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Examining the Relation Between Anthropomorphism and Theory of Mind

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Abstract

Two ways people think about the mental state of others is through anthropomorphism and theory of mind. Anthropomorphism is the attribution of human-like capacities to non-human entities, such as ascribing mental and internal states (Waytz et al., 2013). Theory of mind is the ability to infer and understand other people's mental states, such as beliefs, desires, intentions, and knowledge (Doherty, 2011). We predicted these two concepts are associated, and this prediction was assessed through the research outlined here. The current study examined potential associations between children's (*N*=82; 5-8 years old) anthropomorphism, parent-reported theory of mind, and parent-reported social preferences. Findings indicated the concepts are related, specifically belief understanding was negatively correlated to anthropomorphism of technology and nature. These findings point to a connection between the concepts, hopefully sparking future inquiries into why these connections exist as they do.

Keywords: theory of mind, anthropomorphism

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Anthropomorphism

Human stories are filled with examples of non-human entities taking on human-like traits. From storms being angry to mountains being stern. Hyenas laugh menacingly and golden retriever's smile with joy. While these entities do not have the same capacity for emotion or complex thought as humans, we attribute human emotions and states to them nonetheless. This process of attributing human-like capacities to non-human others is known an anthropomorphism (Waytz et al., 2013). The term comes to English from the Greek roots anthropos (human) and morphe (form). We are giving other entities the forms of humans by attributing mental states we typically reserve only for humans. Anthropomorphism is applying human like characteristics to non-human entities, and has been studied intensively in the past. Many measures examine a narrative process to pick out anthropomorphizing language. There can be individual differences in anthropomorphism (Waytz et al., 2013), where the propensity to attribute mental states may vary across individuals and entities. That is to say individuals may vary in how willing they are to anthropomorphize and the extent to which they anthropomorphize other entities.

Anthropomorphism, and its related concept animism, have been explored extensively in the past. Animism is defined as the attribution of intentional action and the idea of "life" to non-human entities. This differs from anthropomorphism, which is the attribution of human mental states to non-humans (Airenti, 2018). Piaget (1929) examined animism in children, and concluded that the process of applying intentional action and the belief that other entities are filled with a sense of life is an essential aspect of development. However, anthropomorphism extends beyond animism as children have the ability to extend specific human-like states to non-

humans. This understanding that attribution of human characteristics to others is an important step in development is carried into later research.

Anthropomorphism can be measured through a narrative, where the subject is shown a short story – often involving very simple entities, and is asked to describe what happens. A narrative based anthropomorphism measure is highlighted in Heider and Simmel's work (1944), where participants are shown a short film depicting three geometric figures (a small triangle, a large triangle, and a circle) and are asked to describe the events. Many participants went on to describe the video in the context of an ongoing story despite the film being simple shapes moving on a blank background. Some participants turned the geometric shapes into characters, with one turning the shapes into birds acting out a tale, and another describing a fight between two men with a girl being present. Even when not directly turning the shapes into humans or other animals, subjects still used anthropomorphic mental state language to describe the scene, with one participant painting a triangle as the villain trying to break up the innocent love of the other triangle and the circle. Humans have a remarkable ability to extend human like mental states to non-human entities, and it should be no surprise that humans can also extend mental state inferences to other humans.

Theory of Mind

Theory of mind is the ability of people to take other people's perspective, to walk in their shoes and see through their eyes. Theory of mind includes the ability to reason the belief, knowledge, perception, emotion, intention, and desires of other people (Tahiroglu et al., 2014). Belief describes the ability to understand that another person can believe something the child does not believe, and that beliefs can be false. Knowledge pertains to the child's ability to know that different people have different knowledge levels. Theory of mind is important for predicting

and explaining other people's behavior (Doherty, 2011), and is arguably necessary for successful social interactions.

Theory of mind is often studied in developmental psychology. It develops as the child ages, usually allowing the child to have at least a basic understanding of others emotional states by age 2 (Tahiroglu et al, 2014). False belief understanding, or recognizing that someone may have a belief that differs from reality, is arguably the most important aspect of theory of mind. A classic example of a false belief task is the Sally Anne, or false location task (Baron-Cohen et al., 1985), where a doll named Sally puts a marble in a basket before leaving the room. After Sally leaves, Anne moves the marble to a box. Children are then asked where Sally will search for her marble when she returns. If the child believes Sally will look in the basket, they can understand false beliefs, and if they believe Sally will seek the marble out in the box, they do not. Typically, children do not have a false belief understanding at age three, increasingly demonstrate success at the task by age four, and have false belief understanding at age five. Theory of mind continues to develop into middle childhood, where children gain a deeper complexity of thought regarding false belief tasks. Second order theory of mind can also allow the child to understand how perspectives can differ, how this difference can lead to different outcomes, and more complex reasoning about false beliefs (i.e., where does Anne believe Sally believes the marble is; Lagatutta et al., 2015). Additionally, other types of mental states are important for children to reason about, such as intentions, goals, emotions, and knowledge.

While theory of mind and anthropomorphism both include thinking about the mental states of others, the connection between the two concepts has not been extensively studied. Tahiroglu and Taylor (2019) found children (4-6 years old) passing the false belief task scored higher on their interview measure of anthropomorphism. However, the study found no

significant connections between a parent report measure of theory of mind and anthropomorphism. One notion is that spending time thinking about the mental states of non-human others may bolster children's theory of mind abilities. As previously stated, theory of mind is important for children's social abilities, such as predicting or explaining behaviors of others. If the propensity to think about the mental states of others is encouraging theory of mind abilities and anthropomorphism, it may be that children's social interest and shyness play an important role.

Shyness and Social Disinterest

If children have a strong inclination to engage socially with others, it may be important for how children think about the mental states of others. That is, if children are desiring social interactions, they may be better at social understanding and theory of mind reasoning with other people. Likewise, desiring social interaction may increase children's tendency to anthropomorphize non-human others. For example, the attribution of internal states may make it easier to engage socially with non-human others. Therefore, a child's social disinterest and shyness may be related to how they think about the mental states of human and non-human others.

Children can sometimes be seen playing alone, even with a multitude of peers around them. This situation can arise from multiple situations, like conflicted shyness (where the child has a desire to interact with others but holds themselves back due to anxieties), social disinterest (where the child has less desire to interact with others), or active isolation (where a child is being left alone by peers; Coplan et al., 2004). Active isolation is considered to be an external state, while conflicted shyness and social disinterest are considered to be internal, inherent to the child.

Conflicted shyness behaviors are thought to be the result of an approach-avoidance conflict, where the child has a desire to interact with their peers (approach) but fear the possible negative outcomes that could arise from that interaction (avoidance). The cognitive processes related to shyness are also linked to the ability to assess a stranger's likely reaction to a stimulus (Asendorpf, 1989). Children's ability to predict emotional reactions suggests a deeper understanding in the emotion dimension of theory of mind, where they understand that two individuals may have different reactions to the same stimulus. This suggests an association between shyness and theory of mind processes.

Social disinterest, also referred to as unsociability, seems to come from a child being more subject-oriented compared to a peer who may be more person-oriented (Coplan, 2000). Children high in unsociability have a low approach and low avoidance motivations (Coplan & Rubin, 1998). The children rated highly in this measure do not seek out many social interactions because they may not see a reward for doing so or have been conditioned to be satisfied with low social interaction. Children who have a greater propensity to desire social interaction may be more likely to think about the minds of non-human and human others alike, having an increased anthropomorphism and theory of mind scores.

The Current Study

The current study explored to further understand the relationship between children's anthropomorphism and theory of mind and explore potential associations with children's social disinterest and shyness. Children (5-8 years) completed an anthropomorphism measure to assess their individual tendency to attribute internal states to non-human others through a child report. Theory of mind was assessed by a parent-report of children's social understanding of others across six types of mental states (desire, intention, knowledge, emotion, belief, and perception).

Parents also completed a parent-report measure of their child's social disinterest and shyness. The current study aimed to address important gaps in the literature by exploring possible connections between theory of mind and anthropomorphism.

Method

Participants

The sample included 82 participants, ranging in ages from five to eight years old (*M*=6.95, *SD*=1.17). Participant's parents reported gender expression (54.9% female, 43.9% male, 1.2% non-binary/other) as well as ethnicity (64.6% European, 18.3% Multiple Ethnicities, 3.7% Asian, 3.7% other (such as Greek and Egyptian), 1.2% Latin/Central/South American, 1.2% Native American, 7.3% preferred not to answer). Data collection occurred in the UM Living Lab. Study sessions occurred either on a scheduled or drop-in basis. The data collected here are a subset of two studies ran in conjunction (Severson et al., 2023; Sweezy, 2023) to examine children's perception of technologies.

Procedure & Materials

Individual Differences in Anthropomorphism Questionnaire- Child Form.

Anthropomorphism was measured using the Individual Differences in Anthropomorphism Questionnaire-Child Form (IDAQ-CF). A research assistant administered this questionnaire to children. The IDAQ-CF was developed to measure the tenendency to anthropomorphize in children (Severson & Lemm, 2016). The IDAQ-CF consists of 12 items (see Appendix A) to measure children's tendency to anthropomorphize non-human others, such as attributions of intentions, emotions, consciousness, and mindedness. The items on the IDAQ-CF consist of two subscales, Technology/Nature ("Does a robot know it's a robot?" and "Does a tree think for itself?") and Animal ("Does a cheetah have feelings, like happy or sad?"). For each question, the

participant was asked to respond with a “Yes” or a “No,” and if they answered “Yes” they were asked “How much?” They were then given the options of “A little bit” (1), “A medium amount” (2), and “A lot” (3). Thus, the IDAQ-CF was scored on a 4-point scale in which 0 was “Not at all” and 3 was “A lot”. The children were asked the IDAQ-CF in a randomized order. The IDAQ-CF is scored by finding the mean of the child’s answers, where a sum is calculated then divided by the number of items being examined.

Child Social Preference Scale. The Child Social Preference Scale (Coplan et al., 2004) is a parent report measure of a child’s shyness and unsociability. Parents completed the form via a Qualtrics form presented on an iPad. It consists of eleven questions (see Appendix B), rated on a scale of 1-5, where 1 is “not like my child at all” and 5 is “a lot like my child”. 7 questions measured shyness (e.g. “my child seems to want to play with other children, but is sometimes nervous to.”) while the unsociability scale includes 7 questions (e.g. “my child often seems content to play alone.”). With these questions, 3 items are reverse scored due to how the question is written, so 5 counts as a 1, and 1 as a 5, and reverses the scoring. The CSPS is scored based on a sum of the point total the child has achieved.

Children’s Social Understanding Scale- Short Form. The CSUS was developed to examine parent-reported theory of mind tendencies in their children (Tahiroglu et al, 2014). The CSUS short form consists of 18 questions (see Appendix C), examining the six subscales of theory of mind: belief, knowledge, perception, intention, emotion, and desire. The questions are rated on a scale of 1 to 4, where 1 is “definitely untrue” and 4 is “definitely true”, or parents could also respond with a “Don’t Know” option. Two of the questions are reverse scored, as the way the question is phrased requires the scales to be reversed to be accurately scored. With these questions, 4 becomes counted as “definitely untrue”, while 1 is counted as “definitely true”. An

example of a question from the CSUS is “My child understands that hurting others on purpose is worse than hurting others accidentally.” The CSUS is scored as a mean, where the sum is totaled and then divided by the number of questions.

Results

Preliminary analyses examined reliability of the items for each scale and subscale before computing the variables into scale sums and averages. The IDAQ-CF overall measure was computed by averaging all items ($\alpha = .607$), as well as computing the average for the IDAQ-CF technology/nature ($\alpha = .562$) and animal ($\alpha = .595$) subscales. The CSUS overall was computed by averaging all items into a single scale variable ($\alpha = .885$), and although the short form was used in the study, the subscales of belief ($\alpha = .616$), desire ($\alpha = .434$), emotion ($\alpha = .477$), perception ($\alpha = .462$), intention ($\alpha = .535$), and knowledge ($\alpha = .558$) were also averaged to explore how specific components of theory of mind may be related to anthropomorphism. The CSPS overall was computed by summing each item ($\alpha = .902$), as well as summing the CSPS subscales of shyness ($\alpha = .902$) and unsociability ($\alpha = .814$) were both reliable. The means for each of the scales are listed below in Table 1.

Table 1

Descriptive Statistics for IDAQ-CF, CSUS, and CSPS scales and subscales.

Variable	*M*	*SD*
IDAQ Overall	.93	.50
IDAQ Technology/ Nature	.57	.53
IDAQ Animal	1.64	.77
CSPS Overall	26.35	8.90
CSPS Shyness	16.35	6.71
CSPS Unsociability	10.00	3.27
CSUS Overall	3.42	.42
CSUS Desire	3.51	.42
CSUS Knowledge	3.45	.56
CSUS Intention	3.39	.52
CSUS Belief	3.50	.57
CSUS Emotion	3.27	.49
CSUS Perception	3.39	.51

Data were analyzed by a series of Pearson correlations. Age correlations were carried out on whole scales and each subscale. Age and IDAQ-CF Technology/Nature were significantly correlated ($r(80) = -.294$, $p = .007$), however, age was not significantly correlated with the IDAQ-CF overall ($r(80) = -.168$, $p = .13$) or the IDAQ-CF Animal subscale ($r(80) = .083$, p

= .46). Age was approaching significance for the CSUS overall ($r(80) = .212$, $p = .056$) and the CSUS knowledge subscale ($r(80) = .209$, $p = .06$), and age was significantly correlated with the CSUS subscales belief ($r(80) = .252$, $p = .02$) and perception ($r(80) = .236$, $p = .03$). All other CSUS subscales (desire, intention, and emotion) were not significantly related to age (all *p*s >.16). Age was not significantly correlated to the CSPS overall or the shyness and unsociability subscales (all *p*s >.78). Table 2 lists correlations between age and the IDAQ-CF scales, Table 3 lists correlations between age and the CSPS scales, and Table 4 lists correlations between age and the CSUS scales. Figures 1 and 2 illustrate the correlation between age and IDAQ technology/nature and CSUS belief, respectively.

Table 2

Correlations among age and IDAQ-CF.

Variable	1	2	3	4
1. Age	-	-.168	**-.242****	.083
2. IDAQ Overall		-	**.866****	**.732****
3. IDAQ Tech/Nature			-	**.294****
4. IDAQ Animal				-

**$p \leq .01$

Table 3

Correlations among age and CSPS.

Variable	1	2	3	4
1. Age	-	.030	.025	.031
2. CSPS		-	**.951****	**.772****
3. CSPS Shyness			-	**.537****
4. CSPS Unsociability				-

**$p \leq .01$

Table 4

Correlations among age and CSUS.

Variable	1	2	3	4	5	6	7	8
1. Age	-	**.212**†	.077	**.209**†	.061	**.252***	.156	**.236***
2. CSUS Overall		-	**.861****	**.864****	**.707****	**.868****	**.816****	**.770****
3. CSUS Desire			-	**.722****	**.592****	**.711****	**.682****	**.549****
4. CSUS Knowledge				-	**.438****	**.786****	**.604****	**.635****
5. CSUS Intention					-	**..439****	**.592****	**.438****
6. CSUS Belief						-	**.642****	**.630****
7. CSUS Emotion							-	**.497****
8. CSUS Perception								-

† = .06, *$p \leq .05$, **$p \leq .01$

Figure 1

Scatterplot of age and technology/nature anthropomorphism.

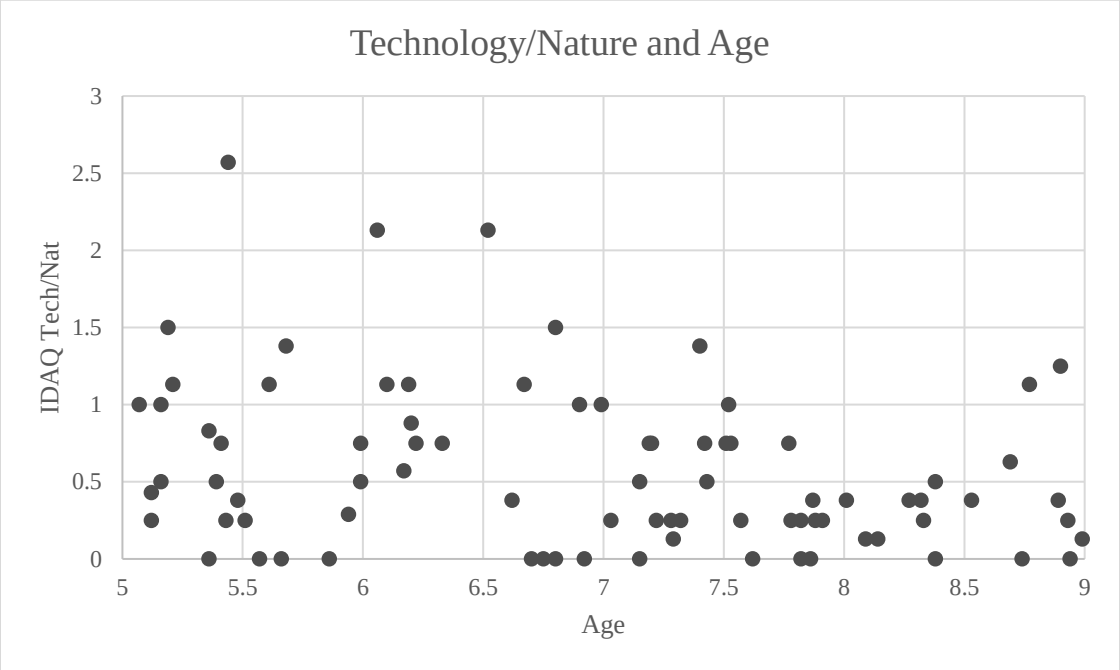
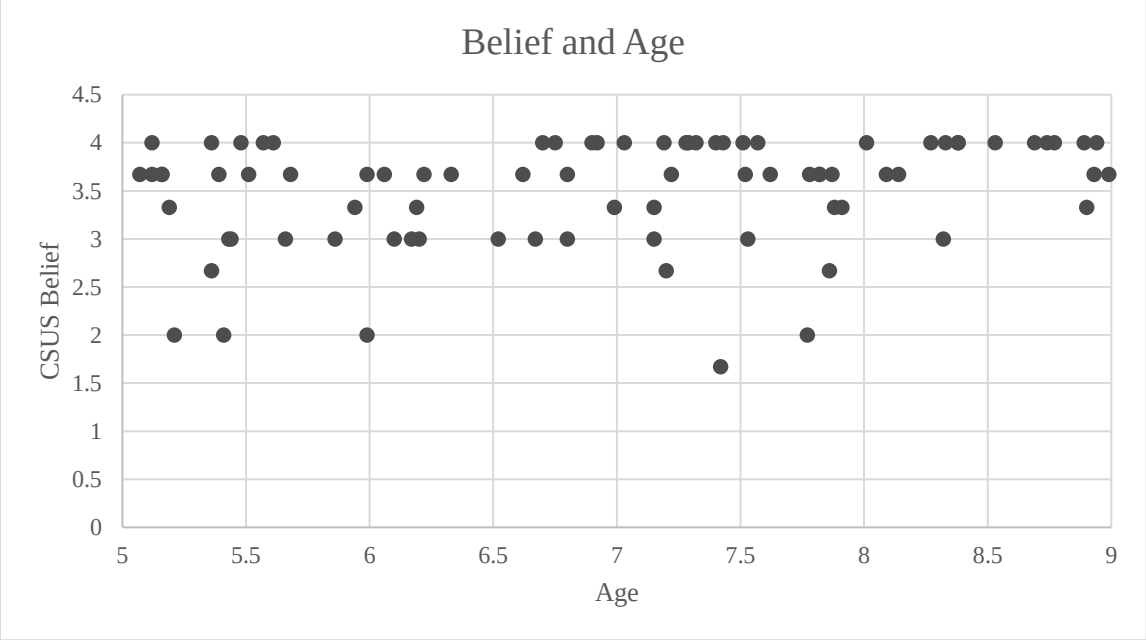


Figure 2

Scatterplot of age and CSUS belief.

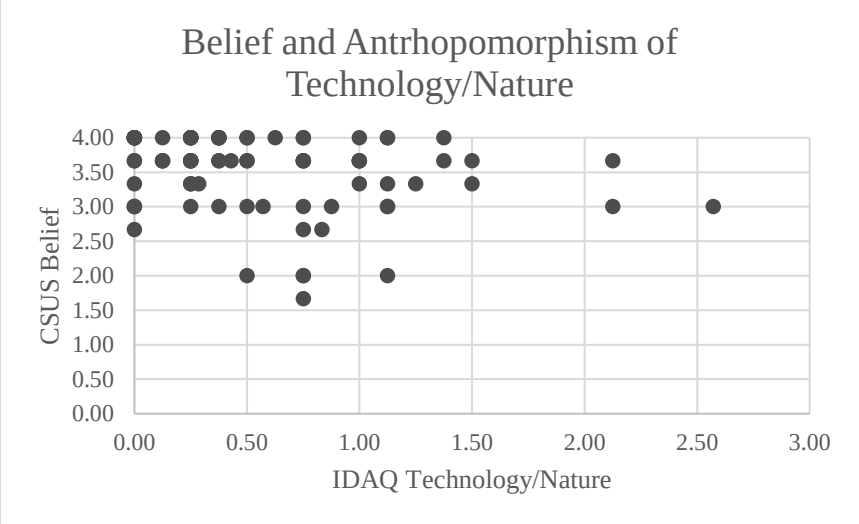


Anthropomorphism and Social Understanding

The IDAQ-CF overall was negatively correlated to the CSUS belief ($r(80) = -.223$, $p = .04$), but was not significantly related to any other CSUS subscales or the CSUS overall (all *p*s >.12). When examining the IDAQ-CF subscales, CSUS belief was specifically associated with the IDAQ-CF technology/nature subscale ($r(80) = -.232$, $p = .04$), but not the IDAQ-CF animal subscale ($r(80) = -.105$, $p = .35$). Figure 3 displays the scatterplot for the correlation between the IDAQ-CF technology/nature and CSUS belief. The CSUS overall and remaining CSUS subscales were not significantly correlated to the IDAQ-CF technology/nature (all *p*s >.13) or the IDAQ-CF animal (all *p*s >.31).

Figure 3

Scatterplot depicting IDAQ-CF technology/nature and CSUS belief.



Anthropomorphism and Social Preferences

The IDAQ-CF overall was not significantly correlated with the CSPS, the CSPS shyness, or the CSPS unsociability subscales (all *p*s >.6). The IDAQ-CF technology/nature subscale was not significantly correlated with the CSPS or CSPS subscales (all *p*s >.6). The IDAQ-CF animal subscale was not significantly correlated with the CSPS or CSPS subscales (all *p*s >.7).

Social Understanding and Social Preferences

The CSUS overall was significantly correlated with the CSPS overall ($r(80)= -.242$, $p = .03$) or the CSPS unsociability ($r(80)= -.233$, $p = .04$), and was approaching significance with the CSPS shyness subscale ($r(80)= -.207$, $p = .06$). The CSPS overall was significantly correlated with the CSUS desire ($r(80)= -.264$, $p = .02$), knowledge ($r(80)= -.222$, $p = .045$), and intention ($r(80)= -.244$, $p = .03$) subscales. The CSPS unsociability subscale was significantly correlated with the CSUS desire ($r(80)= -.227$, $p = .04$) and perception ($r(80)= -.249$, $p = .02$) subscales and approaching significance with the intention subscale ($r(80)= -.215$, $p = .052$). The CSPS shyness subscale was significantly correlated with the CSUS desire ($r(80)= -.240$, $p = .03$) and intention ($r(80)= -.219$, $p = .045$) and approaching significance with the CSUS knowledge subscale ($r(80)= -.208$, $p = .06$). A full list of correlations between the CSUS and CSPS subscales is found in Table 5.

Table 5

Correlations among CSUS and CSPS scales.

Variable	1	2	3	4	5	6	7	8	9	10
1. CSPS Overall	-	**.951****	**.772****	**-.242***	**-.264***	**-.222***	**-.244***	-.120	-.197	-.153
2. CSPS Shyness		-	**.537****	**-.207†**	**-.240***	**-.208†**	**-.219***	-.103	-.174	-.081
3. CSPS Unsociability			-	**-.233***	**-.227***	-.177	**-.215***	-.116	-.179	**-.249***
4. CSUS Overall				-	**.861****	**.864****	**.707****	**.868****	**.816****	**.770****
5. CSUS Desire					-	**.722****	**.592****	**.711****	**.682****	**.549****
6. CSUS Knowledge						-	**.438****	**.786****	**.604****	**.635****
7. CSUS Intention							-	**.439****	**.592****	**.438****
8. CSUS Belief								-	**.642****	**.630****
9. CSUS Emotion									-	**.497****
10. CSUS Perception										-

† = .06, *$p \leq .05$, **$p \leq .01$

Discussion

This study aimed to examine connections between theory of mind, anthropomorphism, and children's social disinterest and shyness. We expected to find a positive correlation between

anthropomorphism and theory of mind, such that as a child's tendency to anthropomorphize increased so would their theory of mind ability. Since attributing mental states to non-human entities would give children more experience thinking about mental states they may have a greater understanding of other people's mental states, or the ability to infer mental states from other people is also giving children experience thinking about the mental states therefore increasing the tendency to anthropomorphize. However, the results did not support this positive relation between anthropomorphism and parent-reported theory of mind.

The results indicated a single negative correlation between belief understanding and anthropomorphism, namely anthropomorphism of technology and nature. While this finding does not explain the connection, it suggests that as children are better at understanding the beliefs of others, they are less likely to attribute mental states to technology and inanimate nature. Since the finding was correlation, this could also be described as children who are less likely to anthropomorphize technology and inanimate nature, they are more likely to understand beliefs of other people. Interestingly, this relation was not found for the anthropomorphism of non-human animals. One explanation could be that animals are animate and prompting cues of anthropomorphism more than inanimate nature and technology. In addition, the negative relation was opposite of the prediction that experience reasoning about mental states, either human or non-human, would increase reasoning about mental states of the other category of entity. Furthermore, these results differ from Tahiroglu and Taylor's (2019) findings. They found a positive connection between children's scores on a false belief task and their interview anthropomorphism measure scores and did not find an association between parent-reported theory of mind and anthropomorphism. However, by examining the specific mental states within

the parent-reported theory of mind measure, our results indicated a negative relation between theory of mind belief understanding and anthropomorphism.

Children's social disinterest and shyness was not related to anthropomorphism, suggesting the desire to engage socially with others is not associated with the tendency to attribute mental states to non-human others. However, children's social preferences were related to children's social understanding of other people. Specifically, social understanding was negatively associated with unsociability and was nearing a significant negative relation with shyness. The relation between social preferences and theory of mind indicated children who are better at understanding the mental states of other people are less likely to be socially disinterested or shy. Said differently, children who are more socially disinterested or shy are reported to be less fluent in reasoning about the mental states of other people. This finding may make sense intuitively, for example, imagine a child who stands alone at the park wanting to engage with others but is too shy, not realizing that a peer is desiring to play along so they do not seek out that peer and ask for them to join in. Overall, children's social preferences were related to children's understanding of desires, knowledge, and intentions. Children's unsociability, or social disinterest, was negatively related to desire and perceptions and approaching a negative relation with intentions. Children who were more likely to be socially disinterested were less likely to understand other's desires and perceptions. Put differently, children who were more likely to understand other people's desires and perceptions were less likely to be socially disinterested. Children's shyness was related to the understanding of desires and intentions and approaching a significant relation with knowledge understanding. That is to say, children who are shyer are less likely to understand desires and intentions of other people, or that children who are more likely to understand desires and intentions are less likely to be shy.

Additionally, age was correlated with some of the measures. Age was negatively related to the anthropomorphism of technology and nature, although not significantly correlated to anthropomorphism overall or with the anthropomorphism of animals. This negative relation aligns with past research. Past research has suggested older children anthropomorphize technology, namely social robots, less than younger children (Goldman et al., 2023; Kahn et al., 2012; Manzi et al., 2020). Age was positively related to theory of mind understanding, namely belief and perception, and was approaching a significant positive relation to knowledge. That is, with age children had increasing understanding of other people's beliefs and perceptions. However, age was not related to children's social preferences of unsociability and shyness.

There are more questions to answer. Our study utilized only parent-reported measures of theory of mind, and could be a limitation of the current findings. Future research should include child measures of theory of mind capacities to examine how a child's theory of mind ability may be related to anthropomorphism. In addition, future research could examine a larger age range to examine developmental differences in theory of mind and anthropomorphism. For example, younger children may demonstrate differences in theory of mind and anthropomorphism differently from older children. Future exploration into these connections could be very interesting and answer the question of why this relation appears in the way that it does. This study had a great many interesting findings, and hopefully that this leads to additional research into these areas.

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Appendix A

Individual Differences in Anthropomorphism Questionnaire – Child Form (IDAQ-CF)

Training Questions Ordered		**No**	**Yes – A little**	**Yes – Med**	**Yes – A lot**
T1	Do you like candy? (YES/NO) If yes, How much do you like candy?	0	1	2	3
T2	Do you like broccoli? (YES/NO) If yes, How much do you like broccoli?	0	1	2	3
T3	Do you like carrots? (YES/NO) If yes, How much do you like carrots?	0	1	2	3

	IDAQ-CF Questions Random Order		**No**	**Yes – A little**	**Yes – Med**	**Yes – A lot**
Technological	1	Does a [**robot]** know it's a robot? (YES/NO) If yes, How much does a robot know it's a robot?	0	1	2	3
	2	Does a [**TV]** have feelings, like happy & sad? (YES/NO) If yes, How much does a TV have feelings (happy & sad)?	0	1	2	3
	3	Does a [**car**] do things on purpose? (YES/NO) If yes, How much does a car do things on purpose?	0	1	2	3
	4	Does a [**computer**] think for itself? (YES/NO) If yes, How much does a computer think for itself?	0	1	2	3
Inanimate Nature	5	Does the [**ocean**] know it's an ocean? (YES/NO) If yes, How much does the **ocean** know it's an ocean?	0	1	2	3
	6	Does a [**mountain**] have feelings, like happy & sad? (YES/NO) If yes, How much does a mountain have feelings (happy & sad)?	0	1	2	3
	7	Does the [**wind**] do things on purpose? (YES/NO) If yes, How much does the wind do things on purpose?	0	1	2	3
	8	Does a [**tree**] think for itself? (YES/NO) If yes, How much does a tree think for itself?	0	1	2	3
Animate Nature	9	Does a [**lizard**] know it's a lizard? (YES/NO) If yes, How much does a lizard know what it is?	0	1	2	3
	10	Does a [**cheetah**] have feelings, like happy & sad? (YES/NO) If yes, How much does a cheetah have feelings (happy & sad)?	0	1	2	3
	11	Does a [**turtle**] do things on purpose? (YES/NO) If yes, How much does a turtle do things on purpose?	0	1	2	3
	12	Does an [**insect or bug**] think for itself? (YES/NO) If yes, How much does an insect or bug think for itself?	0	1	2	3

Appendix B

Children's Social Preference Scale (CSPS)

	How much is your child like that? Not at All ← → A Lot				
1. My child often seems content to play alone.	1	2	3	4	5
2. My child seems to want to play with other children, but is sometimes nervous to.	1	2	3	4	5
3. My child is just as happy to play quietly by his/herself than to play with a group of children.	1	2	3	4	5
4. My child is happiest when playing with other children.	1	2	3	4	5
5. My child will turn down social initiations from other children because he/she is 'shy'.	1	2	3	4	5
6. My child often approaches other children to initiate play.	1	2	3	4	5
7. My child 'hovers' near where other children are playing, without joining in.	1	2	3	4	5
8. My child rarely initiates play activities with other children.	1	2	3	4	5
9. If given the choice, my child prefers to play with other children rather than alone.	1	2	3	4	5
10. My child often watches other children play without approaching them.	1	2	3	4	5
11. Although he/she appears to desire to play with others, my child is sometimes anxious about interacting with other children.	1	2	3	4	5

Appendix C

Children's Social Understanding Scale (CSUS) Short Form (Parent Report)

My Child…	Definitely Untrue	Somewhat Untrue	Somewhat True	Definitely True	Don't Know
1. Talks about differences in what people like or want (e.g., "You like coffee but I like juice").	1	2	3	4	DK
2. Uses words that express uncertainty (e.g., "We might go to the park"; "Maybe my shoes are outside").	1	2	3	4	DK
3. Realizes that experts are more knowledgeable than others in their specialty (e.g., understands that doctors know more than others about treating illness).	1	2	3	4	DK
4. Has trouble figuring out whether you are being serious or just joking.	1	2	3	4	DK
5. Is good at playing "hide and seek" (e.g., is hard to find, does not make give-away noises).	1	2	3	4	DK
6. Talks about how her/his beliefs have changed over time (e.g., "I used to think that drinking from a cup is hard, now I think it's easy").	1	2	3	4	DK
7. Talks about people's mistaken beliefs (e.g., "He thought it was a dog but it was really a cat"; "I thought mommy was coming but it was really daddy").	1	2	3	4	DK
8. Understands that hurting others on purpose is worse than hurting others accidentally.	1	2	3	4	DK
9. When given an undesirable gift, pretends to like it so as not to hurt the other person's feelings.	1	2	3	4	DK

	My Child…	Definitely Untrue	Somewhat Untrue	Somewhat True	Definitely True	Don't Know
10.	When talking on the phone, behaves as if the listener can actually see her/him (e.g., assumes that the listener knows what s/he is wearing).	1	2	3	4	DK
11.	Understands that different people can have different feelings about the same thing (e.g., one child likes a dog but another child is scared of it).	1	2	3	4	DK
12.	Takes into account what others want (e.g., takes turns, shares toys, compromises with other children regarding which game to play).	1	2	3	4	DK
13.	Talks about the difference between the way things look and how they really are (e.g., "It looks like a snake but it's really a lizard").	1	2	3	4	DK
14.	Talks about conflicting emotions (e.g., "I am happy to go on vacation, but I am sad about leaving friends behind").	1	2	3	4	DK
15.	Is good at directing people's attention (e.g., points at things to get others to look at them).	1	2	3	4	DK
16.	Talks about the difference between intentions and outcomes (e.g., "He tried to open the door but it was locked").	1	2	3	4	DK
17.	Understands that telling lies can mislead other people.	1	2	3	4	DK
18.	Talks about the difference between what people want and what they actually get (e.g., "She wanted a puppy but she got a kitten").	1	2	3	4	DK