functioning task at age three predicted their theory of mind performance at age four (Hughes, 1998). However, Perner and Lang claimed in a 2000 review that theory of mind is in fact responsible for enhanced performance on executive functioning tasks, and that in order to exhibit inhibitory control children must be able to meta-represent the action that they are repressing (Carlson et al., 2002; Perner & Lang, 2000).

Yet despite the murky role of executive function in theory of mind development, a positive correlation between the two is widely accepted in the literature (Carlson et al., 2002; Hughes, 1998; Perner & Lang, 2000).

1.2.2.2 Language. Language development has also been cited as a possible key for enabling children to progress from implicit to explicit theory of mind understanding, by providing them with key linguistic structures that are necessary for full comprehension of belief states (de Villiers, 1995; de Villiers, J.G. 2005; de Villiers, P.A., 2005). de Villiers and colleagues have gone as far as to claim that comprehension of sentences containing embedded sentential complements with an independent truth-value from the sentence as a whole is necessary for theory of mind development (de Villiers & de Villiers, 2000; de Villiers & Pyers, 2002). At the heart of the de Villiers argument is longitudinal evidence that mastery of sentential complements precedes mastery of explicit theory of mind, and the observation that deaf children who are language-delayed and missing this particular type of sentential complement are also delayed in theory of mind (de Villiers & Pyers, 2002; Schick et al., 2007). Additionally, in a 2003 training study, four-year-old and older three-year-old children who were trained on these sentential complements improved significantly on a false belief post-test compared to their pretest, suggesting that sentential complements are helpful in facilitating explicit theory of mind understanding. It must be noted however that the children in this same study who were trained only on false belief and not on sentential complements also improved on the false belief post-test, which challenges de Villiers' assertion about the necessity of acquiring these complements (Hale & Tager-Flusberg, 2003). Language training on sentential complements therefore appears to be one avenue through which

children on the cusp of explicit theory of mind understanding can begin to succeed on false belief tasks, but the lack of these specific syntactic structures cannot fully account for all of children's difficulties.

1.2.2.3 Pragmatic Theory. A third theory that has been proposed to explain the discrepancy between infants' and three-year-olds' performance on explicit false belief tasks is the Pragmatic Theory of False Belief Understanding, which holds that children make mistakes during these tasks not because they do not understand the concept that people will act in accordance with their separate beliefs, but rather because they have a hard time discerning when those beliefs are relevant to the question at hand (Lewis et al., 2012; Westra & Carruthers, 2017). The majority of sentences in child-directed speech using belief verbs such as "think" are used as informal endorsements of reality rather than descriptions of someone's belief state. For example, a typical sentence a child might hear directed to them from an adult is "I think it's time for you to go to bed." Here the adult is using the verb "think" to express an indirect command rather than a belief state (Hacquard, 2014). According to the Pragmatic Theory, children understand that verbs like "think" can be used to describe belief states, but due to the type of input they receive young children acquire a pragmatically enriched interpretation of these belief verbs, which causes them to overestimate when they are being used to express indirect commands, requests, or endorsements of reality (Lewis et al., 2012). A tendency to over-assume the prevalence of indirect requests in particular would explain three-year-olds' poor performance on false belief measures such as the change of location task. When asked where the character with the false belief will search for the moved item, it could very well be that children are perceiving the question as a request to help the character

find the item rather than an actual question about how the character will search according to his or her current false belief (Lewis et al., 2012). Lewis et al. (2012) found that children performed significantly better on a truth-value judgment task when the belief states of the characters were made more salient to them. In their task, children had to make judgments about the belief state of one or two characters who were the seekers in a game of hide-and-seek. The researchers found that children were more accurate in their judgments of sentences containing "think" in the condition in which there were two seekers. In this condition the belief states of the two seekers were often in conflict, which appeared to make it clearer to the children that the questions were about belief states and not indirect requests or assertions (Lewis et al., 2012).

1.2.2.4 Improving Theory of Mind through Experience. Previous work has also found that children who initially failed explicit false belief tasks improved significantly after exposure to certain types of scenarios involving skills related to theory of mind. A large portion of this literature consists of training studies that have demonstrated that providing consistent and direct corrective feedback to preschool children about their answers to false belief questions boosts their theory of mind task performance (Ding et al., 2015; Hale & Tager-Flusberg, 2003; Knoll & Charman, 2000; Melot & Angeard, 2003; Slaughter & Gopnik, 1996). However, several training studies focused on varying age groups have successfully extended beyond simple task-specific training. For instance, in Goldstein and Winner (2012), adolescents who participated in a yearlong acting class that involved perspective taking through role-play games significantly improved on a test of higher-order theory of mind compared to their peers who were enrolled in a yearlong visual arts class. Likewise, in Santiesteban et al. (2012) adults who performed the

opposite action of a videoed hand improved on a perspective taking theory of mind task in which they had to envision the point of view of an unseen director in order to understand their instructions about where to place an object. The authors postulated that by inhibiting their impulse to imitate the videoed hand, the adults were activating and strengthening the neural network in charge of the self vs. other distinction, which benefited them when they had to imagine the director's perspective (Santiesteban et al., 2012).

Furthermore, in the case of children, Gola (2012) found that preschoolers between the ages of three and five who had previously failed a false belief pretest significantly increased their scores after spending four sessions watching a series of 128 short video clips of overheard exchanges featuring mental state verbs. Gola reasoned that listening to these conversations made it easier for children to recognize that there can be different points of view in a conversation, an important ability for perspective-taking and false belief reasoning that was then reflected in their higher theory of mind scores (Gola, 2012). In a similar vein, Hale and Tager-Flusberg (2003), which was described earlier in this review, showed that in addition to direct training on the tasks themselves, three- and four-year-old children improved significantly on a false belief post-test when they were trained to answer questions about sentences containing sentential complements with an independent truth value that had no references to mental states at all. Both Gola (2012) and Hale and Tager-Flusberg (2003) therefore indicate that certain kinds of experiences with language are useful outside sources of information for children developing theory of mind.

In sum, there is a predictable trajectory in children's development of theory of mind, although researchers still disagree about the reasons for these changes. The theories presented in this review are neither meant to be exhaustive nor viewed as mutually exclusive, as it is likely that theory of mind arises as the result of many interplaying factors. However, it is clear that certain types of experiences in the world aid children in developing an adult-like understanding of other people's minds, an observation that brings us to the focus of the current study. If unnatural tasks such as listening to disjointed snippets of conversation containing mental state verbs helped children do better on explicit theory of mind tasks after only a few sessions, then could pretend play, something they naturally spend a large portion of their time doing, perhaps act as a similarly helpful learning experience?

1.3 Theory of Mind and Pretend Play

1.3.1 Pretend Play. In addition to theory of mind, preschool aged children exhibit rapid development in other social and cognitive skills such as pretend play. Preschoolers spontaneously participate in all sorts of make-believe scenes in which they adopt the persona of an invented character, an activity that seems to involve inferring the beliefs, desires, and mental states of another person, though children play pretend long before they can reliably pass explicit false belief tasks. For example, Harris and Kavanaugh (1993) found that two-year-olds were able to wipe up imaginary spilled tea at a pretend tea party, as well as describe the pretend action of a teddy bear (Harris & Kavanaugh, 1993). Some studies have even suggested that 18-month-olds are able to participate in some forms of pretend play, a good two and a half years before they are able to explicitly demonstrate knowledge of theory of mind (Baird et al., 2000; Baron-Cohen et al., 1992;

Charman et al., 1997; Howes, 1985). While this early pretend play is heavily scaffolded by adults and depends on props when it first emerges (Harris & Kavanaugh, 1993), by age two children are able to partake in social pretend play involving role-sharing, such as coordinating with a friend who will be the mom and who will be the baby in a pretend game (Howes, 1985). It therefore appears that a perspective-taking aspect of pretend play is fully acquired by the time a child is two. The question then arises—is this supposed perspective-taking just a surface phenomenon, or does it have deep and meaningful implications that help children learn about how other people experience the world?

Researchers are divided on their stances regarding the relationship between pretend play and higher order cognitive and social processes. Positive correlations have been found between higher levels of pretend play and social and cognitive skills such as creativity, social skills, and emotion regulation (Galyer & Evans, 2001; Hoffman & Russ, 2012; Russ et al., 1999; Uren & Stagnitti, 2009), but there is dispute as to whether it is an epiphenomenal or causal relationship, and if it is causal, in what direction it proceeds (Lillard et al., 2013; Weisberg et al., 2013b). A similar body of literature has remarked on the relationship between pretend play and theory of mind. On the one hand are the researchers who believe that pretend play involves foundational skills that are central to theory of mind, and on the other are the researchers who believe that pretend play and theory of mind are separate processes.

1.3.2 Argument for Relationship. Advocates for the position that pretend play is a contributing factor to theory of mind development, or at least related to it, point to both longitudinal and observational evidence. One of the earliest papers in favor of this view, Leslie (1987), asserted that pretend play is a form of meta-representation that is

controlled by a mechanism he called the “theory of mind manipulator ” (Leslie, 1987). In order to pretend, children have to keep separate, (or “decouple”), their representation of the true reality of the world and their representation of the reality that exists within the pretend game. According to Leslie, the theory of mind manipulator attaches the mental state label “I pretend that” to their representation of the reality within the pretend game, such as “I pretend that this banana is a telephone”, thereby creating a mental state expression similar to the ones used to describe belief states (Leslie, 1987). This embedding process, Leslie argues, is an early form of theory of mind understanding (Leslie, 1987). While researchers have since argued that such an elaborate decoupling process is not necessary for children to understand the conflicting realities surrounding pretense (Harris, Lillard, & Perner, 1994; Perner, 1995), additional studies have cited longitudinal relationships that seem to support the idea that pretend play contains aspects of meta-representation that become the foundation of theory of mind.

For example, Howes and Matheson (1992) found that children took part in metacognitive social play that involved negotiating rules and roles at age three, before the age when they were able to pass false belief tasks, implying that these children were able to use pretend play to exhibit a form of meta-representational understanding that involved reasoning about what the game looked like from another player’s perspective (Howes & Matheson, 1992). Additionally, a 1995 longitudinal study found that children’s ability to act out a pretend role at age 2 years 9 months predicted their explicit false belief task performance at age 3 years 4 months (Youngblade & Dunn, 1995). An observational study, Suddendorf and Fletcher-Finn (1996), also found an association between overall pretend play and children’s false belief comprehension. Several theories have been

posited for how pretend play might influence theory of mind development, such as the idea that pretend play allows children to practice "decentration," a moving away from their own point of view to consider another (Fenson & Ramsay, 1980). However, the correlation between pretend play and false belief performance is not so clear-cut. For example, an observational study, Schwebel (1999), suggested a connection between children's amount of pretend play and their performance on an appearance-reality task, but not on other types of false belief tasks (Schwebel, 1999). It is also important to note that none of the studies described above were experimental, and they therefore could not make any definite conclusions about the direction of the relationship between pretend play and theory of mind. One of the few training studies that found a causal relationship between imaginary activities and theory of mind performance focused on older children in acting classes and did not use random assignment or control for adult contact across conditions (Goldstein & Winner, 2012). The data suggesting a positive impact of pretend play on preschool children's theory of mind performance is therefore limited by methodological shortcomings.

1.3.3 Argument against Relationship. Researchers who subscribe to the opposing view, that theory of mind and pretend play are not truly directly related, often reference these shortcomings. A 2013 review cited the lack of standardized methods, controls, and structure in the pretend play sessions in previous studies, along with their correlational nature, as reasons to strongly question the so-called relationship between pretend play and theory of mind that they claimed (Lillard et al., 2013). Some researchers of this opinion have proposed that instead of viewing pretend play in terms of beliefs or perspective-taking, children treat it as a special kind of action that follows different rules

than reality (Harris, Lillard, & Perner, 1994; Perner, 1995). Children must then become adept at predicting what action is appropriate for the non-true situation in the pretend game, but they do not have to think of these actions in terms of mental states, and are in fact unable to until they undergo a fundamental conceptual change at the end of their third year (Harris, Lillard, & Perner, 1994; Perner et al., 1994). A review by Perner et al. (1994) asserted that children who view actions as either pertaining to true or false situations are subscribing to the concept of "prelief," a mix of pretense and belief that does not allow for the multiple, conflicting perspectives that arise in false belief (Perner et al., 1994). In these researchers' view, theory of mind reasoning, rudimentary or not, is not a part of young children's pretend play.

Furthermore, an experimental study, Lillard (1993b) found that four- and five-year-old children, who were well within the age range when children consistently pass explicit false belief tasks, seemed to have trouble relating belief to pretense. They were told a story about characters such as a man named Moe who was acting exactly like a rabbit, but he was from another planet and did not know what a rabbit was. Therefore, he could not be pretending to be a rabbit, but a significant majority of the children said that he was. Lillard interpreted these results as indicating that children do not closely attend to mental states or perspectives when they play pretend, and that children may even come to understand the role of the mind in normal action before they understand it in pretend action (Lillard, 1993b). However, this interpretation rests heavily on the assumption that four- and five-year-old children have an adult-like understanding of the semantics of the word "pretend", and the study itself suffers from a major methodological flaw because the children were asked directly whether the character was pretending. This approach

very likely could have triggered children's bias towards affirming the truth-value of statements (Crain & Thornton, 1998). Nevertheless, the stance this study takes highlights the ideological divide in the field regarding the relationship between pretend play and children's acquisition of a fully-fledged theory of mind.

1.4 Current Study

The current study seeks to examine the relationship between guided pretend play and preschoolers' performance on explicit theory of mind tasks in a systematic and controlled way that ameliorates the methodological concerns of previous work. Guided play has been shown to be an effective learning tool that allows children to actively participate in their own learning process (Weisberg et al., 2013a), and the goal of this study is to determine whether short-term guided pretend play sessions that balance both structure and spontaneity are capable of acting as learning experiences that lead children to greater theory of mind understanding.

The study contains three conditions. In the first, false belief scenarios are incorporated into the pretend play session so that the child directly experiences change of location, unexpected contents, and appearance-reality in the context of a perspective-taking game (Pretend Play—False Belief). Children in the second condition participate in the perspective-taking game but do not directly experience false belief scenarios (Pretend Play—No False Belief), and children in the third condition (Control) play a non-pretend game that is still as equally structured as the pretend play conditions and gives them equal time with the experimenter.

These play sessions potentially have the ability to make mental states (specifically false beliefs) more accessible to the child by either (1) having them directly experience

false belief themselves in a type of situation they can easily understand (play), or (2) giving them experience taking on the perspective of a character or identity different from their own. If Hypothesis (1) holds true, then only the play session in the Pretend Play—False Belief condition should prove helpful to children, as it is the only play scenario that gives them exposure to false belief situations. If however, Hypothesis (2) is true, the play sessions in both of the pretend play conditions should be equally helpful to children since both involve perspective-taking elements. Alternatively, perhaps even non-pretend play will give kids the necessary stimulation and social interaction with the experimenter to better reason about the behavior and mental states of other people. The pattern of facilitation we see across our pretend play conditions will be informative about what exactly in this experience is helpful to children.

On the other hand, if there is no facilitation in any of the experimental conditions, it suggests that perhaps short-term pretend play does not act as a useful form of theory of mind experience the way linguistic training, as well as training that specifically focuses on the exact types of false belief questions that will be asked in the post-test (as in Hale & Tager-Flusberg, 2003), does. This study does not seek to examine the nature of the relationship between pretend play and theory of mind, but rather whether pretend play can act as a valuable learning experience, be that through a deep or surface level relationship.

Although our study does not directly speak to the nature of the theory of mind deficit observed in preschoolers, or to the depth of the relationship between pretend play and theory of mind development, the observed pattern of results may be suggestive of the nature of the deficit. If a short experience with pretend play is enough to influence

children's performance on the false belief battery, it suggests that the difficulty with false belief is a surface deficit. If however, children are missing a deeper conceptual development, then this sort of short-term priming will not be helpful to them.

2. Method

2.1 Participants

Fifty-three preschool-aged children (27 male, 26 female, $M_{AGE} = 4.13$) recruited from the Northern Virginia and greater Williamsburg area who gave verbal assent and whose parents provided written consent participated in the study. Of these 53 children, 46 successfully completed all components of the study. To be included children had to correctly answer at least 3 out of 4 total control questions. Three were excluded due to inability to meet the inclusion criteria and four were excluded due to failure to complete the task. Of those who completed the study, 32 were randomly assigned to one of two experimental conditions and 14 were randomly assigned to the control condition. These conditions will be described in detail below.

2.2 Procedure

Three- and four-year-old participants were assigned to one of three play conditions that were designed to give them exposure to one of three guided play scenarios: pretend play involving components of both perspective-taking and incorporated false belief situations, pretend play involving perspective-taking alone, or non-pretend play, before they were administered a false belief battery as a post-test. All children were tested in a semi-quiet room either at their home or in their preschool. Each play session lasted approximately fifteen minutes. The false belief battery post-test lasted approximately five minutes.

2.3 Play Conditions

2.3.1 Pretend Play—False Belief. The Pretend Play—False Belief condition centered on a pretend game with the goal-directed behavior of fixing a stuffed animal's "broken leg." At the beginning of the play session, the child was told that the experimenter would be the vet and that they would be the vet assistant and must follow a series of steps in order to help the experimenter repair the leg. The pretend play session allowed the child to experience the game from the perspective of a knowledgeable vet assistant and followed a progression of twelve steps that included activities such as setting the leg in a cast and teaching the animal to use a pair of toy crutches. To keep the child engaged, the experimenter gave the child a colorful chart with pictures of six of these steps and told them that when they completed each step they could place a sticker on the corresponding picture.

Throughout the play session, the child experienced six instances of false belief firsthand: two instances of change of location, two of unexpected contents, and two of appearance-reality. For instance, when the child reached for an object that looks like a sponge that they could use to wash off the animal's leg, they discovered that it was in fact a piece of cheese, and when they opened the Band-Aid box they found out that it was instead full of cough drops.

2.3.2 Pretend Play—No False Belief. The Pretend Play—No False Belief condition adhered to the same perspective-taking scenario and series of twelve steps (with a sticker chart corresponding to six) as the Pretend Play—False Belief condition, with one crucial difference. In the Pretend Play—No False Belief condition, children experienced the true belief version of the false belief scenarios from the Pretend Play—

False Belief condition incorporated into their play. For example, for the children in the Pretend Play—No False Belief condition, the object that looked like a sponge was truly a sponge, and the Band-Aid box in fact contained Band-Aids.

2.3.3 Control. Children assigned to the Control condition participated in a sorting game that did not involve pretend play at all. Instead, they sorted through a pile of toys and organized them into six categories according to the type of toy (farm animals, toy people, doctor toys, play food, stuffed animals, or cars). Importantly, the doctor toys that were used in the vet game in the pretend play conditions were the same toys that the children sorted into the doctor toys category in the Control condition. The Control condition was designed so that the children had the same level of structure and interaction with the experimenter as in the pretend play experimental conditions. Children in this condition were also given a sticker chart, and earned a sticker after sorting each of the bins.

Appendices A-C contain the scripts that were used to administer each of the play conditions.

2.3.4 False Belief Battery Post-Test. Immediately following completion of their respective play sessions, all children were administered a false belief battery consisting of a change of location and appearance-reality task. The content of the false belief battery differed from the false belief scenarios that were incorporated into the play session in the Pretend Play—False Belief condition.

In the change of location portion of the false belief battery, children watched a story acted out with figurines about Mickey and Pluto. One of the characters put a toy sandwich in a particular location and then left the scene. While they were gone, the other

character moved the sandwich to another location. The children were then asked two control questions about the original and new location of the sandwich to ensure that they had been following the story, as well as two test questions about where the absent character would look for the sandwich when they returned and their motivation for looking in that particular location.

During the appearance-reality portion of the false belief battery, the experimenter showed each child an eraser that looked like a crayon and asked the child what they thought it was to make sure that the child perceived it as a crayon, before demonstrating that it did not draw like a crayon, could wipe away pencil marks, and was in fact called an eraser. The experimenter then had the child explicitly state what the object really was, to confirm that the child was aware of the true nature of the object. They then asked the child two test questions about what they had thought the object was when they first saw it, as well as what a friend of theirs who had not seen or heard anything about the object would say that it was.

The false belief battery post-test script is found in Appendix D.

2.4 Coding

Children earned both a control and false belief score. The control score was out of four possible points, with two possible points earned from the control questions in the change of location portion of the false belief battery, and two possible points earned from the control questions in the appearance-reality portion. Each control question was worth one point, and children had to have a minimum control score of three in order to be included in the data analysis.

Children's false belief score was likewise out of four possible points, with two possible points earned from the test questions in change of location portion of the false belief battery, and two possible points earned from the test questions in the appearance-reality portion. Each test question was worth one point.

2.5 Hypotheses and Predictions

As discussed in the introduction, it was hypothesized that the pretend play sessions in the current study had the potential to facilitate children's performance on the false belief battery post-test in one of two ways. The first possibility was that after directly experiencing false belief in the context of play, an enjoyable activity that they participate in frequently in daily life, children would subsequently perform better on the unfamiliar tasks in the false belief battery post-test. Under this hypothesis, it was predicted that the Pretend Play—False Belief condition would have a significantly higher average false belief score than either the Pretend Play—No False Belief condition or Control condition, as only the children in the Pretend Play—False Belief condition were exposed to false belief scenarios during their play session.

The second possibility was that guided pretend play sessions would lead to enhanced performance on the false belief battery post-test, not because they acted as a vehicle for children to experience false beliefs, but rather because they gave children a chance to experience role-shifting and taking on the perspective of a character and identity different from their own, a skill they would then be able to transfer to the false belief battery post-test to track story characters' as well as their own prior false belief states. Under this hypothesis, it was predicted that both the Pretend Play—False Belief condition and Pretend Play—No False Belief condition would have average false belief

scores that were significantly higher than the Control condition's average false belief score, but that they would not necessarily differ significantly from each other, as both pretend play conditions involved the same amount of role-shifting and perspective-taking.

Two other hypotheses must also be considered. One is that any form of guided play, pretend or non-pretend, leads to enhanced performance on the false belief battery post-test because there is something facilitative about the social interaction that takes place with the experimenter. In this case, the amount of facilitation would not differ across any of the conditions and would therefore not be observable from patterns in the data. The second is that short-term pretend play is not a useful vehicle of theory of mind training. If it is not, then we would once again expect that there would be no differences on the false belief battery post-test across conditions.

It is also feasible that the effect of the pretend play interventions may vary according to the children's age. It could be that participants closer to the age that the literature documents as when children begin to successfully pass explicit false belief tasks above chance levels (age four) may benefit more from a short-term pretend play session than children who are younger.

2.6 Design and Analysis

This study followed an independent measures design. Children were assigned to one of three play conditions: Pretend Play—False Belief, Pretend Play—No False Belief, or Control, and divided into five age subgroups for the analysis that corresponded to six-month ranges (Figure 2). A univariate analysis of variance was run to examine children's total false belief score as a function of play condition, and two generalized linear models

were used to examine children's false belief score as a function of both play condition and age subgroup, as well as the possibility of an interaction between condition and age. Calculation of the total false belief score is described in the Coding section above, and the results of the generalized linear models are discussed in the following section.

3. Results

A univariate analysis of variance was conducted with play condition split into three (Pretend Play—False Belief, Pretend Play—No False Belief, Control) as the between-subject factor and mean total false belief post-test score as the dependent variable. This test found no significant differences among the mean false belief scores across the three play conditions, $F(2, 43) = .343$, $p = .711$ (Figure 1). A generalized linear model was then run with both play condition split into three and age subgroup split into five (Figure 2) as between subject factors, to determine whether the play conditions produced differential priming effects on the mean false belief post-test score across age groups. This model indicated neither a significant main effect of condition, $X^2 = 2.383$, $p = .304$, nor a significant interaction between condition and age subgroup, $X^2 = 11.488$, $p = .176$ (Figure 3). Pairwise comparisons showed no significant difference in the mean total false belief post-test score between the two pretend play conditions, $p = .464$. Therefore, to examine whether the insignificant results of the first model were due to lack of statistical power, a second generalized linear model was run that combined the two pretend play conditions. This model also did not find a significant main effect of condition, $X^2 = 1.949$, $p = .163$, but did produce a significant interaction between condition and age subgroup, $X^2 = 1.949$, $p < .05$ (Figure 4). However, the condition that was associated with higher mean false belief performance was not consistent across the

age groups that showed differential performance according to condition (Figure 5). Additionally, neither generalized linear model found a significant main effect of age on the mean total false belief post-test score (model 1: $X^2 = 8.465$, $p = .076$; model 2: $X^2 = 7.575$, $p = .108$). A graph of the mean false belief post-test performance per age subgroup regardless of condition is found in Figure 6.

4. Discussion

The aim of the present study was twofold: to design a controlled method for studying pretend play in an experimental setting and to discern whether short-term guided pretend play was capable of acting as a useful vehicle of theory of mind experience for preschool children. A specific question of interest was if and how children who participated in one of two guided pretend play scenarios, one of which included incorporated false belief situations (Pretend Play—False Belief) and the other which did not (Pretend Play—No False Belief), differed in their performance on a subsequent false belief battery post-test compared to children who participated in guided non-pretend play (Control condition) before the post-test. It was hypothesized that guided pretend play would facilitate children's performance on false belief tasks by either allowing them to first experience false belief firsthand in the familiar context of play, or by priming them to think about perspectives different than their own current one by giving them an opportunity to take on a new identity during the pretend play game. However, according to the results, neither experimental pretend play condition appeared to offer children a clear facilitative advantage on the false belief battery post-test compared to the control.

Such results do not completely rule out the possibility that pretend play can be a valuable learning experience that leads to theory of mind development, as there are

several reasons why the pretend play manipulations may have failed to produce a differential effect in this context. For instance, as stated in the introduction, it could be that children perform poorly on explicit false belief tasks because they are lacking a deeper conceptual development that would take longer than a single pretend play session to acquire. The design of the current study made it possible to examine in a controlled way whether pretend play could act as a form of short-term theory of mind priming, and if there was priming, what aspect of the play was driving the effect. However, the study was not able to ascertain to what extent pretend play might serve as a means of fostering theory of mind development in the long term, because there was only one play session and the post-test occurred immediately after. Future work providing children with play sessions over a longer period of time before administering the false belief post-test is therefore necessary. It could be that longer-term pretend play training would give children in the pretend play conditions more time to capitalize upon the perspective-taking elements of the pretend play sessions in order to bring about a deeper conceptual development and realization about the role of mental states and their connections to actions, leading to better performance on false belief tasks.

Secondly, it is possible that although there were no significant differences among total false belief scores across play conditions, that the children in the pretend play conditions were performing better on the false belief battery post-test than they would have if they had not received the pretend play intervention. Performance on the false belief post-test was highly variable in this study and was not associated with age, so it is unclear to what extent the control condition acted as a reliable indication of the baseline performance of the children in the pretend play conditions. A potential follow-up that

includes administering all children a theory of mind pre-test in addition to the post-test and assesses their performance on a within-subjects basis would be beneficial in clarifying this uncertainty.

Thirdly, it must be considered that guided pretend play does act as a useful theory of mind learning experience, but only for a certain age group. It could be that as a whole children who are on the cusp of developing theory of mind (most likely older three-year-olds and younger four-year-olds) are able to capitalize on the relevant aspects of the guided pretend play session in order to boost their performance on the false belief tasks in the post-test, but that in general younger children cannot and older children will have acquired a developed enough theory of mind that their scores will no longer benefit from a short experience with pretend play. The current study does not have enough statistical power to reliably detect such an effect, as no age subgroup has more than five children in each play condition when play condition is split into three (Pretend Play—False Belief, Pretend Play—No False Belief, Control) and no more than eight when the two pretend play conditions are combined, as they were for the second generalized linear model (Figure 2).

The fourth explanation for the pattern of results observed in the current study is that pretend play truly does not act as mechanism of theory of mind development, and that play that involves taking on imagined identities does not give children the input they need to enhance their theory of mind understanding, neither through perspective-taking nor through directly experiencing false belief situations during the pretend play. Such a claim would infer that whatever children are doing during pretend play, it is not reasoning about other people's minds. However, due to existence of other plausible

explanations for the lack of significant differences among the false belief battery post-test scores of children in the three play conditions, the current study is not able to make this strong claim.

Additionally, no data was gathered on children's language exposure at home. This information would have been useful to have, as it is possible that children whose first language was not English may have had a more difficult time understanding the task instructions, which in turn may have masked their ability to reason about the false belief scenarios in the post-test.

As mentioned earlier, a comprehensive 2013 review of the pretend play literature cited the lack of standardized methods, controls, and structure in pretend play studies to date, along with their correlational nature, as reasons to be wary of the claims these studies made from their inconclusive results, as they did not contain not enough evidence to distinguish between causal and epiphenomenal relationships (Lillard et al., 2013). The present study is the first of its kind to carefully manipulate the structure of pretend play between conditions as a means of examining its relation to theory of mind, and builds upon previous research that has sought to evaluate the role of pretend play in children's developing understanding of the perspectives of other people.

5. Future Directions

Although the current study did not produce evidence supporting pretend play's ability to act as a facilitative theory of mind learning experience in a short-term context, future work examining its impact over a longer time period will provide further insight into the cognitive function of this popular childhood pastime. One possibly fruitful avenue of research would be to implement a longer-term training study that mirrors the

design of similar successful training studies that have been carried out in the past, such as Hale & Tager-Flusberg (2003), the linguistic training study that was described in the introduction of this paper. Such a continuation would retain three- and four-year-olds as the age range of interest and follow the same structure as the current study with three major changes. First, data on home language exposure would be collected for all participants. Secondly, all children would be administered a false belief pre-test consisting of a change of location and appearance-reality task. Third, instead of a single play session with the false belief post-test following directly after, all children in the three conditions (Pretend Play—False Belief, Pretend Play—No False Belief, Control) would receive two play sessions within one week of each other that were as similar to each other as possible, with the post-test administered three to five days after the last play session, as in Hale & Tager-Flusberg (2003). This timeline is sufficiently spaced out so that children experience each play session as distinct, while still being short enough so that it is possible to be confident that any differences among the false belief post-test scores are due to the training and not some other confounding factor that has interfered in the meantime.

If children of all age groups in the pretend play conditions in such a study score significantly higher compared to the control group on the false belief post-test, it would suggest that guided pretend play is in fact an effective means of fostering theory of mind development after all, and that children simply need more exposure to it than they were receiving in the present study in order to for it to be helpful to them in improving their performance on explicit false belief tasks. If however, none of the children in the pretend play conditions in any age group score significantly higher on the theory of mind post-

test compared to the control group, it would lend more evidence suggesting that guided pretend play is not an effective means of fostering theory of mind development, even over a longer timeline.

It is also a possibility that the long-term guided pretend play sessions may lead to higher theory of mind post-test scores in the pretend play conditions compared to the control condition, but only in the limited age range of older three-year-olds and younger four-year-olds. This kind of result would suggest that this long-term guided pretend play intervention is only helpful for who are about to develop theory of mind and does not drive deeper conceptual development in younger children.

The difference in outcomes between the condition with pretend play with incorporated false belief scenarios and the condition with pretend play with perspective-taking only in this longer-term format would also provide valuable information about what type of pretend play is most instrumental in promoting theory of mind development over time. It could be that both lead to equal improvement in children's theory of mind task scores over time, that neither does, or that one type does but not the other.

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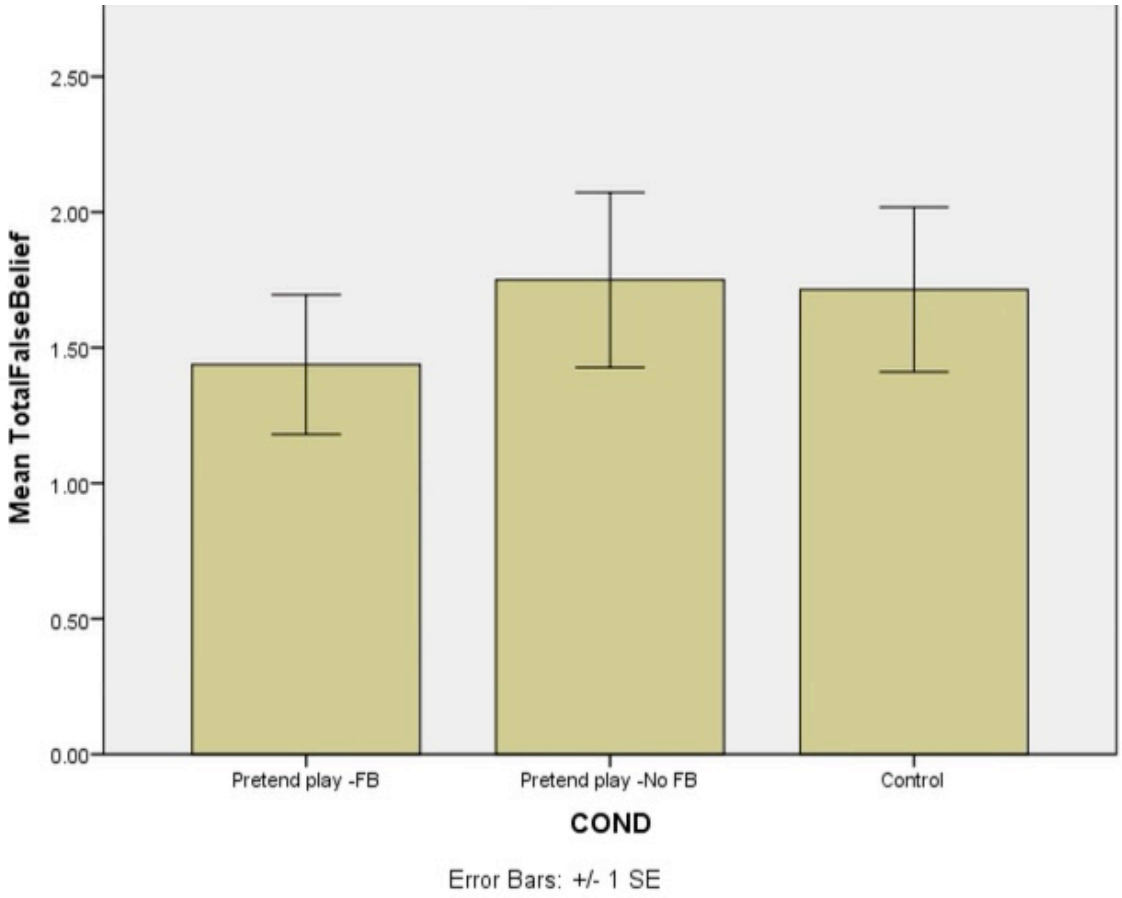

Figure 1. Graph of mean total false belief score by play condition. A univariate analysis of variance of the between-subject factors revealed no significant differences among the mean false belief scores across the three play conditions, $F(2, 43) = .343$, $p = .711$.

	Age Bin #1 (3.0—3.5)	**Age Bin #2 (3.5—4.0)**	**Age Bin #3 (4.0—4.5)**	**Age Bin #4 (4.5—5.0)**	**Age Bin #5 (5.0—5.5)**
Pretend Play—False Belief (*N*=16)	5	3	2	4	2
Pretend Play—No False Belief (*N*=16)	2	4	5	4	1
Control (*N*=14)	1	4	4	4	1

Figure 2. Table of number of participants per age subgroup (in years) per condition.

Tests of Model Effects

Source	Type III Wald Chi-Square	df	Sig.
(Intercept)	88.574	1	.000
COND	2.383	2	.304
AgeBin	8.465	4	.076
COND * AgeBin	11.488	8	.176

Dependent Variable: TotFB
Model: (Intercept), COND, AgeBin, COND * AgeBin

Figure 3. Model 1: Generalized linear model test of model effects. Results of this model produced no significant main effects for age or condition, and no significant interaction between condition and age subgroup.

Tests of Model Effects

Source	Type III Wald Chi-Square	df	Sig.
(Intercept)	63.050	1	.000
AgeBin	7.575	4	.108
ComboControl	1.949	1	.163
AgeBin * ComboControl	9.927	4	.042

Dependent Variable: TotFB
Model: (Intercept), AgeBin, ComboControl, AgeBin * ComboControl

Figure 4. Model 2: Generalized linear model test of model effects. Results of this model produced no significant main effects for age or condition, but a significant interaction between condition and age subgroup.

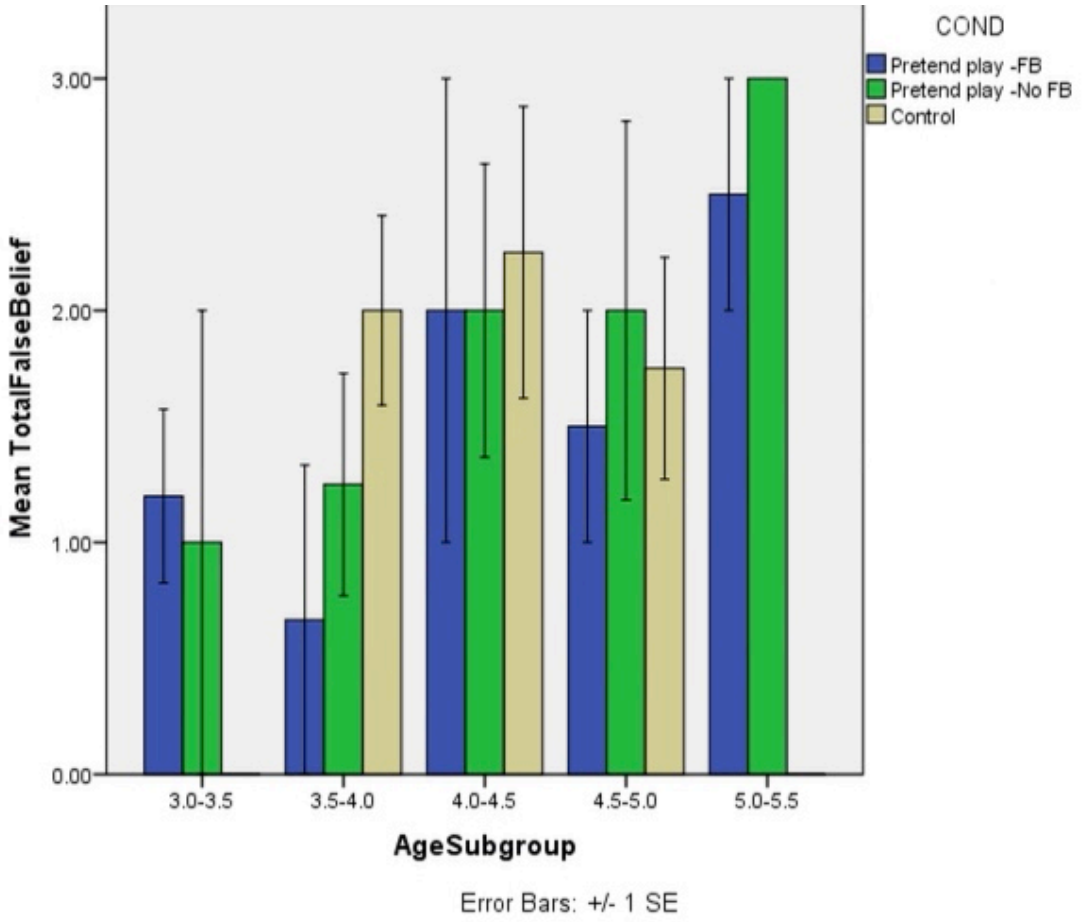

Figure 5. Graph of mean total false belief post-test score by age subgroup (in years). As demonstrated by this graph, the condition associated with the highest mean false belief post-test score in each age subgroup was highly variable.

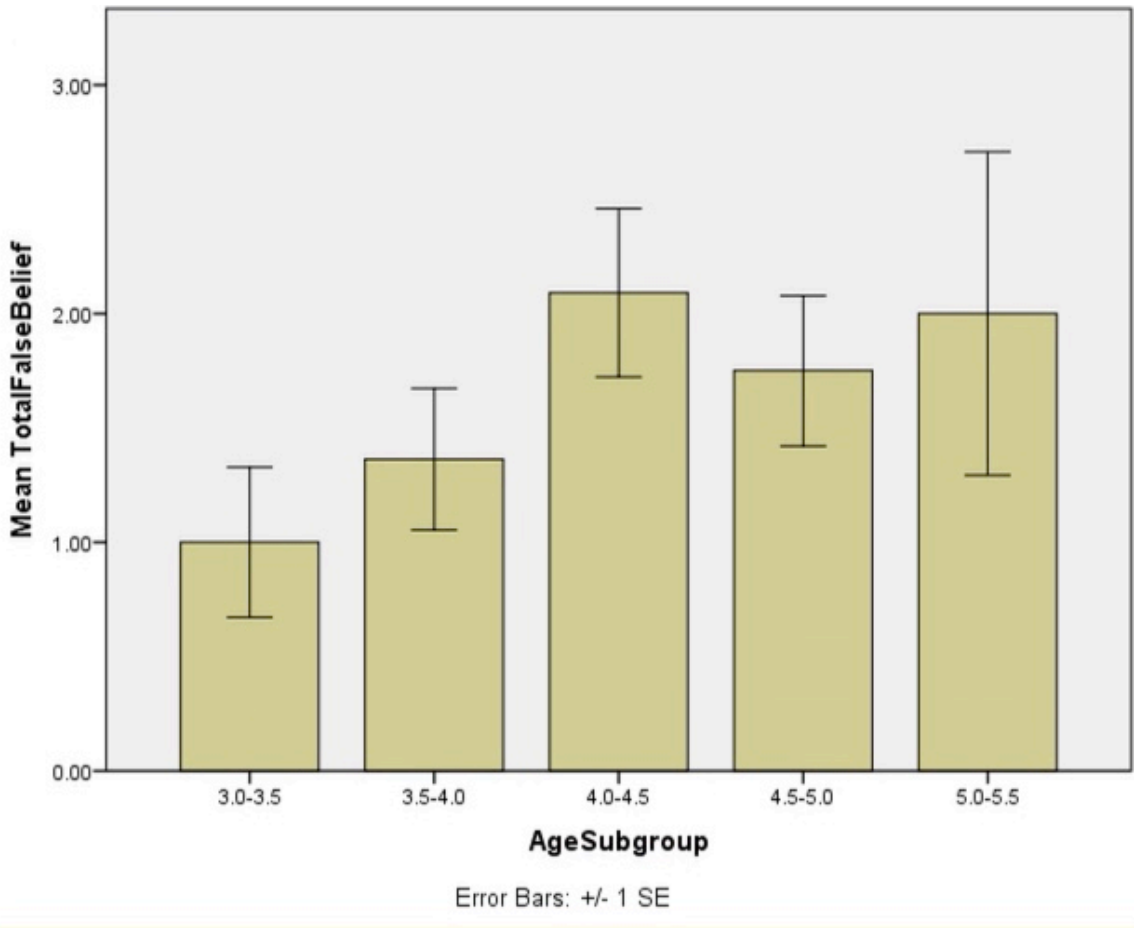

Figure 6. Graph of mean false belief post-test performance per age subgroup (in years) regardless of condition. This graph illustrates that there was a lack of consistent mean improvement in performance on the false belief post-test as children became older.

Appendix A

Pretend Play—False Belief Experimenter Script

Pretend Play, False Belief

Hi [child's name]. It's really nice to meet you! I'm going to need your help in the animal hospital today, okay? I'll be the doctor and you can be the special assistant!

give child stethoscope/lab coat to get them in the right mindset

This is Spot. Spot was running around and being silly and he broke/sprained/hurt his leg. He needs our help to get better. Will you help me with Spot? Okay, great! I know you'll do a great job. Here is a chart with the steps you have to do, and every time you finish one I'll give you a sticker! How does that sound?

1. First, we need to lay out Spot on this stretcher because he can't walk.
2. Now, let's lay him out on this table.
3. Then we need to prop his hurt leg up on this pillow. Okay, that was the first step on your chart! We got Spot ready. Here's a sticker!
4. Okay, good! Now I need my doctor's bag from over there. Can you go get it?...Oh no! It wasn't there? Someone must have moved it!
5. Oh look out—it looks like it might be heavy because there's a boulder in it! Oh wait—that's not a boulder! That's a sponge! That's pretty silly.
6. [before opening bag] Now, let's see. I need some things from inside this bag. My casts for dog legs are in that compartment. [gesture at compartment in the bag] [have kid unzip compartment] Wait! These aren't dog casts! These are the needles for giving shots!
7. Okay, what we have to do now for Spot is to wash off his leg to make sure it's all clean before we put it in the cast. Here, use this soap to wash it off. Huh? Wait a second! This isn't soap! This is cheese!
8. Awesome! Now let's put some ointment on it to make sure it doesn't get infected. Nice job! That was the second step! We cleaned Spot's leg. Here's another sticker!
9. All right, now Spot needs somes bandages for his leg! Can you take out the Band-Aid box and take out a Band-Aid for Spot? ...Look at that! Those aren't Band-Aids in the box! Those are cough drops!
10. Okay, now let's wrap his leg up with this stretchy bandage and cast. Nice job! Guess what? You get another sticker because you just did the third step!
11. Now let's take Spot's temperature with this thermometer to make sure he doesn't have a fever or anything else going on. Good job! The fourth step is done because we checked his temperature. Here's a sticker!
12. Now Spot needs some crutches so he can walk! Can you go get the crutches out of that box over there? They weren't there? Oh no! Someone must have moved them!

13. All right, let's test to make sure Spot can use his crutches. Here, you hold the crutch under Spot's leg and we'll show him how to walk. Good job Spot! That was the fifth step. We helped Spot practice with his crutches. That means it's time for another sticker!
14. Whew, that was a lot for Spot! I think he deserves a treat, don't you? Here, let's give him this piece of candy to cheer him up. Yay, that was the last step! We cheered Spot up! Here's the last sticker!

Appendix B

Pretend Play—No False Belief Experimenter Script

Hi [child's name]. It's really nice to meet you! I'm going to need your help in the animal hospital today, okay? I'll be the doctor and you can be the special assistant!

give child stethoscope/lab coat to get them in the right mindset

This is Spot. Spot was running around and being silly and he broke/sprained/hurt his leg. He needs our help to get better. Will you help me with Spot? Okay, great! I know you'll do a great job. Here is a chart with the steps you have to do, and every time you finish one I'll give you a sticker! How does that sound?

1. First, we need to lay out Spot on this stretcher because he can't walk.
2. Now, let's lay him out on this table.
3. Then we need to prop his hurt leg up on this pillow. Okay, that was the first step on your chart! We got Spot ready. Here's a sticker!
4. Okay, good! Now I need my doctor's bag from over there. Can you go get it? Thank you so much!
5. [before opening bag] Now, let's see. I need some things from inside this bag. My casts for dog legs are in that compartment. [gesture at compartment in the bag] [have kid unzip compartment] Great! Let's put that over here for later.
6. Okay, what we have to do now for Spot is to wash off his leg to make sure it's all clean before we put it in the cast. Here, use this sponge to wash it off.
7. Awesome! Now let's put some ointment on it to make sure it doesn't get infected. Nice job! That was the second step! We cleaned Spot's leg. Here's another sticker!
8. All right, now Spot needs somes bandages for his leg! Can you take out the Band-Aid box and take out a Band-Aid for Spot? Okay great, let's wrap his leg up tight! Now let's use the stretchy bandage and the dog cast to wrap his leg up tight. Yay! That was the third step! You get another sticker!
9. Now let's take Spot's temperature with this thermometer to make sure he doesn't have a fever or anything else going on. Good job! The fourth step is done because we checked his temperature. Here's a sticker!
10. Now Spot needs some crutches so he can walk! Can you go get the crutches out of that box over there?
11. All right, let's test to make sure Spot can use his crutches. Here, you hold the crutch under Spot's leg and we'll show him how to walk. Good job Spot! That was the fifth step. We helped Spot practice with his crutches. That means it's time for another sticker!
12. Whew, that was a lot for Spot! I think he deserves a treat, don't you? Here, let's give him this piece of candy to cheer him up. Yay, that was the last step! We cheered Spot up! Here's the last sticker!

Appendix C

Control—Experimenter Script

Hi [child's name]. It's really nice to meet you! We're going to have a really fun time today playing some games! The first one is a sorting game. We have all these toys over here, and I need you to sort them into these six different bins. Every time you finish a bin, I'll give you a sticker on this chart! How does that sound? Perfect! Okay, let's sort them by the *type* of toy. We have farm toys, doctor toys, cars, dolls, stuffed animals, and food toys. Let's look for the farm toys first. Which toys do you think are the farm toys?

Oh look, you finished the entire bin! Great job! Here's a sticker.

[repeat five times]

Appendix D

False Belief Post-Test Experimenter Script—All Conditions

Post-test: Change of Location

Mickey and Pluto are going on a picnic together. They get all set up with their food. Pluto is having a good time eating his sandwich with Mickey, but then he remembers that he forgot the juice at his doghouse! He tucks his sandwich under the picnic blanket so that the bugs can't get it, and then he goes back to his doghouse to get the juice. While he's gone, Mickey takes the sandwich out from under the picnic blanket and puts it in the picnic basket because it's dirty on the ground.

Where did Pluto put his sandwich?
Where is the sandwich now?

Pluto comes back from his doghouse with the juice. He's going to look for his sandwich so he can keep eating it. He remembers where he put it.

Where is Pluto going to look for his sandwich?
Why is he going to look there?

Post-test: Appearance-Reality

Look what I have here!

What is this? *gestures to crayon eraser*

A crayon? Okay! Let's try to color with it. Oh! This isn't a crayon! This is an eraser! That's kind of silly, isn't it?

*What did you **think** this was when I first showed it to you?*
What is it really?

What's the name of one of your friends? Oh, ok. S/he hasn't seen this yet, and s/he hasn't heard anything we've been talking about.

*If s/he comes in here, what would s/he **say** this is?*