Perspective-Taking and Theory of Mind
A Relational Frame Account

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Cognitive perspective-taking has attracted considerable attention in the mainstream developmental literature, and is most commonly studied under the rubric of Theory of Mind. The current article reviews the levels of understanding of informational states that are believed to underlie cognitive perspective-taking from this conceptual framework. An alternative approach to perspective-taking from a functional behavioral framework is also presented. The concepts and methodologies behind this approach are driven by a modern behavioral account of human language and cognition known as Relational Frame Theory. As well as providing a brief summary of the core concepts of Relational Frame Theory, the article presents the relational frame account of cognitive perspective-taking. The empirical evidence in support of this view of perspective-taking as well as related research on false belief and deception are reviewed. The overlap between the Theory of Mind and Relational Frame Theory approaches to perspective-taking is discussed.
Key words: Perspective-taking; theory of mind; Relational Frame Theory; false belief; deception.

Relational Frame Theory (RFT) is a modern behavioral and functional account of human language and cognition (Hayes, Barnes-Holmes, & Roche, 2001). The theory draws primarily on the concept of derived multiple stimulus relations and a behavioral process called arbitrarily applicable relational responding as the core features of verbal behavior. Accordingly, RFT argues that this process underlies many, if not all, of the basic phenomena that comprise human language and cognition, including, naming, storytelling, humor, metaphor, perspective-taking, and even spirituality. In the current paper, we are concerned primarily with the RFT account of perspective-taking as an example of a complex human psychological phenomenon that can be accounted for in behavior analytic terms. In the first part of the article we present the basic concepts of RFT. In Part 2 we outline the RFT approach to cognitive perspective-taking, and review the empirical evidence that supports this view, drawing comparisons with the more traditional account of this phenomenon known as Theory of Mind (ToM).

Relational Frame Theory and Derived Relational Responding

According to RFT, relational responding in accordance with arbitrary stimulus relations is not controlled solely by formal stimulus properties, but by contextual cues. For example, if you are instructed that 'A is the same as B, and B is the same as C', then as a verbally sophisticated organism you will readily derive, without additional information, that 'A is the same as C' (although A and C are not physically the same stimulus). In the language of RFT, the derived sameness relation between A and C is controlled by contextual cues, in this case the word "same", the relational functions of which have been established by the verbal community. For RFT, deriving the A-C relation in this case is an example of arbitrarily applicable relational responding because the "sameness" of the relation is arbitrarily applied and can be modified by social whim. For example, I could now tell you that 'A is larger than B and B is larger than C'. In this case, you would derive new relations ('A is larger than C and C smaller than A'), and this relational response provides an example of the relational frame of comparison (rather than sameness).

The literature on RFT has identified a number of patterns or families of arbitrarily applicable relational responding, referred to as relational frames (Hayes, Fox, Gifford, Wilson, Barnes-Holmes, & Healy, 2001). Although these frames are distinctive in various ways, they all have the same three

defining properties: mutual entailment, combinatorial entailment, and transformation of stimulus function. Mutual entailment describes the relations between two stimuli or events. For example, if A in a specific context is related in a particular way to B, then a relation between B and A is also entailed in that context. Mutually entailed relations may or may not be symmetrical. For instance, if A is the same as B, then the derived mutually entailed relation between B and A is also one of sameness (i.e., B=A). However, if A is more than B, then a less than relation is entailed between B and A.

Combinatorially entailed relations pertain among three or more related stimuli. Consider again the comparison example presented previously: 'A is larger than B and B is larger than C'. In this case, a larger than relation is entailed between A and C, but a smaller than relation is entailed between C and A. Combinatorially entailed relations also differ from mutually entailed relations with regard to their specificity. For instance, 'if A is shorter than B and A is shorter than C', then the entailed relations between B and C and between C and B remain unspecified (i.e., B and C might be the same, or one might be shorter than the other).

The transformation of stimulus functions is the behavioral property that provides stimulus relations with psychological content. Consider again the 'A larger than B' example. If in certain contexts A acquires anxiety eliciting functions, then by virtue of the comparative relation, B will acquire reduced anxiety eliciting functions, relative to A. In effect, the different functions possessed by A and B are determined by the nature of the relation that holds between them (Dougher, Hamilton, Fink, & Harrington, 2003).

A number of studies have provided empirical evidence in support of the relational frames identified thus far, including, frames of coordination, comparison, opposition, and deictic frames of perspective-taking (Dymond & Barnes, 1995; McHugh, Barnes-Holmes, & Barnes-Holmes, in press; Roche, Barnes-Holmes, Smeets, Barnes-Holmes, & McGeady, 2000; Steele & Hayes, 1991). According to RFT, these families of relational frames play different roles in different types of verbal or cognitive behavior. For example, the family of deictic frames is believed to underpin cognitive perspective-taking, and in the remaining sections of the article we will address perspective-taking in detail.

Theory of Mind and Perspective-Taking

Cognitive perspective-taking has for many years attracted considerable research attention in the mainstream cognitive developmental literature, and is most commonly referred to under the rubric of ToM (Baron-Cohen, 1995; Baron-Cohen & Hammer 1997; Baron-Cohen, Tager-Flusberg, & Cohen, 2000). One of the primary goals of research in this area has been a pragmatic one, and involves the design of intervention programs that might facilitate the remediation of perspective-taking deficits in populations such as those diagnosed with autism.

Theory of Mind researchers have outlined five levels of understanding of informational states that must be mastered if children are to learn to take the perspective of another (Howlin, Baron-Cohen, & Hadwin, 1999). These levels and the scenarios used to establish the appropriate performances are described below. Level 1 of this model involves simple visual perspective-taking, and concerns the fact that different people can see different things. Attempts to establish this skill from a ToM framework include presenting the following scenario. A two-sided card (e.g., with a house on one side and a dog on the other side) is placed in front of two children. Each child can see only the side of the card directly in front, but not both sides. One of the children may then be asked to describe which image he/she can see and which image can be seen by the other child (i.e., adopting the perspective of the self and another).

Level 2 is referred to as complex visual perspective-taking, and is concerned with the ability to know that people can see the same things differently. In a typical scenario, for example, two children are

seated opposite each other and a one-sided picture (e.g., of a cat) is placed down on a table in front of them. In this arrangement, one of the children will see the cat the right way up, whereas the other child will see the cat upside down. Once again, one child is asked to describe what can be seen by each individual.

At Level 3, visual features are believed to play a less salient role in perspective-taking, and individuals at this level come to understand the principle that 'seeing leads to knowing.' In a typical scenario, a young boy, for example, is presented with an empty box and asked to close his eyes. During this time an unknown item is placed inside the box. The boy is then asked "What is inside the box?" and a correct response involves knowing that he cannot know what was inside because he did not see. The child is thereafter allowed to look inside the box, and is asked "How do you know what is inside the box?" A correct response now involves knowing that he can know what is inside the box because he has seen inside. A similar scenario is then presented in order to determine the child's ability to take the perspective of another (e.g., of a teddy bear), and the same questions are asked with regard to this alternative perspective.

The fourth level of understanding informational states involves true beliefs and predicting actions on the basis of a person's knowledge. Imagine the following true belief scenario. Two play scenes are presented to a young boy. In one of the play scenes, that is described as occurring in the morning, an action figure is placed beside a toy boat, whereas in the other scene, that is described as occurring later, an identical action figure is placed beside a toy airplane. The child is then instructed as follows: "This morning, you saw the action figure near the boat but you did not see the action figure near the airplane". The child is then asked: "Where do you think the action figure is?" A correct response should indicate that the action figure is near the boat. If the child is then asked "Why do you think the action figure is near the boat?" a correct response will indicate that this is where the action figure had been seen previously. If the boy is then asked: "Where would you go to find the action figure?" a correct response would involve looking near the boat. If the child is finally asked "Why will you go to the boat?" a correct response will involve indicating that this is where the action figure had been seen previously. From a ToM perspective, responding correctly to these questions indicates knowing that a person will only know what has been seen, and will act on this basis (i.e., true belief).

The fifth and most complex level of knowledge of informational states from a ToM perspective involves the understanding of false belief and predicting actions on the basis of beliefs that are false rather than true. Consider a typical training scenario as follows: A young girl is presented with a jewelry box and asked, "What do you think is inside the jewelry box?" Having not seen inside the box, the child is likely to suggest that there is jewelry inside. However, unbeknownst to the child, the box contains candy instead of jewelry. When the box is then opened and the child sees the candy, she is then asked, "Before we opened the jewelry box, what did you think was inside?" A correct response involves the child stating that previously she thought there was jewelry inside. If then asked "What was really inside?" a correct response now involves stating that there is candy inside the box. Similar to Level 4 of this model, responding correctly to the questions contained within this scenario indicates knowing that a person can act on the basis of previous beliefs that are false, as well as current beliefs that are true. A similar scenario is then presented from the perspective of another (e.g., a doll), and the same questions are posed in order to determine the child's ability to respond in accordance with an alternative perspective. In summary, therefore, a ToM approach to the development or establishment of perspective-taking involves increasing levels of complexity in understanding informational states from simple visual perspective-taking to acting on the basis of false belief. In subsequent sections of the current article we will present the RFT approach to these phenomena and consider possible areas of overlap between the two accounts.

Relational Frame Theory and Perspective-Taking

In its approach to cognitive perspective-taking, RFT attempts to specify the relational repertoires that are necessary for competent perspective-taking performances. According to RFT, the development of perspective-taking is underpinned by increasing complexity in abilities to respond in accordance with a family of deictic frames that specify a stimulus relation in terms of the perspective of the speaker. The three relational frames that appear to be fundamental to the development of perspective-taking skills are the frames of I and YOU, HERE and THERE, and NOW and THEN (Barnes-Holmes, Barnes-Holmes, & Cullinan, 2001). Deictic relations are believed to emerge in part through a history of responding to questions such as " What were you doing there?" or "What am I doing now?" Although the form of these questions is often identical across contexts, the physical environment is different. What remains constant across these events are the relational properties of I versus YOU, HERE versus THERE, and NOW versus THEN. In the course of language and cognitive development, these relational properties are said to be abstracted through learning to talk about one's perspective in relation to the perspective of others (Hayes, 1984). For example, I is always from this perspective here, but not from the perspective of another person there. Consider again the scenario from ToM Level 2 in which two children are sitting opposite one another and observing a picture of a cat placed on the table in front of them. In this arrangement, the child on the left will see the cat the right way up, while the child on the right will see the cat upside down. Although both children in this example are observing the same picture, the perspective of the child on the left is different from the perspective of the child on the right. In other words, when the child on the left speaks of seeing the cat from "here", it is not the same place as when the child on the right speaks of seeing from "here".

Many commonly used phrases provide exemplars of the relevant relational properties of I-YOU, HERE-THERE, and NOW-THEN (e.g., "*I* am *here now*, but *you* were *here then*"). It should also be emphasized that these perspective-taking properties may be present even when the actual words "I", "you", "here", "there", "now", and "then" are absent. That is, relevant phrases often include or substitute words coordinated with particular individuals, places, and times (e.g., "It is two o' clock and I am at home [HERE and NOW], but Erica [YOU] is still in the restaurant" [THERE and NOW]). These alternative or substituted words serve the same contextual functions that would otherwise be provided by the actual words themselves. For example, "Erica" or "her" may be functionally equivalent to "YOU", and "the restaurant" may be functionally equivalent to "there". What is important, from an RFT point of view, is the generalized relational activity and not the actual words themselves (as is the case for all relational framing).

There is currently a growing body of evidence in support of the RFT view of perspective-taking as relational responding. In one of the earliest studies the current authors conducted in this area (McHugh, Barnes-Holmes, O'Hora, & Barnes-Holmes, in press) we developed a protocol that targeted the three perspective-taking frames of I-YOU, HERE-THERE, and NOW-THEN, in conjunction with three types, or levels of relational complexity, referred to as: *simple* relational responses; *reversed* relational responses; and *double reversed* relational responses. An example of one task from each frame combined with each level of complexity, and an RFT interpretation of the processes involved in responding to these tasks, is presented below.

Consider a simple I-YOU perspective-taking task in which subjects were presented with the following question: "If I (Experimenter) have a yellow brick and YOU (subject) have a blue brick: which brick do I have? Which brick do YOU have?" (No experimental stimuli were present during the trial). In technical terms, a correct response on this trial (i.e., "You/Experimenter have a yellow brick and I/subject have a blue brick") requires that the subject respond in accordance with the "I-YOU" deictic relational frame, under the contextual control of the if-then relational frame. In effect, the if-then frame

determines the functions (i.e., the yellow and blue bricks) that become attached to the I and YOU related events in the deictic frame.

The protocol designed for this study also included simple HERE-THERE perspective-taking trials. In a simple HERE-THERE trial the subject may have been instructed as follows: "I am sitting here on the blue chair, and you are sitting there on the black chair. Where are you sitting? Where am I sitting?" A correct response on this trial requires that the subject respond in accordance with the I-YOU and HERE-THERE frames, under the contextual control of if-then.

The third simple relational task we investigated involved simple NOW-THEN relations. These trial-types differed from the other simple relations in that they did not involve responding to I and YOU *simultaneously*. Consider the following example: "Yesterday I was watching television, today I am reading. What was I doing then? What am I doing now?" In this case, only the perspective of I (the Experimenter) is targeted (the YOU perspective was targeted on alternate trials). Once again, a correct response requires that the subject respond in accordance with the I-YOU and NOW-THEN frames, under the contextual control of if-then.

Simple perspective-taking responses can be made more complex by explicitly reversing the deictic relations involved. The protocol we devised incorporated reversed I-YOU, reversed HERE-THERE, and reversed NOW-THEN trials. Consider the following example of a reversed I-YOU trial: "If I have a yellow brick and you have a blue brick, and if I was you and you were me: which brick would I have? Which brick would you have?" Responding correctly to this trial involves a transformation of functions in accordance with a deictic relation between I and YOU. That is, the mutually entailed relation between I and YOU transfers yellow brick from I to YOU and blue brick from YOU to I. Reversed HERE-THERE and NOW-THEN relations followed the same format in which transformations of functions occurred via mutually entailed relations.

The third and most difficult level of relational complexity we investigated was referred to as a double reversed relation, in which two relations were reversed simultaneously. Consider the following double reversal trial referred to as an I-YOU/HERE-THERE double reversal: "I am sitting here on the blue chair and you are sitting there on the black chair. If I was you and you were me, and if here was there and there was here: where would you be sitting? Where would I be sitting?" In this trial, the I-YOU reversal followed by the HERE-THERE reversal involves two mutually entailed relations between I and YOU and HERE and THERE, thus reversing the initially reversed relation. In simple terms, the subject deriving these relations ends up in the chair in which they started.

Double reversals based on HERE-THERE and NOW-THEN followed the same format (except that I and YOU were presented separately). Subjects, for example, were instructed as follows: "Yesterday I was sitting there on the blue chair, today I am sitting here on the black chair. If here was there and there was here, and if now was then and then was now: where would you be sitting now? Where would I be sitting then?" Once again, in simple terms, the subject deriving these relations ends up in the chair in which they started.

The findings from this study revealed differences between subjects' responses on the various frames, and on the three levels of relational complexity.   Specifically, the results for relation type revealed that subjects emitted more errors on the HERE-THERE and NOW-THEN relations when each was compared with the I-YOU relations. The results for relational complexity revealed that subjects made significantly more errors on reversed and double reversed relations than on simple relations. Overall, these findings indicated that, even in adults, perspective-taking appears to consist of functionally distinct relational components.

In a subsequent study (McHugh, Barnes-Holmes, & Barnes-Holmes, in press) we employed the same relational protocol in an attempt to conduct a developmental profile of these perspective-taking skills with individuals of different age groups. The mean percentage of errors of subjects in each of the five age groups on the three levels of relational complexity is presented in Figure 1. As is evident from the figure, the findings from this study indicated a clear developmental trend in the ability to perform the relational perspective-taking tasks from early childhood to adulthood. Specifically, children (aged 3-5 years) produced more errors than all of the older age groups (ranging from 6-30 years).   Furthermore, these differences are broadly consistent with the mainstream cognitive literature, which has reported that performances on simple ToM tasks generally develop across the ages of four and five years old, and are usually well established by age six (Taylor, 1988).
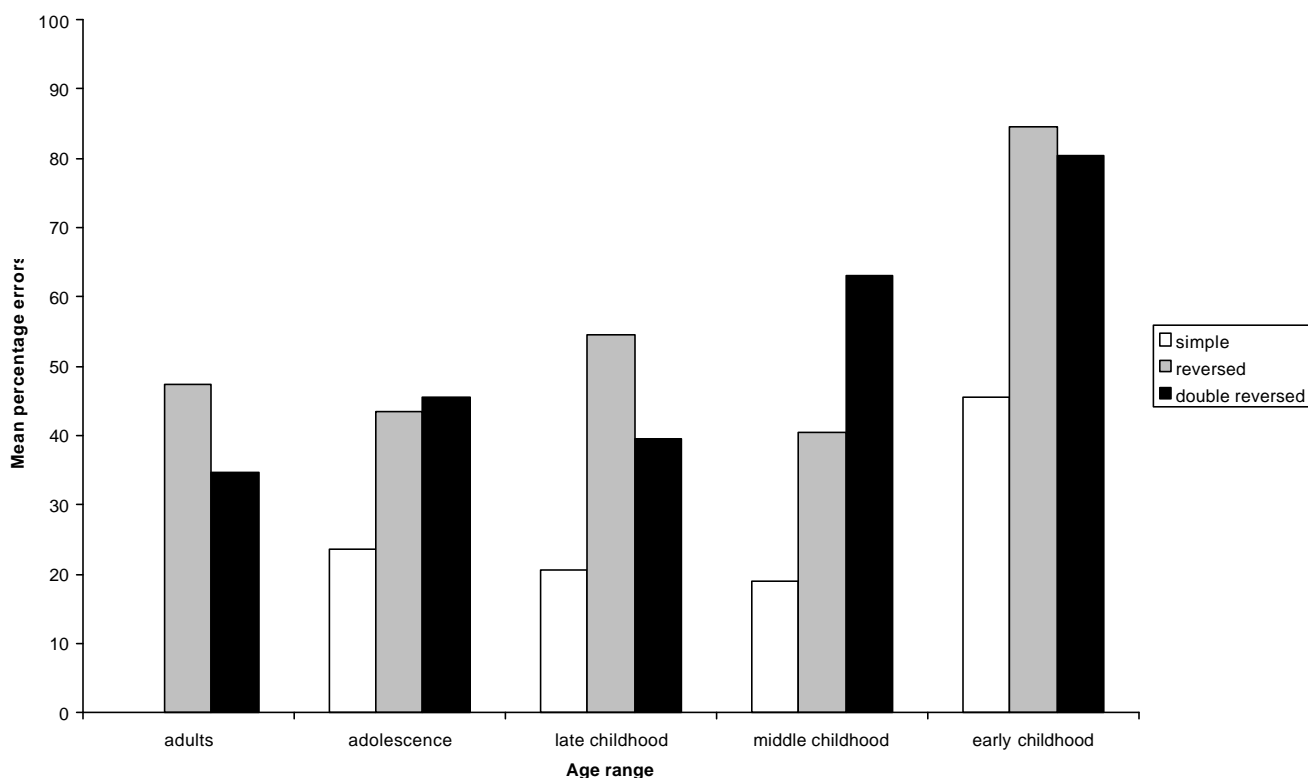

Figure 1
Mean percentage of errors recorded for the five age groups of subjects in the perspective-taking protocol employed by McHugh, Barnes-Holmes, & Barnes-Holmes, (in press).

In summary, therefore, the findings from this study indicated that the relational repertoires required for perspective-taking appear to follow a distinct developmental trend, and may be comprised of functional relational units of analysis. This latter point has important implications for the design of programs of remediation with populations that often display perspective-taking deficits (e.g., autistic children).

Two preliminary RFT studies we have conducted are relevant in this regard (Barnes-Holmes, 2001; McHugh, Barnes-Holmes, & Barnes-Holmes, 2003). In these studies we attempted to remediate deficits in relational perspective-taking in a number of normally developing young children. In the first study, two children were exposed to the perspective-taking protocol with corrective feedback presented after each trial. One seven-year-old female required training on the reversed and double reversed relations in order to complete the entire protocol. A three-and-a-half year old male was exposed only to I-YOU and HERE-THERE trials, and required extensive training across exemplars, also on the reversed and double reversed relations. In the second study, we found that extensive and systematic exemplar training was necessary to establish even simple NOW-THEN relations in another four-year old child. Although, this work on training perspective-taking remains preliminary, these interventions lend further support to the RFT conceptualization of perspective-taking, and suggest the possible utility of RFT methodologies in remediating perspective-taking deficits.

The findings from the studies available to date, particularly the results obtained from the training studies, have indicated significant overlap between ToM and a relational frame approach to cognitive perspective-taking. According to RFT, ToM tasks provide incidental training in contextual control of the three perspective-taking frames, and add relational flexibility by requiring control by the relational frame of *logical not* in order to establish competent perspective-taking performances. In the language of RFT, tasks from ToM Levels 1 and 2 (simple and complex visual perspective-taking, respectively) inadvertently establish contextual control of the relational frame of I-YOU. That is, responding correctly to questions such as "What can I see/What can you see?" is determined by the cues "I" and "you," which are contained in the tasks. According to RFT, training tasks in ToM Level 3 (seeing leads to knowing) increases the contextual control of I-YOU, and indirectly establishes control by the frame of NOW-THEN. Consider the correct responses to the scenarios that focus on the self and other: "I did not see THEN so I do not know NOW" and "YOU saw THEN so YOU know NOW". Level 4 ToM training tasks (understanding and predicting actions on the basis of true belief) appear to involve indirect training in contextual control of all three perspective-taking relational frames. Consider the frames involved in responding correctly as follows: "I saw the action figure near the boat (THERE) this morning (THEN), and so I think the action figure is THERE NOW." According to RFT, ToM training at Level 5 also incorporates incidental training in contextual control of the perspective-taking frames, and adds relational flexibility by requiring control by the relational frame of logical not. Consider the role of the perspective-taking frames in the correct answer: "I did NOT see inside THERE and THEN, but I do see inside HERE and NOW."

In interpreting the ToM approach to perspective-taking, we would argue that the tasks commonly used to establish a ToM repertoire, with regard to understanding informational states, indirectly involve training in relational perspective-taking (i.e., I-YOU, HERE-THERE, and NOW-THEN). In light of the foregoing research, and more recent unpublished evidence, we have come to believe that the relational skills required to complete the perspective-taking tasks in the RFT protocols may be heavily involved specifically in Levels 1-3 of the traditional ToM tasks. In order to investigate higher levels of perspective-taking, and the role of the perspective-taking frames in responding to true and false belief (Levels 4 and 5 of the ToM model), we have designed a similar protocol for testing true and false belief as relational responding.

In this study (McHugh, Barnes-Holmes, & Barnes-Holmes, under submission) we developed a true and false belief protocol that consisted of six trial-types that differed from each other in terms of the relational frame or frames being targeted. This protocol was modeled on the ToM methodology most commonly used to investigate this phenomenon known as the 'deceptive container task.' For ease of communication, the trial-types contained within the RFT true and false belief protocol are referred to as: HERE trials, THERE trials, NOT HERE trials, NOT THERE trials, BEFORE NOW trials, and AFTER

NOW trials.

The HERE and THERE trials were employed to assess responding to true belief (ToM Level 4). Consider a HERE trial-type: "If you put the doll in the cookie jar and I am here: what would I think is in the cookie jar? What would you think is in the cookie jar?" This trial-type emphasizes the HERE aspect of responding on the basis of the HERE-THERE frame. The protocol also contained THERE trials that were identical to the HERE trials, except that the perspective of THERE was emphasized (e.g., If you put the doll in the cookie jar and I was there what would I think is in the cookie jar? What would you think is in the cookie jar?").

From an RFT perspective, responding in accordance with logical not may be important in understanding false belief. The protocol, therefore, incorporated a combination of HERE-THERE and logical-not trials, referred to as NOT HERE and NOT THERE trial-types, in order to assess the subjects' ability to understand false belief. These trials were almost identical to the HERE and THERE trials, respectively, except that they involved the addition of logical not. Consider a NOT THERE trial as follows: "If I put the doll in the cookie jar and you were *not there*: what would I think is in the cookie jar? What would you think is in the cookie jar?" The correct response in this case involves indicating that I (Experimenter) will know what is inside, but you (subject) will not know, because you were not located *there*. The NOT HERE trials were almost identical to the HERE trials, except that logical not was included.

The two remaining trial-types contained within the protocol directly targeted the third perspective-taking frame of NOW-THEN. Once again, some of these trial-types assessed true belief, referred to as AFTER NOW trials, while others assessed false belief, referred to as BEFORE NOW trials. Consider the AFTER NOW trial "You open the cookie jar and there is a doll inside now. Now, what do you think is in the cookie jar? After now, what would you think is in the cookie jar?" This task assessed true belief because the correct response requires subjects to indicate that they can act on the basis of what they have seen as true. The BEFORE NOW trial-types were similar in format but assessed false belief. Unlike the other false belief trials, BEFORE NOW trials did not assess false belief by emphasizing logical not. Instead, false belief was implied in the temporal order of the events stated in the trial. Consider the following example: "You open the cookie jar and there is a doll inside now. Now, what do you think is in the cookie jar? Before now, what did you think was in the cookie jar?" This task assessed false belief because the correct answer required subjects to determine that before now they could only act on the basis of a false belief (i.e., that there were cookies in the cookie jar).

The results of this study add to our earlier work on the developmental profile of relational perspective-taking (ToM Levels 1-3). On the protocol containing both true and false belief tasks, we also found a clear developmental trend in the performances of subjects aged from early childhood to adulthood. These results are presented in Figure 2. This developmental trend was supported by significant differences in the number of errors between most of the age groups, and the fact that error rates appeared to decrease as a function of age.
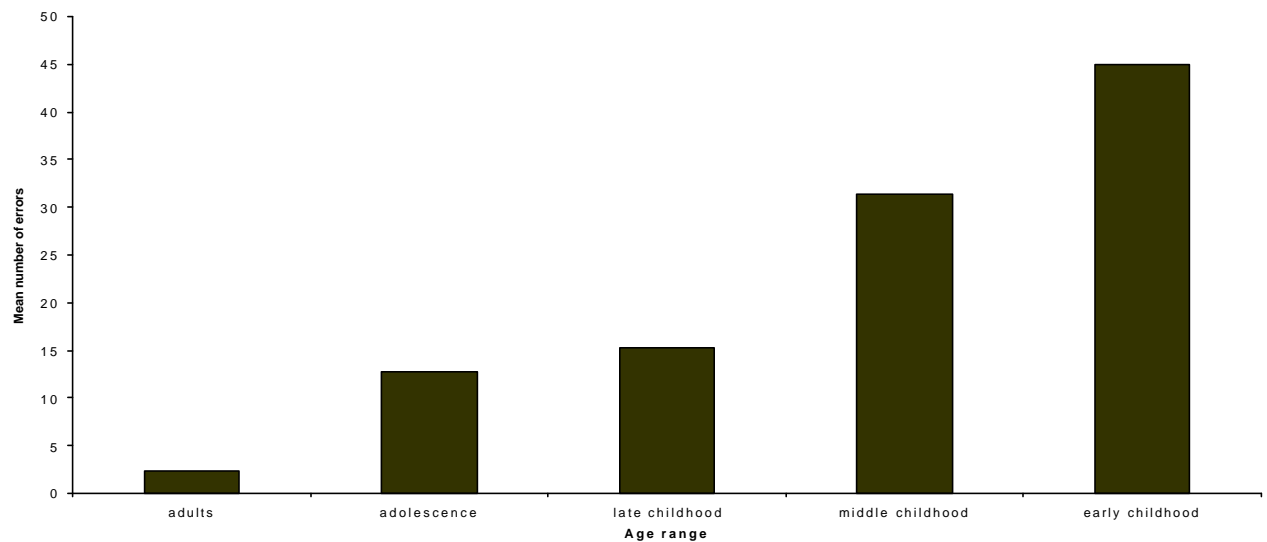
Figure 2
Mean number of errors recorded for the five age groups of subjects in the true and false belief protocol employed by McHugh, Barnes-Holmes, & Barnes-Holmes, (under submission).

In our most recent work in this area, we have turned our attention to what is considered to be the most advanced level of ToM. Specifically, we are developing a relational frame analysis of deception (McHugh, Barnes-Holmes, & Barnes-Holmes, in preparation). In this research we have employed a protocol similar to that designed to examine false belief. In the current protocol, however, the three perspective-taking frames are manipulated in conjunction with a frame of distinction, and logical not.   For illustrative purposes, consider the following task, in which a subject is instructed as follows: "If I have a teddy bear and I do not want you to find it, where should I hide the teddy bear?" In this trial, the scenario depicted involves I (the Experimenter) aiming to deceive you (the subject). In a similar trial, the subject may then be instructed: "If you have a teddy bear and you do not want me to find it, where should you hide the teddy bear?" Although the correct responses to the trials are the same, they each require the subject to adopt a different perspective. Our preliminary findings are broadly consistent with the developmental profiles obtained from our relational perspective-taking and true and false belief protocols. That is, the deception protocol appears to generate yet another clear developmental profile from early childhood to adulthood. However, the deception protocol, as would be predicted given its greater relational complexity, has produced many more errors than the previous two protocols, and larger age differences particularly among the younger groups.

Summary and Conclusions

The ability to take the perspective of another individual is considered by most mainstream cognitive and developmental psychologists to be a complex and critical set of cognitive abilities. Interestingly, some cognitive researchers have criticized ToM for its lack of precision in defining the specific cognitive skills involved. At worst, ToM has been characterized as a description rather than an

explanation of the psychological processes involved in perspective-taking. At the same time, behavioral psychology has had very little to say about perspective-taking, and has played virtually no role in the ToM research program and the debate surrounding it. The development of an RFT account and research program on perspective-taking may well change this state of affairs and allow the behavioral tradition to play a possibly important role in the study of this most important human psychological ability.

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