

CHILDREN'S UNDERSTANDING OF FALSE BELIEFS ABOUT PEOPLE'S TRAITS

By

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Children aged 4–7 years ($N = 79$) received 6 false belief tasks, 2 object and 4 trait tasks (2 Trait-congruent and 2 Trait-incongruent conditions) testing their understanding of different kinds of beliefs. On the object measure, a location of an object was changed, whereas on the Trait tasks, a behavior of a person changed. In the Trait-congruent condition, a person's behavior representing his or her true trait changed temporarily due to an external factor. In the Trait-incongruent condition, a person's behavior also varied, but no information was provided about the true trait or the reason for the change. On all of the Trait trials two perceivers were presented, one who saw one of the behaviors and one who saw the other behavior. Types of beliefs in the two Trait conditions therefore differed. The beliefs examined in the Trait-congruent condition were either a true or a false belief whereas the beliefs examined in the Trait-incongruent condition were both true beliefs possessing a relative nature. After hearing each belief story, children received questions to test their understanding of different beliefs. On the object measures questions were directed to others' beliefs only. On the Trait measures, children were provided questions for both others' beliefs and self belief. Findings showed that there were no differences in understanding of others' beliefs across the three types of trial: Object, Trait-congruent, and Trait-incongruent. Older children were overall more successful than 4-year-olds

at providing correct judgments and relevant justifications on these measures. Comparisons of performance on the different kinds of beliefs provided on the Trait measure however showed some variations. Children performed equivalently on the true belief and false belief questions on the Trait measure but did more poorly on the self questions than on those directed to others' beliefs. Children in particular had trouble responding to the Trait-incongruent measure, suggesting their difficulty taking into account multiple perspectives. Justification responses to self questions also evidenced qualitative change in styles of justifications in children beyond the preschool ages. These variations suggest the possibility of different kinds of beliefs that can be observed in the social situation.

CHAPTER 1 INTRODUCTION

Reality influences what we think and believe, and the way our minds operate also shapes representation of reality. Theory of mind, what we understand about minds such as thoughts, emotions, and beliefs, serves as a basis for successfully recognizing reality. In particular one important element for such recognition is appreciation of false beliefs, the idea that beliefs can be mistaken. The links between the reality and our beliefs can be explained by an emphasis on a false belief mechanism. Namely, our belief is not a direct reflection of reality but a result of subjectively processed mental representation.

False belief has been one of the most popular research topics in child development for two decades now. Of a variety of research questions that have been examined, one most frequently asked is the age of mastery as to when children first become able to appreciate false beliefs. Such research is delimited to two specific uses of false belief methodology. One concerns general development of false belief measuring a scale of theory-of-mind ability. A structured experimental setting of false belief allows researchers to assess and compare the developmental stages of such understanding in different groups of children. Most of the early part of the literature was devoted to this general aspect and there is a great understanding with regard to this knowledge. Researchers in general agree that false belief appreciation is a universal achievement; children between the ages of 3 and 5 in any cultural setting become able to successfully respond to the two standard false belief paradigms, the unexpected transfer and the unexpected content forms (for reviews, see Miller, 2000; Wellman, Cross, & Watson, 2001).

The other topic for which false belief methodology has been used is relatively new, concerning more specific patterns of belief forms. As described in the previous section, the general aspect of false belief emphasizes a cognitive process that requires a certain level of

intellectual ability. The mastery of beliefs can however differ with the diverse contents about which the beliefs are formed. Ascribing a particular belief may dictate the use of certain knowledge that often turns out to be less important for other types of beliefs. In contrast to the general aspect of false belief, when and how children understand particular types of false beliefs is relatively unknown and new to the literature.

Comparisons of the general and the specific aspect noted in the previous sections bear witness to one of most distinctive differences between the trends of false belief research, that is the differences in targets of beliefs employed. The unexpected content and the unexpected transfer paradigms concern beliefs about physical facts—either a content of a container or a location of an object. In contrast, the targets used in the specific aspect of false belief research are directed to beliefs about the social world such as a person’s activity or a person’s location. These person measures were created in an attempt to have a more socially adapted form of false beliefs, allowing researchers to examine possible relations between theory of mind and social development (e.g., Nguyen & Frye, 1999; Symons, McLaughlin, Moore, & Morine, 1997).

A series of studies with employment of the person-oriented measures have demonstrated some variations in mastery of false beliefs. The first study was by Symons et al. (1997) who utilized a false belief measure with a focus on a location of a caregiver. On the measure a caregiver voluntarily moves to another location without the knowledge of her child. The child must search for the parent after their separation, and therefore when children hear the false belief story, negative emotions such as feelings of anxiety or sadness might disrupt their performance. Children between the ages of 3 and 5 had little success on the caregiver measure compared to the unexpected transfer trial. An interesting result was that there was no age-related improvement on this caregiver trial whereas the performance on the object measures increased with age.

Children's recognition of emotions negatively correlated with their performance on the caregiver trial, suggesting that it is the negative emotions causing children to underperform.

Another explanation for this underachievement is that children lack the ability to understand internality. Either internal or external motives can cause a person's movement, but children had special difficulty reasoning about a person's internally-caused movement. They responded well to involuntary movement and object tasks in which the relocation resulted from an external agent. One conclusion offered by Symons et al. (1997) was that the internality in the voluntary movement trial disrupts performance because it is another form of mental state that children have to face in the task. This explanation is more legitimate for older children, in particular 5-year-olds who are in the process of mastering the belief mechanism. They become more sensitive to the situations caused by another set of mental states and hence find the story more confusing and difficult to understand.

Rai and Mitchell (2004) replicated the caregiver measure with a different form of test question which was known to help improve false belief performance in some studies (Siegal & Beattie, 1991; Surian & Leslie, 1999). It however did not strikingly increase 5-year-olds' responses to the person-internal trials. This finding was also supportive of the claim by Symons et al.—false beliefs involving an internal agent decrease 5-year-olds' chances to succeed.

Children's problem with people's voluntary action was demonstrated in another study. Nguyen and Frye (1999) developed a task in which a main character built a mistaken belief about a play partner's intended activity. Performance of 3- and 5-year-olds on the trial was significantly lower than that on the unexpected transfer trial. This is consistent with what the other Western studies (Rai & Mitchell, 2004; Symons et al., 1997) argued with regard to inferior understanding of false beliefs caused by an internal agent.

Naito and Koyama (2006) also compared person and object false belief measures but the sample was drawn from Japan, a non-Western country. The person measure was an unbiased version of the caregiver location story created by Symons et al. (1997). Naito and Koyama changed the caregiver to a neutral person thus removing potential negative feelings caused by the caregiver-child separation. On this revised version of the person-internal measure, Japanese children's performance did not lag behind the unexpected transfer form.

Another cultural study by Ahn and Miller (2009) provided an expanded approach from the study by Naito and Koyama. Ahn and Miller utilized the same formats of false beliefs that Naito and Koyama used, in addition to a self-concept measure to examine qualitative differences in self-conception possibly existing between Asian and Western children. Korean children outperformed the US counterparts on both voluntary and involuntary person trials but the findings failed to replicate what the series of Western studies demonstrated. American children's performance on the person-internal trial did not significantly differ from that on the unexpected transfer trial.

Summing up, the current false belief literature does not provide a consistent picture with regard to children's false beliefs about people. As noted, the literature has produced two different results: better understanding of object measures than person and equal understanding of object and person measures. Regardless of what conclusions can be made from these contradictory findings, the current literature needs to provide further developmental evidence about false beliefs with regard to a person's internality by employing a new person task. In this way, the discrepancy shown in the literature can be examined beyond the existing person paradigms that have at least one limitation.

The limitation of the existing person paradigms concerns the characteristics of the target which do not fully take into account the essence of people or the social world. The voluntary-movement measure captures some of the important features by adding internal characteristics of a person to the measure. The target however is equivalent to what the standard object paradigms have presented. The target of the voluntary-movement measures is a physical location of a person, just as a location of an object is provided by the unexpected transfer scenario.

The New Trait Measure

The present study proposed new person measures to rectify limitations of the previous person false belief methodology. The target of the new measure will be a person's trait, one of the topics common in the social cognition literature (e.g., Barenboim, 1981; Cain, Heyman, & Walker, 1997; Heyman & Dweck, 1998; Liu, Gelman, & Wellman, 2007; Miller & Aloise, 1989; Rholes & Ruble, 1984; Yuill, 1992). The standard object measures present an object that is characterized from its physical information. In contrast, persons' behaviors can be explained with two types of internal processes—immediate mental states or relatively permanent traits. Of these, one equivalent to the knowledge about physical facts is the trait conception. A set of mental states provides a situation-based explanation which depends on the temporal status of the mind that can change at times. A trait-based explanation, on the other hand, concerns a more reliable and predictable interpretation of behavior. Internal characteristics of a person, namely his or her traits, are therefore considered as being analogous to physical characteristics of objects.

Another distinction between beliefs about traits and beliefs about objects concerns the nature of beliefs to be formed in different contexts. The object belief provides the exact answer for a true and a false belief. In contrast, understanding true and false beliefs about people's traits may be less clear and more difficult. A trait is commonly inferred from specific behaviors which are often governed by an external factor (e.g., unexpected circumstances) rather than the trait

itself. There is no absolute criterion that can be directly utilized for reasoning about the truth or falseness. Furthermore, recognizing someone's traits is not a single cognitive process when different factors are involved in the context. It may require a higher level of cognitive ability to integrate information from behavioral and situational factors together.

Due to the differences in the two belief forms just described in the earlier sections, the new trait measures created for this study had two different features compared to the Object transfer form. One difference was that the trait measures have two conditions, the Trait-incongruent condition and the Trait-congruent condition. The Trait-incongruent condition reflects the relative nature of beliefs about the social world by representing two conflicting forms of trait information. Children for example hear a story in which a main character sees a person behave nicely in one scene and another main character sees the person behave badly in another scene.

In contrast to the Trait-incongruent condition, the belief presented in the Trait-congruent condition is more similar to the nature of the belief presented in the Object measure. In the Trait-congruent condition, a person's trait is demonstrated in a more consistent way by adding an explanation to the conflicting sets of behaviors shown in the Trait-incongruent condition. For example, a main character knows very well about a person being nice and sees the person's nice behavior every day. In another scene, the person however cannot act nicely due to the occurrence of an unexpected circumstance. In the last scene, another main character who does not know about the person sees the person's negative behavior.

There were also procedural differences in the Trait and the Object measure. The Object transfer form usually offers one test question directed to the false belief of the protagonist. The Trait measure provides two test questions with regard to either a true or a false belief. The beliefs

asked in the Trait-incongruent condition are the true beliefs as formed given the available evidence. These beliefs however possess a relative nature as well in that the child must realize that two people can have different beliefs about the same target. The test questions asked in the Trait-congruent condition concern either a true or a false belief; the belief of the first main character is true and the belief of the second main character is false.

Furthermore, the Trait measures provided a self question to examine children's own judgment. The self question has not been examined in the unexpected transfer trial even though the self-other distinction of mind understanding has been a central issue in the relevant literature (e.g., Bartsch, 2002; Gopnik & Astington, 1988; Gopnik & Wellman, 1992; Goldman, 1992; Harris, 1992; Lucariello, Donne, Durand, & Yarnell, 2006; Wellman & Gelman, 1992). Inclusion of the self question was to examine children's subjective reasoning processes beyond the story information presented. The two different conditions of person measures were expected to reveal possible differences in self justification.

There were three goals in creating the Trait measure. As just noted, investigating possible variations in children's judgments about different types of beliefs was the first goal. The second goal was to more closely examine beliefs that we experience in the social world. Trait judgment is a subjective process in real life. A person's trait is judged by the way the person's behaviors are evaluated by other people. Therefore what we observe about a person can be different from what other people do and this is the purpose for which the Trait-incongruent condition is created. We however know that someone's behaviors can be often governed by an external factor which sometimes operates opposite to his/her true characteristics. An example of this condition is the Trait-congruent trial.

The third goal was a more general one concerning children's development of trait understanding. The belief forms examined in the Trait measure had resemblance to the specific trait forms measured in the trait literature. Previous work in the trait literature has provided systematic comparisons of children's trait understandings using different types of inference ability. The types were behavior-to-behavior inference, behavior-to-trait inference, and trait-to-behavior inference.

The behavior-to-behavior inference has been utilized mainly for the traditional studies in which children are asked to predict other behaviors from behaviors relevant to traits (e.g., Flavell & Miller, 1998; Miller & Aloise, 1989; Ruble & Dweck, 1995; Yuill, 1992). Research showed that it was only the older group (9- and 10-year-olds) who could make a correct selection of behaviors consistent with traits. The second form of inference ability utilized in studies is trait-to-behavior inferences (predicting specific patterns of behaviors from traits explanation). Literature shows that 4- and 5-year-olds also had difficulty predicting trait-consistent behaviors from traits (e.g., Liu et al., 2007). The last form of inference ability that has been employed in studies is behavior-to-trait inference (labeling traits from trait-relevant behaviors). Heyman and Gelman (1999) and Liu et al. (2007) demonstrated that 4-year-olds can infer traits (nice, mean, and shy) from specific behaviors described.

Among the three types of inferences, the Trait measure created for this study required children to use the behavior-to-trait inference. Because the Trait measures of this study incorporated the experimental procedure utilized in the Object form, it would be interesting to compare children's performance on the new measures with performance on the traditional trait measures.

Mastery of Beliefs

Incorporating these two Trait tasks as well as the unexpected transfer trial, the present study was specifically interested in children's mastery of beliefs. The unexpected content trial was excluded from this study due to the procedural disparity from the unexpected transfer form. All the belief stories presented to children were story book formats.

The comparisons between the Trait and the unexpected transfer measures were expected to provide information with regard to possible variations in belief mastery. For the comparisons of performance on object and Trait trials, two developmental components of beliefs were investigated. The first component concerns age of mastery. This study was interested in examining exactly when children become proficient in the two different types of beliefs and if there are differences in development as hypothesized in the previous section. The literature demonstrated a robust developmental pattern of judgments on object beliefs during the preschool period. Justifications in children older than 5, however, have been studied in less research. Furthermore, there have been no such belief studies to date focusing on preschool children's false beliefs about underlying traits of people. There were also no voluntary movement studies conducted to examine level of performance in children beyond the age of 5. This study provided a within-subject investigation of both the object and the trait performance in children with an age range between 4 and 7. Adding relatively older children such as 6- and 7-year-olds to this study was expected to provide a fuller version of developmental knowledge with regard to both object and person beliefs.

The second important component was criterion for mastery. A justification procedure has not been a common tool to explore development of false beliefs in the literature. Only a handful of object studies have provided a justification procedure after the false belief question (Clements & Perner, 1994; Clements, Rustin, & McCallum, 2000; Parker, MacDonald, & Miller, 2007;

Ruffman, Slade, & Crowe, 2002; Ruffman, Slade, Rowlandson, Rumsey, & Garnham, 2003; Wimmer & Weichbold, 1994). In the person literature, there was one voluntary-movement study in which only Japanese children participated (Naito & Koyama, 2006) and no person study has measured Western children's explanations.

This study employed two explanation systems to examine children's justifications for belief responses: factual information and added information. The factual information category has been commonly observed in the previous studies in which situational and mentalistic justifications are investigated. The situational explanation concerns the search of the protagonist with situational cues presented in the story but it is not directed to the current mental state of the protagonist. A common example of this explanation shown in the unexpected transfer trial would be "because that's where she left it." Mentalistic explanation, in contrast, concerns children's direct mentioning of mental state terms—for example, "because that's where she thinks it is."

Along with the factual information system, a new type of justification, the added information category, was utilized, in particular with regard to the Trait trials. The added information was to investigate whether children could reason about the targeted traits beyond the factual level by using knowledge or reasoning tendencies they previously possessed. In the case of the Trait-incongruent condition, the story itself does not provide sufficient or conclusive information about a person's trait. This might result in children's use of knowledge reflecting their preexisting mindsets.

In summary, this study examined development of different kinds of beliefs (self vs. other belief and true vs. false belief) on the Trait measure in children aged from 4 to 7, in addition to the development of object false belief through judgment and justification procedures. Consistent with the literature, children's understanding of the object false belief was expected to improve

during the preschool years. In contrast, due to the nature of different kinds of beliefs as previously noted, it was expected that there would be some developmental variations in performance on the Trait measure. Further expectations were that children would perform equivalently on true belief and false belief and that self understanding would be lower than other understanding. Types of justifications on the Trait measure across the different age groups were also expected to provide evidence of qualitative change in belief development.

CHAPTER 2 METHOD

Participants

There were nineteen 4-year-olds (mean age: 4 years 5 months, 10 girls and 9 boys), twenty-one 5-year-olds (mean age: 5 years 6 months, 9 girls and 12 boys), twenty-seven 6-year-olds (mean age: 6 years 4 months, 15 girls and 12 boys), and twelve 7-year-olds (mean age: 7 years 2 months, 6 girls and 6 boys) recruited from preschool or elementary-school settings of a small university town in the southeastern area of the United States. The large majority of the sample was White, and three Asian, five Black, eight Hispanic, and four middle-eastern children made up the rest of the sample.

Design

This study was a within-subjects design within which each child heard six different belief scenarios. Two were the object and the other four were the trait scenarios. The trait scenarios contained two conditions, the Trait-congruent and the Trait-incongruent condition. Performance on the object, the Trait-congruent, and the Trait incongruent condition was compared across different age groups to examine the effect of age and type of belief problems.

Materials

All of the scenarios were constructed on the frame of the unexpected transfer form with slight variations. The unexpected transfer form in general presents two main characters in the story in which the status of the target (usually an object) for one of the main characters is changed. The unexpected transfer story is usually provided with a sequence of three important scenes: 1) two characters with the target, 2) one character placing the target at a place, and 3) the other main character relocating the target to another place in the absence of the first character. One of the object trials (one question version) in this study presented the identical sequence

shown in the unexpected transfer form. Children therefore heard a story in a three-page booklet: 1) two characters with an object (e.g., Michael showing a book to Jenny), 2) one character placing the object in one place (e.g., Michael leaving the book by the bench), and 3) the other character relocating the object to another place (e.g., Jenny placing the book by the rock). The test question was directed to the protagonist's belief about the object (where will Michael look for the book?). The other type of object trial (two questions version) had the same sequence as the unexpected transfer form but with the two test questions which were directed to both of main characters presented in the story (e.g., where will Michael look for the book? and where will Jenny look for the book?). The two question-version object trial was to provide a similar kind of testing procedure to the Trait trials which will be specifically explained in the next section.

The Trait trials also based upon the unexpected transfer form differed from the object trial in two aspects. The first aspect concerned differences in targets. The targets of the Trait trials were a person's behaviors utilized to infer a trait of the person. Previous studies investigating children's trait understanding have suggested that young children can understand and predict basic traits such as good, nice, bad, naughty, shy, and selfish (e.g., Bretherton & Beeghly, 1982; Cain et al., 1997; Heyman & Gelman, 1999; Liu et al., 2007). Kind/not kind, nice/mean, good/bad, and clean/messy were selected as initial forms of underlying traits for the stories of this study. Each story represented a set of behaviors that children commonly experience in their everyday life such as sharing crayons with friends, saying hi to people, playing with a dog, and picking up toys. The pilot data conducted to assess the developmental appropriateness of the specific traits selected however indicated that some young children, in particular 4-year-olds, prefer to use superficial terms. They judged the behaviors targeted to clean/messy or kind/not kind with the terms either nice/mean or good/bad. The final forms of the

traits were therefore nice/mean and good/bad. These traits were selected with consideration of developmental patterns across all ages of children, but children's spontaneous answers relevant to the target behaviors were encouraged and recorded during the procedure.

As previously described, the trait behaviors were displayed in two different conditions, the Trait-congruent and the Trait-incongruent conditions. In the Trait-congruent trial, children heard a story with three scenes: 1) A main character sees a behavior of a person that represents the person's trait (e.g., Amy knows Tom well and sees that Tom is sharing crayons with friends everyday), 2) an unexpected situation leading the person to behave in the opposite way (e.g., Tom cannot share crayons due to the class task that he has to finish), and 3) the other main character who does not know about the person sees the behavior opposite to his true characteristics (e.g., Elizabeth sees Tom not sharing crayons).

The target of the Trait-incongruent trial was also a behavior of a person, but the trial varied in the number of scenes presented. There were only two scenes shown to children on the Trait-incongruent trial without the presence of the middle scene of the Trait-congruent condition. Children, for example, heard a scenario with two page illustrations: 1) A main character sees a behavior of a person (e.g., Amy sees Tom sharing crayons with friends) and 2) the other main character sees the opposite behavior of the person (e.g., Elizabeth sees Tom not sharing crayons with friends).

All the stories were presented in a story book form by 8" by 11" inch colored illustrations and the order of the stories was counterbalanced across children. In particular, two sets, each of which consisted of three belief stories, were created. The two sets and three belief trials (object, Trait-congruent, Trait-incongruent) in each set were balanced. Such counterbalancing created 12 possible orders of six belief trials and these orders were randomly assigned to children.

As described in the previous section, two object and four trait stories were created for the two sets of six false belief trials. The main structure of these scenarios was identical across the measures except for slight changes in wording in the object trials and the change of the middle scene in the Trait trials. In addition, the sequence of the two scenes in one of the Trait-incongruent conditions was also reversed in the alternative set to remove a possible order effect resulting from a specific trait presented in a fixed order. The Appendix provides an example of the object and trait scenarios. The condition of each trial within the object and the Trait measure was balanced across children. For example, the book scenario (the one question version of the Object trial) became the two-question version with inclusion of another test question. The sharing crayons scenario became the Trait-incongruent trial with the absence of the middle part and the saying hi scenario became the Trait-congruent trials with the explanation part in the middle of the story.

Procedure

Children were tested individually in a room in their schools by two female research assistants. One of the research assistants managed testing (presenting stories and asking questions) and the other was responsible for recording answers provided by the children. After presenting each story, one of the research assistants asked children two control questions directed to the current reality of the story (e.g., for an object measure, “Where is Jenny’s book now?” and “where did Jenny leave the book?” for a person measure, “what did Elizabeth see Amy do?” and “what did Tom see Amy do?”). If the child failed to respond correctly to either of the reality questions, the critical part of the scenario was reviewed and the question was asked again. If the child failed to answer correctly up to three times the trial was omitted. After the child succeeded on both of the reality questions, the test questions followed. The initial form of test question was open-ended format (e.g., “Where will Michael look for the book?” or “What does Tom think

about Amy?"); if there was no response, the child had a forced-choice follow-up with which he or she could make a choice for the answer (e.g., "Will Michael look for the book by the bench or by the rock?" or "Does Tom think Amy is nice or mean?"). The justification questions followed each test question in order to examine children's explanations for their belief judgments (e.g., "why do you think Michael will look there?" or "Why do you think Tom thinks Amy is nice?").

CHAPTER 3 RESULTS

The central interests of data analyses were in the comparisons among children's performance on different types of belief measures with a developmental emphasis. Repeated measures for dichotomous or ordinal data, in particular generalized estimating equation (GEE) analyses (Liang & Zeger, 1986; Zeger & Liang, 1986) for the variables of age and belief type, were performed throughout the analyses due to two aspects of the data—repeatedly measured false belief trials and a dichotomous or an ordinal value at each level of false belief. The GEE analyses were performed using PROC GENMOD in the SAS package, with binomial distribution, logit link, and an exchangeable correlation structure for the dichotomous data, and with multinomial distribution, cumlogit link, and an independent correlation structure for the ordinal data. The age by type interaction term was also added to each analysis in order to examine the possible interaction between children's age and type of problem.

This study contained two different kinds of analyses. The first one was directed to the accuracy of the belief judgments. Children who provided the correct judgment to the test question(s) on each trial (one test question was given on the one-question Object version and two test questions were given on the other five belief trials) were considered successful on the trial. If they failed any of test question(s), children did not receive any credit. Such scoring was also applied to children's judgments on the self questions. Answers for the self judgments were one of three types (e.g., nice, mean, and both). A positive trait (nice or good) for the Trait-congruent condition and both positive and negative traits for the Trait-incongruent condition were considered as the accurate answers for the self questions.

The second analysis examined children's justifications for their belief judgments. Children's adequate explanations were quantified for statistical analyses. In particular, children

earned 1 point each for each correct judgment and adequate justification for one trial (0: incorrect judgment, 1: correct judgment with inadequate justification, 2: correct judgment with adequate justification).

The style of explanations children used to justify their judgments was further analyzed in the next step. The style was coded into categories of factual and added information. Those in the factual type were further categorized into situational and mentalistic explanations. Situational justifications in particular were for children who answered with circumstantial information (e.g., “because she left it there,” “because he left the legos on the floor”). If children mentioned terms directed to protagonists’ mental states such as think, feel, know, or want (e.g., “because he thinks it is there”), the answers were categorized into the factual explanation category as mentalistic type. In contrast to the justifications relevant to factual information, justifications categorized into the added information category were those using information beyond the story facts presented on the trials. If children’s justifications concerned story outlines presented (e.g., he is good because he picked up the toys) they were categorized into the factual information type. If the justifications were not based on the stories (e.g., he couldn’t pick up the toys because he had a bad day) they were categorized into the added information.

Four raters were involved in coding of children’s justification of beliefs. The initial coding was completed independently by two raters who were blind to the hypotheses of this study and children’s age information. Interrater reliability between the two raters was 93% (110 cases of disagreement over a total of 1603 ratings). Conflicting ratings were further reviewed and resolved by the other two raters who were also blind to children’s age information.

Analysis of Judgment

As previously described, children’s spontaneous responses to test and self questions on the Trait measures were recorded. Aside from the conventional traits (nice, mean, good, bad)

given in the belief questions, children provided various terms directed to the mental states of the main characters described in the stories. Four-year-olds appeared to use terms less relevant for describing the specific behaviors presented (“beautiful,” “happy,” and “gentle”), although they did use the term “messy” which is a specific trait term. Although children older than 4 also mentioned “sad” and “fun” these cases were rare. Older children were more likely to focus on specific trait terms appropriate for characterizing main characters’ behaviors such as “polite,” “clean,” “messy,” “respectable,” “rough,” “rude,” and “responsible.” Children received the forced-choice question to further clarify some of the terms from which positive or negative traits could not be inferred.

On 45 trials out of a total of 474 belief trials, children failed to provide the correct answers to reality questions. Overall younger children made more errors than older children on the Trait trials compared to object trials. In particular, 24 cases were from 4-year-olds (5 on the Object trials, 8 on the Trait-incongruent trials, and 11 on the Trait-congruent trials), 12 were from 5-year-olds (4 on the Object trials, 5 on the Trait-incongruent trials, and 3 on the Trait-congruent trials), and 9 were from 6-year-olds (2 on the Trait-incongruent trials and 7 on the Trait-congruent trials). These missing trials were omitted from data analyses.

A preliminary analysis using the GEE method was performed to examine the effect of gender and task order on children’s overall false belief performance on the three tasks. Result revealed no significant effect in both cases. The gender and task order variables were therefore omitted from further analyses.

Judgment of Other Belief

The first analysis was directed to partial correlations among children’s performance on the belief measures (the Object, the Trait-congruent, and the Trait-incongruent trials) with age controlled. There were significant correlations between the Object and the Trait-congruent (r

(54) = .33, $p = .013$) and between the Trait-congruent and the Trait-incongruent ($r(53) = .29, p = .031$).

The GEE analysis examined possible relations between children’s age and their accuracy of judgments in different types of belief (the Object, the Trait-congruent, and the Trait-incongruent trials). Descriptive information is presented in Table 3-1. There was a significant main effect of age on belief performance, $\chi^2(3) = 15.10, p = .001$. Further comparisons of least squares means showed that 4-year-olds’ performance ($M = .40$) was significantly lower than that of the other age groups ($M_s = .79, .78,$ and $.84$ for 5-, 6-, and 7-year-olds respectively), $\chi^2_s > 16.27, ps < .001$.

Table 3-1. Proportion of correct responses to belief judgments on test questions

	Object	Trait-Congruent	Trait-Incongruent	Total
4-year-olds	30	41	50	40
5-year-olds	76	77	86	79
6-year-olds	83	82	69	78
7-year-olds	87	83	83	84
Total	70	72	72	

Neither the effect of type of trial nor the age by type interaction emerged from the analysis. Such a result suggests that there were no differences in belief understanding across the three types of measures within each age group of children. Further analyses comparing performance on belief trials within each age group supported this finding. Each age group of children showed equivalent performance across the three measures. Analyses of the six trials individually also showed analogous performance within each group. These results suggest that there are no differences between object and trait beliefs and also no differences between true and false beliefs within the Trait measure.

Further analysis was directed to children’s false belief understanding on the Trait-congruent measure. Again, children’s false belief performance on the Trait-congruent measure

provided a similar pattern to that on the Object measure as shown in Table 3-1. Performance of 4-year-olds ($M = .55$) on understanding of other people's false beliefs on the Trait-congruent measure was lower than other age groups ($M_s = .87, .82,$ and $.87$ for 5-, 6-, and 7-year-olds respectively).

Judgment of Self Belief

Children's responses to the self questions indicated that there were a total of 10 cases in which children provided no judgments to both the self question and the forced-choice follow-up. Younger children, in particular 4- and 5-year-olds, in general compared to the older age groups showed such a tendency. Specifically, 2 cases were from 4-year-olds (1 on the Trait-congruent and 1 on the Trait-incongruent), 6 cases were from 5-year-olds (3 on the Trait-congruent and 3 on the Trait-incongruent), 1 case on the Trait-incongruent was from 6-year-olds, and 1 case on the Trait-congruent was from 7-year-olds. These cases were omitted from the analyses performed.

Table 3-2. Proportion of responses to belief judgments on self questions

	Trait-Congruent			Trait-Incongruent		
	Positive	Both	Negative	Positive	Both	Negative
4-year-olds	<i>57</i>	4	38	<i>66</i>	3	31
5-year-olds	<i>42</i>	25	33	<i>56</i>	<i>15</i>	29
6-year-olds	<i>65</i>	24	11	<i>48</i>	29	23
7-year-olds	<i>65</i>	13	22	<i>52</i>	22	26

Note. Proportion of accurate responses is in italics

Table 3-2 presents the proportion of responses to self judgments as a function of age and belief type (the Trait-congruent and the Trait-incongruent). An analysis performed to examine self judgments confirmed the main effect of task, $\chi^2(1) = 21.42, p = .001$, and age, $\chi^2(3) = 13.57, p = .001$. Children were more accurate on the Trait-congruent measure ($M = .57$) than the Trait-incongruent ($M = .18$). Furthermore, the main effect of age emerged. The differences in least

squares means showed that 4- year-olds ($M = .29$) and 5-year-olds ($M = .28$) had less success compared to 6-year-olds ($M = .46$) and 7-year-olds ($M = .43$), $x^2s > 4.31$, $ps < .036$.

Another analysis was performed to examine children's correct self responses accompanied by correct false belief responses on the Trait-congruent task. Findings showed a similar pattern to the proportion of children's judgments on self belief provided in Table 3-2. There was a significant age main effect ($x^2(3) = 16.55$, $p = .001$). Comparing least squares means further revealed that 6- ($M = .59$) and 7-year-olds ($M = .65$) performed better than 4- ($M = .36$) and 5-year-olds ($M = .34$).

Another interesting developmental tendency observed from children's self responses was the age difference in the pattern of judgment. As Table 3-2 indicates, older children were more likely to take into account two perspectives simultaneously compared to the 4-year-olds. They tended to answer "both positive and negative" rather than responding with single perspective (either positive or negative) on the two Trait measures. An analysis was performed to confirm this age-related characteristic. The result showed that there was age related improvement in the use of multiple perspectives, $x^2(3) = 9.08$, $p = .028$. From comparisons of least squares means the percentage to simultaneously use two perspectives for overall self judgments in 4-year-olds (3%) was significantly lower than the other age groups (5-year-olds = 20 %, 6-year-olds = 26%, 7-year-olds = 17%), $x^2s > 4.04$, $ps < .044$.

Analysis of Justification

Justification of Other Belief

For the analysis of justification, the next sections will be devoted to children's explanations for the target's belief first, with explanations for the self judgments to follow. Children provided adequate explanations for 95% of their overall correct belief judgments. Such a high rate reflected the fact that the older age groups succeeded on the trials more often than the

4-year-olds. In particular, 4-year-olds had 9 cases of inadequate explanations (3 on the Object, 2 on the Trait-incongruent, 4 on the Trait-congruent), 5-year-olds had 4 (2 on the Trait-incongruent and 2 on the Trait-congruent), 6-year-olds had 3 (1 on the Object and 2 on the Trait-congruent), and 7-year-olds had 2 (1 on the Trait-incongruent and 1 on the Trait-congruent).

Table 3-3 summarizes the proportion of children’s correct judgments accompanied by adequate justifications as a function of age and belief task. Although the age effect fell short of significance, the tendency to provide adequate explanations appeared to increase with age. Older age groups (5-year-olds: 95%, 6-year-olds: 97%, and 7-year-olds: 97%) in general compared to the 4-year-olds (75%) made fewer errors and a larger proportion of children in these groups relevantly justified their belief judgments.

Table 3-3. Proportion of correct judgments accompanied by adequate explanations

	Object	Trait-Congruent	Trait-Incongruent	Total
4-year-olds	70	63	86	75
5-year-olds	100	93	93	95
6-year-olds	97	94	100	97
7-year-olds	100	95	95	97
Total	96	91	95	

When an analysis was performed to examine children’s judgment-plus-explanation performance with the quantified scores (0: incorrect judgment, 1: correct judgment with inadequate justification, 2: correct judgment with adequate justification), the age effect was clear. The analysis showed an age main effect, $\chi^2(3) = 17.76, p = .002$. Further analyses of this effect revealed that older children ($M_s = .78, .77, \text{ and } .83$ for 5-year-olds, 6-year-olds, and 7-year-olds respectively) outperformed 4-year-olds ($M = .35$), $\chi^2_s > .13.21, p_s < .001$.

As indicated earlier, adequate justifications made for correct judgments to test questions were further coded as factual (situational or mentalistic) and added information. Most of the cases fell into the category of situational explanation, making up 97% of the overall adequate

justifications. Few cases were the mentalistic and the added-information type, but the tendency to use those types still appeared to improve with age. In particular, 4-year-olds made only one added- information explanation on the Trait-incongruent measure. In contrast, 1 case of mentalistic explanation on the Object measure and 4 cases of added-information explanations (2 on the Trait-incongruent measure and 2 on the Trait-congruent measure) were from 5-year-old children. Six-year-olds and 7-year-olds also showed a similar explanation style to the 5-year-olds. Two mentalistic explanations (1 on the Object and 1 on the Trait-congruent measure) and 5 cases of added-information explanations (3 on the Trait-congruent and 2 on the Trait-incongruent) were from 6-year-olds. Finally 7-year-olds made 3 mentalistic explanations (1 on the Object and 2 on the Trait-incongruent) and 2 added-information explanations (1 on the Object and 1 on the Trait-incongruent).

Justification of Self Belief

More variations in explanation style were observed from children's responses to self justifications. Children overall provided added-information explanations for 13% of their self-judgments. The rest fell into the situational type, and no mentalistic explanations were made to explain self judgments. The proportion of different styles utilized in different age groups of children is summarized in Table 3-4. Again, there was age-related increment in use of the added-information style. Three cases (2 on the Trait-congruent measure and 1 on the Trait-incongruent) were from 4-year-olds, 2 cases (on the Trait-incongruent) were from 5-year-olds, 4 cases (2 on the Trait-congruent and 2 on the Trait-incongruent) were from 6-year-olds, and 8 cases (3 on the Trait-congruent and 5 on the Trait-incongruent) were from 7-year-olds.

Table 3-4. Proportion of type of self justifications

	Trait-Congruent			Trait-Incongruent		
	Situational	Mentalistic	Added	Situational	Mentalistic	Added
4-year-olds	98	0	2	96	0	4
5-year-olds	100	0	0	94	0	6
6-year-olds	95	0	5	96	0	4
7-year-olds	86	0	14	79	0	21

An analysis indicated that the age and task effect on style of self justifications fell short of significance, yet there was a trend toward an age main effect (Table 3-4). Differences in percentage across age groups demonstrated that the employment of added information in belief judgment was more usual in older children, markedly 7-year-olds (17%), in general compared to 4-year-olds (6%), 5-year-olds (3%), and 6-year-olds (4 %).

CHAPTER 4 DISCUSSION

This study provides the first clear evidence on how young children understand beliefs about people's traits, one of the beliefs constructed about the social world. The Trait measures utilized in this study had several differences from the previous false belief measures. One difference concerns the nature of the targets presented. In the previous work, the target was a physical location of an object or a person; in this study it was a trait of a person. The Trait measures also differed in that they included a self belief question. In the previous studies, the Object transfer form or the other social false belief measures did not provide a self question but the Trait measure in this study did. Finally in the previous studies the focus was mainly on children's false belief understanding; this study focused initially on a false belief but also extended it to a true and a relative belief. Among 12 questions asked on the Trait measures, one of the two test questions on each of the Trait-congruent trials was directed to false belief understanding. The other questions (one of the two test questions and the self question on each of the Trait measures) concerned true beliefs.

One of the central research questions in previous work on social false belief was whether children understand social beliefs equivalently to object beliefs. Most researchers reported that recognizing social beliefs is more difficult than recognizing object beliefs in Western children (Rai & Mitchell, 2004; Symons et al., 1997). This study did not replicate this outcome. The difference probably results from methodological variations between measures utilized. As described earlier, the characteristics of the targets in the social false belief measures utilized in previous work and the Trait measures utilized in this study differ. Another explanation for the different results is that the social false belief versions utilized in the Symons and Rai and Mitchell studies have some methodological disparity from the standard Object transfer form as

pointed out in the study by Naito and Koyama (2006). Ahn and Miller (2009) demonstrated that the use of the less biased social measure produced an equivalent level of performance in a Western sample.

Whatever the reasons for the underachievement in several Western studies might be, internality does not appear to be the central issue for the lower level of performance. A trait, the target of the Trait measure utilized in this study, has more resemblance to internal characteristics of people, compared to a physical location utilized in previous literature. Examination of the existing trait literature also suggests a similar point. Findings indicated that children's understanding of traits from a given context has a similar progression to understanding of false belief. Children's ability to infer a person's internal characteristics develops around 4 and 5 years of age (e.g., Heyman & Gelman, 1999; Liu et al., 2007), the same period when children start to attribute false beliefs to others.

A further comparison of findings in the trait literature and the current study also raises several interesting issues. The trait literature provides an experimental context in which a single perspective (a perceiver or self) is involved. In contrast, the context presented in the Trait false belief measure requires understanding three different perspectives (two perceivers and self) about a person's trait. In general, children's understanding of traits and their understanding of beliefs about traits appear to emerge in a similar manner. Similarly to Heyman and Gelman (1999) and Liu et al. (2007), this study showed that children's understanding of a belief about a person's trait develops during the preschool years. However, using more than two traits simultaneously appears to be more difficult than recognizing one trait. In this study the correct self response on the Trait-incongruent measure was to mention both positive and negative traits presented in the story. Although there was age-related improvement between 4- and 5-year-olds,

children across all age groups produced relatively lower rates of success compared to the other types of false belief measure.

In fact, self judgments produced overall lower performance compared to other judgments. A general claim in false belief research is that there is no difference in recognizing beliefs of self and other. This study however showed that children were less likely to succeed at understanding beliefs of self than others. This discrepancy appears to stem from a number of new characteristics the Trait measure had as previously described. The self question utilized in the Trait measure concerns a true belief. Furthermore, the procedure provided in the Trait measure was different from that in the Object measure. In the Object content form, the self and other questions have the same right answer. In the Trait measures the self questions require an answer that is never required for the questions about the others. In this way, answering the self questions may require an extra reasoning process. In the Object measure, the only process required is to recognize the two beliefs of the main characters. The Trait measure also requires the same mental process to correctly identify the beliefs of the two perceivers. For self judgments provided after presentation of the other judgments another reasoning process such as remembering and integrating the specific situations provided seems to be necessary.

It is also worth noting that there were some consistent findings with previous work on false belief. One of the consistent findings is mastery of false belief development across the various age groups. The previous work on false belief judgment, especially the Object transfer form, has consistently reported that children's false belief understanding improves between the ages of 4 and 5 (Miller, 2000; Wellman et al., 2001). This study provided the equivalent finding, suggesting that false belief development emerges between the ages of 4 and 5. Such mastery was confirmed from the justifications data. Children older than 4 compared to the 4-year-olds are

more successful at providing an adequate explanation for their correct judgments made on the Object false belief. A similar developmental progression for judgment-plus-justification was also found in previous studies (Clements & Perner, 1994; Clements et al., 2000; Parker et al., 2007; Ruffman et al., 2002; Ruffman et al., 2003; Wimmer & Weichbold, 1994).

A further result from performance on the Object and the Trait measure provides useful information on specific age differences in belief development. The majority of previous studies have provided developmental evidence for false beliefs in 4- and 5-year-olds. This study examined children from the age of 4 to 7. Most children older than 4 years performed well on the Object measure, but the interesting result was from variations in performance on the Trait measures. In the Trait measure, children in general performed well on beliefs of others but not on beliefs of self. The dramatic improvement in recognizing those beliefs occurred during the preschool years, but success on the self judgments remained lower compared to other judgments. Results of adequate justifications accompanied by correct judgments also confirmed such a developmental tendency. Overall the acceleration of belief understanding, whether it is the Object or the Trait measure, or a true or a false belief, occurs between the ages of 4 and 5.

Although developmental changes occur between the ages of 4 and 5, the comparisons of older age groups added to the value of this study. Children's understanding of different beliefs continuously improved with skills for correct judgments and adequate explanations. Around age 7, children seemingly start to think more creatively to explain beliefs they judge. This age difference suggests a possibly new and interesting finding in 7-year-olds. One of the new aspects of this study was to incorporate a new coding system, namely the added information type. This study shows that children's use of added-information explanations may start dramatically improving at age 7. This false belief variation suggests that it is after mastering belief

understanding that children may start actively applying their personal level of knowledge to the questions asked especially when the information provided is not adequate (as is true on the Trait-incongruent trial).

The overarching purpose of this study was to explore variations in children's understanding of beliefs about objects and traits by using a newly created social false belief task, namely the Trait-congruent and the Trait-incongruent measure. Although some require further examination, most findings of this study extend previous demonstrations in belief research. This study confirmed that an important developmental stage for false belief understanding was the preschool years. Specific findings further suggest possible variations with regard to different belief forms, object and trait beliefs, true and false beliefs, and self and other beliefs across different ages.

APPENDIX
BELIEF SCENARIOS

One Question-Version Object Condition

Michael is showing his friend Jenny the new book that he got at the store. They are having so much fun! Then Michael's mom calls him into the house. So Michael puts the book down by the bench and goes into the house. While Michael is inside, Jenny looks at the book, but then she has to go home. As she leaves, she puts the book down by the rock. When Michael is finished talking with his mom he comes back out to look at his book.

1st reality question: Where is the book now?

2nd reality question: Where did Michael last see the book?

Test question: Where will Michael look for the book?

Forced-choice question: Will Michael look by the bench or will he look by the rock?

Justification question: Why will he look there?

Two Question-Version Object Condition

Susie is playing with her doll in her backyard. It's her favorite doll and she is having lots of fun! Susie plays with her doll for a long time. Then she gets up to go to the bathroom. Before she goes inside she leaves her doll in the sandbox. While Susie is inside, her sister Ashley comes outside and sees the doll. She picks it up and plays with it. Then their mother calls Ashley to come in. Ashley sets the doll by the tree.

1st reality question: Where did Ashley leave the doll?

2nd reality question: Where did Susie leave the doll?

1st test question: Where will Susie look for the doll?

Forced-choice question: Will she look in the sandbox or by the tree?

Justification: Why will she look there?

2nd test question: Where will Ashley look for the doll?

Forced-choice question: Will she look in the sandbox or by the tree?

Justification: Why will she look there?

1st Trait-Congruent Condition

This is Tom. Tom and Amy are best friends. Tom always sees Amy sharing her crayons with other friends. Every day Tom sees Amy sharing her crayons. Her friends look happy when Amy shares them. However, one day, Amy cannot share her crayons with her friend because her teacher told her to finish her picture. This is Elizabeth. Elizabeth does not know about Amy because she just started school. While Elizabeth is looking for friends to play with, she sees Amy not sharing crayons with her friend. Her friend looks sad.

1st reality question: What did Elizabeth see Amy do?

2nd reality question: What did Tom see Amy do?

1st test question: What does Tom think about Amy?

Forced-choice question: Does he think Amy is nice or mean?

Justification question: Why does he think that Amy is nice/mean?

2nd test question: What does Elizabeth think about Amy?

Forced-choice question: Does she think Amy is nice or mean?

Justification question: Why does she think that Amy is nice/mean?

Self question: What do you think about Amy?

Forced-choice question: Do you think Amy is nice or mean?

Justification question: Why do you think that Amy is nice/mean?

2nd Trait-Congruent Condition

This is Karen. Karen and Brian are best friends. Karen always sees Brian cleaning up his toys at school. Every day she sees Brian picking up his toys. Their classroom looks clean when Brian

picks them up. However, one day, Brian cannot clean up his toys because his mom comes to pick him up early. Brian has to hurry and cannot clean up his legos. This is Mark. Mark does not know about Brian because he just started school. Mark walks into the classroom to play with the legos. When Mark gets to the classroom, he sees Brian leaving his toys on the floor. The room looks messy.

1st reality question: What did Mark see Brian do?

2nd reality question: What did Karen see Brian do?

1st test question: What does Karen think about Brian?

Forced-choice question: Does she think Brian is good or bad?

Justification: Why does she think that Brian is good/bad?

2nd test question: What does Mark think about Brian?

Forced-choice question: Does he think Brian in good or bad?

Justification: Why does he think that Brian is good/bad?

Self question: What do you think about Brian?

Forced-choice question: Do you think Brian is good or bad?

Justification: Why do you think that Brian is good/bad?

Trait-Incongruent Condition

This is Paul. When Paul is on a walk one day, he sees Sarah saying hi to her friend. Her friend looks happy. This is Jessica. The next day when Jessica is walking down the street, she sees Sarah walking by her friend without saying hi. Her friend looks sad.

1st reality question: What did Jessica see Sarah do?

2nd reality question: What did Paul see Sarah do?

1st test question: What does Paul think about Sarah?

Forced-choice question: Does he think Sarah is nice or mean?

Justification question: Why does he think that Sarah is nice/mean?

2nd test question: What does Jessica think about Sarah?

Forced-choice question: Does she think Sarah is nice or mean?

Justification question: Why does she think that Sarah is nice/mean?

Self question: What do you think about Sarah?

Forced-choice question: Do you think Sarah is nice or mean?

Justification question: Why do you think that Sarah is nice/mean?

Reversed Trait-Incongruent Condition

This is Billy. One day, when Billy is looking for his friend outside, he sees Mr. Miller yelling at his dog on the side of the road. His dog looks sad. This is Rachel. The next day while Rachel is walking to her house, she sees Mr. Miller playing with his dog. His dog looks happy.

1st reality question: What did Rachel see Mr. Miller do?

2nd reality question: What did Billy see Mr. Miller do?

1st test question: What does Billy think about Mr. Miller?

Forced-choice question: Does he think Mr. Miller is good or bad?

Justification question: Why does he think that Mr. Miller is good/bad?

2nd test question: What does Rachel think about Mr. Miller?

Forced-choice question: Does she think Mr. Miller is good or bad?

Justification question: Why does she think that Mr. Miller is good/bad?

Self question: What do you think about Mr. Miller?

Forced-choice question: Do you think Mr. Miller is good or bad?

Justification question: Why do you think that Mr. Miller is good/bad?

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