


## EMPIRICAL ARTICLE

# Could, would, should: Theory of mind and deontic reasoning in Tongan children

Mele Taumoepeau<sup>1</sup>  | ‘Ungatea Fonua Kata<sup>2</sup> | ‘Ana Heti Veikune<sup>3</sup> | Susana Lotulelei<sup>2</sup> | Peseti Tupou’ila Vea<sup>3</sup> | ‘Ilaisaane Fonua<sup>2</sup>

<sup>1</sup>Department of Psychology, University of Otago, Dunedin, New Zealand

<sup>2</sup>School of Teaching Studies, Tupou Tertiary Institute, Nuku'alofa, Tonga

<sup>3</sup>School of Language, Arts and Media, University of the South Pacific, Tonga Campus, Tonga

#### Correspondence

Mele Taumoepeau, Department of Psychology, University of Otago, P.O. Box 56, Dunedin, New Zealand.  
Email: [mele.taumoepeau@otago.ac.nz](mailto:mele.taumoepeau@otago.ac.nz)

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#### Abstract

This study examined the developmental profiles of children's social reasoning about individual agentive and deontic concerns. Tongan children ( $N = 140$ , 47.9% male), aged 4–8 years, were given a set of mentalistic (standard theory-of-mind) and deontic reasoning tasks. On average, children found diverse desires, knowledge access, hidden emotion, and belief emotion easier than the false-belief and diverse belief tasks. Tongan children were sensitive to social norms governing behavior, and this information was recruited for predicting behavior in a false-belief task when embedded in a socially normative context. We discuss the potential for cultural mandates to shape children's social understanding and the impact of culture on our theoretical framing of children's development.

Children's ability to contemplate mental life is considered one of the most important aspects of early social understanding (Brownell et al., 2006; Caputi et al., 2012; Carpendale & Lewis, 2004; Denham et al., 2003; Dunn & Cutting, 1999; Lewis & Mitchell, 1994; Olson et al., 1988; Perner, 1991). As data accumulate, however, across a range of social groups and cultural contexts, it is becoming clear that the developmental path and timing of mental state understanding varies widely in both the ages and ordering of theory-of-mind (ToM) acquisition. Our interest is in understanding how variation in developmental profiles might be explained by the interplay between reasoning about behavior from an individual mentalistic perspective, and using deontic knowledge—what a person must or must not do—to predict how others might behave. We test this idea by examining the developmental sequence of both mentalistic and deontic reasoning task performance, in Tongan children growing up in a Tongan context.

Current theories of social understanding favor the *intentional stance* (Dennett, 1978), which posits that for children to understand social behavior they must learn about others' minds or mental states, and to view behavior as intentional, shaped by their knowledge, beliefs, and desires. This account emphasizes an individual orientation toward the mind and psychological explanations for behavior. Social procedures have evolved to reinforce this cultural mandate of independence (Kitayama et al., 2009), and are reflected in parental socialization goals (Keller, 2018) as well as in child socialization activities. There is evidence about the types of parent–child conversations that reflect the cultural mandate of independence, and which are consistent with the intentional stance. For instance, parental conversations about mental states play an important role in drawing attention to the unseen contents of mind, which help children reflect and internalize different perspectives on the same event (Devine & Hughes, 2018;

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**Abbreviations:** BE, belief-emotion; CFB, contents false-belief; DB, diverse beliefs; DD, diverse desires; DR, desires rules; ERFB, explicit rule false-belief; HE, hidden emotion; IRFB, implicit rule false-belief; KA, knowledge access; LFB, location false-belief; RKI, rule knowledge-ignorance; ToM, theory-of-mind; TTI, Tupou Tertiary Institute; USP, University of the South Pacific.

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Ruffman et al., 2018; Taumoepeau & Ruffman, 2006, 2008). Caregivers also vary in the extent to which they use a mind-minded style of talk—a propensity to treat children as agents with minds, which is linked to ToM task performance (de Rosnay et al., 2004; Lundy, 2013; Meins, 1998).

The dominance of the intentional stance, however, and consequent focus on particular tasks, especially the false belief task, have led to a narrow view of sociocognitive development (Wellman & Miller, 2008). Attributing a person's actions to a false-belief (a belief that is different from reality) involves the ability to differentiate one's cognitive perspective from a third-person perspective. There is ongoing debate concerning the ontogeny of the capacity to mentalize. Studies of infant performance on false-belief tasks that use spontaneous response measures, such as anticipatory looking paradigms, suggest that the capacity to mentalize about the actions of others is present from infancy, and at similar rates across a range of large- and small-scale societies (e.g., Barrett et al., 2013). There is considerable debate, however concerning the interpretation of spontaneous response analogues of false-belief tasks, with some scholars favoring leaner interpretations of infant success, such as the capacity to observe patterns in behavior (Ruffman & Perner, 2005) or to track an agent's registration of objects at locations as belief-like states using a minimal model of mind reading (Apperly & Butterfill, 2009; Low et al., 2016).

Of interest in the present study is the explicit capacity of children evidenced through elicited-response tasks, to ascribe mental states to the actions of others. Data from cultures beyond Western, Educated, Industrialized, Rich, Democratic (WEIRD), groups suggest that the developmental path and timing of mental state understanding, and especially false-belief understanding varies widely in two specific ways (De Gracia et al., 2016; Dixon et al., 2018; Hughes et al., 2014; Liu et al., 2008; Mayer & Träuble, 2013; Naito & Koyama, 2006; Nawaz et al., 2015; Vinden, 1996). First, there are now well-documented discrepancies across a variety of nation and cultural groups in the ages at which children reliably pass different social cognition tasks (Lecce & Hughes, 2010; Liu et al., 2008; Mayer & Träuble, 2013; Shahaeian et al., 2011; Wellman et al., 2001), and second that universal developmental sequences now appear to be more culture specific (Liu et al., 2008; Shahaeian et al., 2011; Wellman & Liu, 2004). Of note, are consistent differences in the ordering of children's understanding of knowledge access (KA, seeing leads to knowledge and not seeing leads to ignorance) versus diverse beliefs (DB, persons may hold differing beliefs). Children from more collectivistic cultures appear to more easily pass knowledge-access tasks, which may reflect enculturation practices that emphasize the value of knowledge (Dixon et al., 2018; Liu et al., 2008; Shahaeian et al., 2011; Shahaeian et al., 2014). Children from individualistic cultures on average tend to pass diverse-belief tasks earlier,

which may reflect socialization processes that encourage asserting one's autonomy, point of view, and differing beliefs.

In the face of such diversity, the question remains as to the adequacy of the current framework of universal development in social cognition (Dack & Astington, 2011; Lillard, 1998, 1999; Miller, 2002). In keeping with past proposals (Wellman & Miller, 2008), we suggest that a broader view should include tasks that reflect the *normative stance*—consideration of children's deontic knowledge—what you may, must, or must not do in certain situations—which appeals to norms, obligations or permissions when explaining behavior (Clement et al., 2011; Kalish & Cornelius, 2007; Rakoczy & Schmidt, 2013; Wellman & Brandone, 2009; Wellman & Miller, 2008). In this account, the emphasis is not just on autonomous internal states of the individual, but rather on collective, normative explanations (Ames et al., 2001). For instance, in interpreting why a person is happy to keep a sick relative company for several hours, a child might reason that the person is *obliged* to, rather than the person especially *wanting* to. Thus, as Wellman and Miller (2008) articulate, the “force” to engage in the action reflects a normative response rather than an individualized internal state. A particular socialization focus on norms and obligations is in line with an interdependent cultural mandate which emphasizes group harmony and relational self-concept. There is also evidence that groups that value interdependent self-construals privilege more talk about norms and rules (Taumoepeau et al., 2019) and focus less on talk about internal state attributes (Lillard, 1998; Ochs, 1982; Ochs & Schieffelin, 1984; Taumoepeau, 2015; Wang, 2001).

Wellman and Miller's (2008) theoretical position purports that deontic reasoning and mental state reasoning are strongly entwined, with theory of mind underpinning deontic knowledge. On this account, although permissions, obligations, and social rules govern a range of behavior, the underlying interpretation of that behavior is inherently mentalistic (Kalish, 2006). For instance, in performing permissions and obligations, underlying these deontic concerns are mentalistic concerns such as desires. Thus, your obligation to look after your sick relative requires you to do this action regardless of your desire, and if you seek permission to leave the hospital early, this reflects your desire to leave. In other words, a theory of mind is elaborated to encompass obligations and permissions.

Others have critiqued this theory by suggesting that deontic reasoning in itself might trigger inferences regarding others' or third-person interpretations of behavior, without recourse to more fundamental mentalistic explanations (Clement et al., 2011). Clement et al. (2011) offer this theory as an alternative, more parsimonious route through which younger children may be able to participate in social worlds. Appealing to a rule that might oblige a person to behave in a certain way removes

the burden of representing the individual perspective of the “other” when attempting to explain their behavior. Clement et al. (2011) argue that the overlap between mentalistic interpretations and deontic reasoning is not a “cognitive necessity,” and evidence from their studies with 3-year-olds, who are unlikely to pass the false-belief task shows just that—that in conditions where children are informed that an object *must* always be placed in a certain location, they are more likely to choose that location than the location where the object really is.

## Mind understanding in the Pacific

Recent work in the Pacific—a region comprising many small-scale societies that endorse strongly interdependent cultural mandates—may shed light on the interplay between mentalistic and deontic knowledge in early development. From a social cognition perspective, interest in the Pacific has been fueled by ethnographic evidence of the opacity of minds doctrine—the idea that it is impossible to know the mind of another. Such a position appears to be endorsed by several small-scale societies and presents a model of the mind that discourages mental state inferencing (Robbins & Rumsey, 2008). Empirical evidence, however is equivocal as to the developmental profiles of mentalizing in young children from Pacific contexts.

On the one hand, studies that have focused on cross-cultural synchrony in the onset of false-belief understanding suggest some consistency in development across cultural settings. In a cross-cultural study that included an assessment of fifteen 3- to 5-year-old Fijian children's false-belief performance, the 3-year-olds were consistently failing compared to the 5-year-olds (Rochat et al., 2009). In another study involving 59 Samoan children, a similar pattern was found, although it is worth noting that when compared to the other cultural groups, the Samoan 4-year-olds were significantly failing the false-belief task, and the 5-year-olds were not passing at comparable rates (Callaghan et al., 2005). Moreover, in a replication of that same study with more than 300 Samoan children, across a wider age range, only 8-year-old children were beginning to pass this task, with pass rates ranging modestly from 53% to 68% in the 8–14 year age bracket (Mayer & Träuble, 2013).

Further questions regarding the privileged position of belief attribution are raised in the light of a recent comprehensive analysis of 449 ni-Vanuatu rural and urban children's elicited responses to a battery of ToM tasks, where up to 38% of 12- to 14-year old children from Nguna island, found certain false-belief tasks difficult (Dixson et al., 2018). Yet, the same children demonstrated relative skill in tasks that required emotional understanding. For instance, compared to Western children's ToM profiles, belief emotion was relatively easy for both urban and rural Vanuatu children, with 72%

and 66% pass rates, respectively, as well as hidden emotion (HE) (53% and 60% pass rates). Children's relative ease with understanding HE and emotional experiences based on beliefs would be consistent with socialization practices that focus on emotional and relational connectedness—a skill important for gaining information on the state of group relations.

Taken together, extant work with Pacific children suggests that when their mentalizing skills are assessed across larger samples and age ranges and with a broader selection of tasks questions remain as to the privileged position of belief attribution, with older children still struggling to pass false-belief task, yet succeeding in tasks that require other forms of mental state knowledge. These mixed findings open up the need for further information on other skills that Pacific children may be recruiting to interpret behavior. For instance, children's capacity to apply externally motivated actions, may be especially important in cultural contexts where norms and rules are especially salient (Naito & Koyama, 2006). In particular, monitoring emotional states in others may provide clues to children as to the permissions and obligations that they must adhere to within any given context. Strong emotional arousal elicited through certain emotions, such as shame and fear are known to have a socializing function by helping children internalize social norms and inculcate social conformity (Röttger-Rössler et al., 2013). Children may be thus encouraged to pay attention to these specific states and to use this information to understand others' behavior, and to modify one's own behavior to satisfactorily carry out cultural tasks.

## The present study

Our overarching aim was to examine more explicitly the developmental profiles of a broader battery of children's social reasoning tasks that included both individual agentive and deontic concerns. We chose to examine these tasks in a Tongan context because as a Pacific island nation, Tonga adheres to strongly collectivistic principles, and where social obligations are strongly present. Our interest was twofold. First, we wanted to build on the work from Vanuatu, to add to our understanding of the development of mind understanding of children from interdependent cultures beyond Southeast Asia (Dixson et al., 2018). Given the work in Vanuatu, we had certain expectations regarding Tongan children's performance. Our first hypothesis (H1) was that Tongan children would perform better on the KA task relative to diverse belief tasks. Much value is placed on knowledge in the Tongan context: Māhina (2007) describes the Tongan philosophical basis of education as transforming the human intellect from *vale* (ignorance) to *ilo* (knowledge) to *poto* (skill). Knowledge, or the process of acquiring knowledge represents in Māhina's view a state of harmony and symmetry.

The second expectation was that children would be skilled in attending to others' emotional states. One of the key features of a context that privileges a relational self is the corresponding need to attend to others' emotions. Moreover, the practice of concealing and regulating socially disengaging emotions, such as anger is likely expected in strongly hierarchical and interdependent contexts where there is an emphasis on the need to maintain harmony (Mesquita et al., 2017). Thus, children are socialized from an early age to experience and attend to emotions that serve cultural mandates. Consequently, our second hypothesis (H2) was that Tongan children would display relative skill in the tasks that included emotional considerations such as understanding the distinction between how one might feel and how they might appear to feel, and also in how one might feel given a mistaken belief. Both tasks are considered difficult relative to tasks that require only the understanding of belief without the added requirement of understanding the corresponding emotion.

Our second goal was to observe in the same children the developmental profile of their performance on desires, beliefs, and knowledge-ignorance tasks that included additional deontic considerations. We were interested in their performance in these tasks relative to their purely mentalistic counterparts (ToM battery) and represented more exploratory work. As described earlier, deontic concerns focus on the obligations and permissions that act as a "force" for acting. Clement et al. (2011) argue that such rules present a more parsimonious route for children in predicting others' behavior, which can take place without recourse to the mentalistic component of the behavior. For instance, where there is a rule about where objects *must* be located, this rule could be applied when predicting a third-person perspective—rather than theorizing about a person's beliefs about the location of the object. Thus, we wanted to understand the extent to which norms and rules might assist children in predicting a person's behavior, and if there were distinct developmental changes in this capacity. In providing this information we hoped to model more closely the rich socio-normative context that children experience when faced with decisions about behavior.

We used three tasks that have already been developed to test children's capacity to use additional normative information regarding the obligations imposed by rules. The first task was adapted from Bernard et al. (2016), which tested 3- to 5-year-old children's ability to predict whether a group of protagonists would behave in line with a school norm, which was counter to their desire. Thus, this task tested the saliency of norms versus traits or internal states when predicting behaviors (Kalish & Shiverick, 2004). Our third hypothesis (H3) was that Tongan children would demonstrate high levels of conformity to the social expectations of the group, across all ages. The second group of tasks was an adaptation of a false-belief task in which the standard change of location

false-belief (LFB) task was prefaced with a rule about where objects are kept (Clement et al., 2011). In the explicit version, the child is told that there is a rule regarding where certain objects are kept. The rule is unique however, to that particular story context and not a social norm. In the implicit version, the protagonist acts on objects in a certain way, and the rule governing where objects are placed is inferred from the facial expression of a person in authority. Our prediction was that children would be highly sensitive to the emotional expressions that signal normative expectations of behavior, and that this would help them make an accurate prediction about where the protagonist would search. Thus, our fourth hypothesis (H4) was that children would do better on the implicit rules false-belief task compared to the explicit rules false-belief task. The final task addressed children's understanding of the knowledge or ignorance of a rule, and how this knowledge predicts the assignment of blame (Wang et al., 2011). We were interested in discovering whether Tongan children showed the same movement from overapplication of the rule in both knowledgeable and ignorant contexts to an application of mentalistic understanding in the older age group.

Finally, we sought confirmation of our expectation that Tongan parents socialize their children in ways that reinforce relational concerns by asking parents to fill out a questionnaire regarding their socialization goals for children. We expected that parents would favor more relational goals than autonomy-related goals.

## METHOD

### Participants

A total of 140 children and their families were recruited into the study. Participants were recruited from villages on the main island of Tongatapu. These villages were spread across the whole island and represented a diverse group of children from both rural (80%) and urban areas. The mean age of the children was 6.47 years,  $SD = 1.40$ . There were 67 (47.9%) males and 73 (52.1%) females. There were no significant differences in the average age of boys versus girls,  $t = -0.19$ ,  $p = .846$ . Children were recruited from five age brackets, 28 four-year-olds, 27 five-year-olds, 34 six-year-olds, 24 seven-year-olds, and 27 eight-year-olds. All children spoke Tongan fluently, and 98% of children spoke Tongan as their main language at home. All child tasks and parent interviews were conducted in the Tongan language. The vast majority (95%) of children had siblings. The mean total number of siblings was 3.36,  $SD = 2.15$ , range = 0–11. The mean number of older siblings was 2.36 ( $SD = 2.03$ ) and the mean number of younger siblings was 0.99 ( $SD = 1.05$ ). The children's main caregivers were mothers (86.4%), grandmothers (7.1%), aunts (2.9%), fathers (2.9%), and



one grandfather (0.7%). The mean size of the households comprised 7.76 adults and children (range: 2–17). Socioeconomic information was not gathered by the team as this was considered sensitive information for younger student researchers to ask.

## Procedure

The research team comprised the three principal investigators (the first three authors), all of Tongan descent. The first author was based at a New Zealand university, and the other two investigators were based at two tertiary-level institutions in Tonga: Tupou Tertiary Institute (TTI), and the University of the South Pacific (USP), Tonga Campus. There were also two Tongan supervisors, who were teachers at each Tongan institution, a Tongan administrator who was located at TTI, and 20 Tongan student researchers. Ten of the students were enrolled at the TTI, and in either their second or third year of a diploma of teaching, and the remaining 10 students were enrolled in the USP, Tonga Campus, and were undertaking a range of degree courses. This research structure was proposed by the Tonga-based principal investigators, to facilitate the communication and training between the principal investigators and the student researchers, but also to provide an opportunity for developing research skills in the community with whom we were working. As a collectivistic society, the fostering of trust between relationships was crucial for the success of the project. The project was a result of several years of interaction between the three principal researchers and the consultation and discussion of the research project were established through several meetings prior to the application for funding. The fair and adequate funding of the local researchers', supervisors' and student researchers' time was also an important consideration, and advice was taken from the researchers based in Tonga. Ethics approval was obtained from the Institute of Education, at the USP, as well as the University of Otago ethics committee.

The student researchers were trained in data collection procedures (described below) and assigned the task of recruiting and testing seven participants from specified age groups from their respective villages. The student researchers were chosen on the basis of the location of their village to ensure that families were recruited from across the whole island. The two supervisors completed 4 days of training, which was delivered by the principal investigators, and which also included the piloting of the training materials. This allowed for a thorough test of the materials and resolution of any inconsistencies in the research protocol. Students then spent 3 days undergoing training in the research protocol and 1 day recruiting and testing a pilot child. All tasks were administered in the Tongan language.

Each student was required to recruit and test a child from each of the five age brackets, and then an extra two children from a randomly allocated age group. By distributing the recruitment across the age categories for each student, we avoided concentrating on any specific age bracket with a small group of students. The students worked in pairs for data collection. Once recruitment and testing started, the full research team met twice a week and every member of the team including the student researchers reported back to the group on the progress of the project as well as a reflection on what they felt they were learning from the project. In addition, each student met with the principal investigator after each visit to discuss the procedure and any issues that arose, such as difficulties in reading handwriting, missing demographic data, or if a participant had accidentally missed filling out a page in the questionnaire. All data entry took place within a day of the student seeing each child, so any data issues were quickly resolved and if necessary corrected.

Tasks were administered over 2 days and task order was counterbalanced by institution. The TTI students administered the ToM tasks on day 1 and then the Deontic tasks on day 2, whereas the USP students administered the two task batteries in reverse order. The task order of ToM and Deontic tasks were fixed within the schedule (see below). Separate tasks for male and female participants were created to conform with strong cultural norms regarding gender roles and relationships, which included Boy protagonists for the male participants and Girl protagonists for the female participants. Families were offered a stationery voucher as a gift for their time. Parents were also interviewed regarding their socialization goals.

## Materials

All materials were translated and further developed through several iterations with the research team. All materials, stories, and pictures were developed so that they were appropriate for the Tongan context. All tasks were first piloted in two phases, first on three to four children in the preparation phase, and then with 20 children across all the age groups in the training phase. The tasks were revised before the main study took place.

## ToM tasks

Six ToM tasks from Wellman and Liu (2004) and the belief-based emotion task from Dixson et al. (2018) were adapted for the Tongan context and administered in the following order: Diverse desires (DD), DB, KA, LFB, HE, contents false-belief (CFB), and belief-based emotion (BE).

*Diverse desires*

Participants were shown a gender-matched paper doll and a picture of a banana and some cooked taro. The experimenter first established the child's preference and then indicated that the doll preferred the opposite. The child was then told that the doll will now eat some food and can only choose one food. The child is then asked which one the doll will choose. The child received 1 point for choosing the food that was consistent with the doll's preference.

*Diverse beliefs*

Participants were shown a different gender-matched paper doll and a picture of a bush and a house. The participants were told this is where the character lives and that s/he is looking for their cat. The cat could be hiding in the bush or under the house. The child is then asked where he or she thinks the cat is hiding. They are then told that the character believes the cat is hiding in the opposite location. For the test question, the child is then asked where the character will look for their cat. The child is assigned 1 point if they answer or point to the location that the character believed the cat to be.

*Knowledge access*

Participants were shown a different gender-matched paper doll, which is then hidden in an enclosed bag. The child is then shown a closed, opaque box, which contained a candle. The child is then asked what they think is inside the box. The contents are then revealed and the candle is returned to the box. The doll is then removed from the bag and the child is asked the test question of whether the doll knows what is inside the box. The child is then asked a memory question of whether the character has seen inside the box. The child was assigned 1 point if they answered both the test question and the memory question correctly.

*Change of LFB*

The children are shown a series of photos depicting a kitchen scene in which two siblings are eating some sweet potatoes. The protagonist then returns the leftover sweet potato to the pot, and leaves the room to sleep. While he is asleep, his brother removes the sweet potato from the pot and puts it in the fridge. The child is then asked two memory questions to ascertain that they have followed the story. The first memory question checked if they remembered where the protagonist put the sweet potato, and then the reality question asked the child to indicate where the sweet potato was now located. The protagonist then returns from his sleep and the child is told that he is hungry. The child is then asked the test question of where he will look for his sweet potato and is presented with two photos depicting the pot or the fridge. Children were assigned 1 point if they answered the test and the memory questions correctly. The children were also asked to justify their answer which was recorded verbatim.

*Hidden emotion*

In this task, children were shown a drawing of a happy, neutral and sad face as well as picture of a boy or girl facing away. The children were then told a story about a character who was playing with his friends. An older child in the story then teases the main character, and the other children in the story laugh at this because they thought it was funny. The story reveals that the protagonist did not want the other children to know that he did not find it funny and that he tried to hide his feelings so that they would not call him a cry baby. The participant is then asked a couple of memory questions to check that the children remembered how the children reacted when the older boy teased the protagonist (laughed) and how the children would behave if they found out how the protagonist felt about being teased (they would call him a cry baby). For the first test question, the participant was asked how the character really felt—happy, sad, or ok—and then in test question 2 they were asked what facial expression the character expressed when the children in the story laughed at him. Children were awarded one point if they reported the emotion that the character expressed in test question 2 was more positive than the emotion expressed in test question 1.

*Contents false-belief*

In this task, children were shown a gender-matched paper doll which is then hidden in a bag where they are told it cannot hear or see anything. The child is then shown a box of playing cards, a common game in Tongan households, and asked what they think is in the box. After the child responds, the contents of the box are revealed to show that there is a sweet inside. The sweet is then returned to the box, and the child is asked a memory question to check that she or he knows what is now in the box. The paper doll is then removed from the bag and the child is then reminded that the doll has not seen inside the box. The child is then asked the test question of what the doll thinks is inside the box? The child was assigned 1 point for answering the test question correctly.

*Belief-based emotion*

In this task, participants are tested on their ability to link a person's beliefs to how they may feel about a situation. In this task, the child is introduced to two siblings in a pictorial story, one of whom (the protagonist) loves a local snack (*Twisties*) and the child is then tested on the protagonist's emotional response to the snack (happy). While the protagonist is away, the sibling substitutes the snack with leaves. The child is then asked the first test question of how the protagonist feels on his return when he sees his snack, and asked to justify their answer. The child is then asked a false-belief question about what the protagonist believes is in the snack packet, followed by a memory reality question of what is really in the packet. Finally, the child is then asked a comprehension question of how the protagonist will feel on opening his

packet and the justification for that emotion. The child was assigned 1 point for correctly predicting the protagonist's emotional state in the first test question and the final comprehension question, and a separate point was awarded for correctly predicting the protagonist's false-belief.

## Deontic tasks

Four rule-based tasks were developed and administered to the children in the following order: desire rules (DR: Bernard et al., 2016), explicit rule false-belief (ERFB: Clement et al., 2011), implicit rule false-belief (IRFB: Clement et al., 2011), rule knowledge-ignorance (RKI: Wang et al., 2011).

### *Desire rules*

In this task, participants were presented with a picture showing either a group of three girls, or three boys (depending on the gender of the child), a teacher's desk, and a collection of three school bags. The group was depicted holding paintings. The child is told that there is a rule in this classroom that all finished paintings are left on the teacher's desk. The child is then told that the three characters' desires are contrary to the rule—they want to take their paintings home, and then asked the test question: “what do you think the children will do, will they place their paintings on the table, or in their school bags.” The choice of location was counterbalanced between the genders. The child is then asked a justification question for their answer, and then a follow-up memory question asking them what the rule was. Children were awarded 1 point for answering that the group would put the paintings on the teacher's desk. Only children who correctly remembered the rule were included in the analyses.

### *Explicit rules false-belief*

In this task, participants were shown photos of two gender-specific characters playing cards. The participants are also told that there is a rule in this house that cards must be kept in a certain bag (present in the picture). The main protagonist is then shown putting her cards in the designated bag, and then leaves the room to have a sleep. While she is asleep the second character is shown moving the cards from the bag to an empty ice-cream container. The child is then asked a memory question to check they know where the cards were originally placed, and a reality control question to check that they knew where the cards were now placed. The child is then asked a rule reminder question regarding what the rule was. If the child could not remember the rule the story was repeated up to two times, and their memory of the rule was checked each time. The child is then presented to two photographs depicting the location choices and asked a test question: Where do

you think Nina will search for her cards, in the bag, or the container (counterbalanced). The child is awarded 1 point for correctly indicating she will search for the cards in the bag and for getting the memory questions correct. Children who were unable to remember the rule despite the repetitions were removed from the sample.

### *Implicit rules false-belief*

Participants were presented with a line drawing of the side of church building with two sets of doors, one at the front of the church and one at the back. Situated in the center is a doorman—a common feature of Tongan churches. The doorman's role is to direct people to seats where needed, and to maintain order and discipline amongst the children. The protagonist is then introduced to the child and told that she is going to church. On arriving at the church she goes to remove her shoes at the front door before entering. While she is preparing to do that, the child is shown a picture of the doorman looking on with an angry expression on his face. The protagonist then moves her shoes to the back of the church, after which time the doorman looks happy. While the protagonist is inside the church, her friend comes and moves her shoes to the front of the church. Various checks are made during the story to ensure that the child is following the story. First, the child is then shown a picture of the church and a control question regarding the rule: where in this church are people supposed to put their shoes, at the back of the church or the front of the church (counterbalanced). If the child could not remember, the story is repeated from the beginning up to two times. The child is then asked a reality control question: where were the shoes moved to by the friend of the protagonist—to the front or the back of the church? The test question asked the child where the protagonist will look for her shoes when she comes out of her church service—at the back of the church or the front of the church? One point was awarded for correctly identifying that the protagonist would look for her shoes where she last left them (at the back of the church) and for correctly answering the memory questions. If children correctly answered the question, they were asked a justification question, to explain their answer. Similar to the explicit rules task, if the child failed to remember the rule even after the repetitions they were excluded from the sample.

### *Rules knowledge-ignorance*

The objective of this task was to understand how children coordinate information about knowledge states with social norms. There were two components to this task. First, participants were given experience of a criticism scale, which depicted two faces—an angry face indicating that the protagonist would get in trouble and then a neutral face where the protagonist would not get in trouble. The second scale showed a range of

criticism—from a little (one angry face) to a lot (three angry faces). The participants were then introduced to several characters in a school setting, which described what children must do when they arrive at school. The first rule (or norm) was that their bags must be hung on the hooks outside the classroom. At this point, children complete two trials: An Ignorance (RKI\_I) and a Knowledgeable trial (RKI\_K). In the Ignorance trial, the child is told that the following day the rule of where to put one's school bags has been changed—they are now placed inside the classroom against the wall and that the protagonist was absent from school on the day the rule was changed. The protagonist then returns and the child is asked to predict what she will do with her bag, and is shown two pictures depicting the protagonist either placing the bag in the original location or in the new location. Once the child has made her choice, she is shown the protagonist breaking the rule, and placing her bag in the original location. The child is then asked if the protagonist should be criticized, and if so how much criticism (a lot or a little). In the knowledgeable condition, a different protagonist is introduced, who was present on the day of the rule change. Similarly, when he comes to school the next day, the child is asked how he will behave, and chooses from the two possible behaviors. When the protagonist is revealed to break the rule, the child is then asked if he should be criticized for his behavior, and if so, how much.

### Parent autonomy-relatedness questionnaire (Keller, 2007)

This questionnaire comprised 10 items, five pertaining to the heteronomy-autonomy dimension (e.g., “by the time they enter school children should develop independence”), and five to the separateness-relatedness dimension (e.g., by the time they enter school children should learn to obey parents). Parents endorsed each item on a 5-point Likert scale, (1) *I do not agree at all*, to (5) *I agree completely*, and a mean autonomy and mean relatedness score was computed for each parent.

## RESULTS

### Analysis plan and preliminary analyses

Of the 13 child task variables (8 ToM and 5 Deontic variables), there were 1.7% missing data. To maintain as large a sample as possible, and consistency with standard practice, children were counted as passing the ToM and Rule-based tasks if they passed the test question and the control questions. Of these children, several children did not pass the memory and reality questions for the ToM tasks. For the KA

task, 12%, LFB task = 17%, CFB = 8%, BE first-order false-belief question 17 did not pass the reality and memory tasks. In the rule-based tasks, similar to the procedure employed by Clement et al. (2011), children were dropped from the sample if they did not remember the rule in the ERFB task, (3.5%) the IRFB task (5.7%) and the DR task (10%). Overall, there were only two tasks where there were gender effects. Girls outperformed boys on the DB task, Fisher's exact test,  $p = .028$ , Cramer's  $V = 0.194$ ,  $p = .02$ , and the LFB, Fisher's exact test,  $p = .011$ , Cramer's  $V = 0.22$ ,  $p = .009$ .

### Parents' socialization goals

The questionnaire yielded an overall reliability of Cronbach's alpha = .81; autonomy subscale reliability = 0.70, and the relatedness reliability = 0.71. Using paired sample  $t$ -test, as expected parents' tended to endorse relational goals more highly ( $M = 4.00$ ,  $SD = 0.82$ ) over autonomy goals ( $M = 3.57$ ,  $SD = 0.90$ ),  $t(132) = -6.45$ ,  $p < .001$ . We then calculated the response style of parents to identify any differences in patterns of extreme responding between the subscales. Likert scale endorsements of 1 or 5 were recoded as 1 and all other scores as 0. Scores for each set of items for the different subscales were summed for each participant (Lamm & Keller, 2009). Scores on the relational goal subscale were more likely to contain extreme scores than scores on the autonomy subscale,  $Z = -4.147$ ,  $p < .001$ . A difference score (relatedness minus autonomy) was also calculated to identify the percentage of parents who were more likely to endorse relatedness compared to autonomy goals. Sixty-nine percent of parents had greater relational endorsement than autonomy, 13.6% endorsed autonomy goals more highly, and 15.7% endorsed autonomy and relatedness equally. The subscales were not significantly associated with any of the child tasks.

### ToM tasks performance

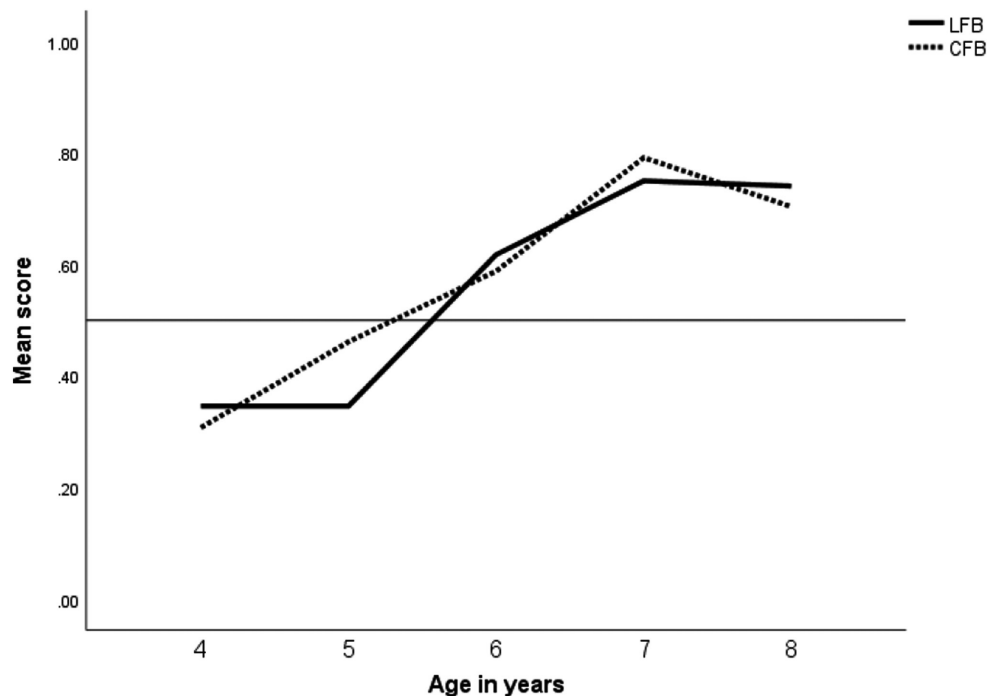
Table 1 contains the summary statistics for the ToM tasks by age group. The pass rates for the following tasks were significantly higher than chance and passed in the following order, DD,  $\chi(1) = 40.47$ ,  $p < .001$ , KA,  $\chi(1) = 25.04$ ,  $p < .001$ , HE,  $\chi(1) = 14.57$ ,  $p < .001$ , and BE,  $\chi(1) = 8.07$ ,  $p = .005$ . Overall, several tasks were not passed, these included LFB,  $\chi(1) = 2.08$ ,  $p = .15$ , CFB,  $\chi(1) = 2.64$ ,  $p = .10$ , and DB,  $\chi(1) = .007$ ,  $p = .93$ . Thus, in line with H1 children found the KA task easier than the DB tasks, and when directly compared there was a significant difference in the pass rates,  $\chi(1) = 12.85$ ,  $p < .001$ . These results also demonstrated that consistent with H2, the HE and BE tasks were relatively easy compared to the DB and FB tasks.



**TABLE 1** Percentage pass rates for each ToM task by age group

|     | 4 Years | 5 Years | 6 Years | 7 Years | 8 Years | Total |
|-----|---------|---------|---------|---------|---------|-------|
| DD  | 81.5    | 81.5    | 73.5    | 75      | 74.1    | 77    |
| KA  | 48.1    | 55.6    | 79.4    | 83.3    | 88.9    | 71.2  |
| HE  | 48.1    | 63      | 67.6    | 79.2    | 74.1    | 66.2  |
| BE  | 50      | 73.1    | 58.8    | 70.8    | 60      | 62.2  |
| CFB | 30.8    | 46.2    | 58.8    | 79.2    | 70.4    | 56.9  |
| LFB | 33.3    | 37      | 61.8    | 75      | 74.1    | 56.1  |
| DB  | 51.9    | 40.7    | 52.9    | 58.3    | 48.1    | 50.4  |

Abbreviations: CFB, contents false belief; BE, belief-emotion; DB, diverse beliefs; DD, diverse desires; KA, knowledge access; HE, hidden emotion; LFB, location false belief.

**FIGURE 1** Mean scores for location false-belief (LFB) and contents false-belief (CFB) tasks by age category

Specific age effects were observed in the KA task  $\chi(4) = 17.19$ ,  $p = .002$ , Cramer's  $V = 0.35$ , with 4- and 5-year-olds at chance levels and a significant change in pass rates at age 6 years. In the two false-belief tasks there was also a clear change in pass-rates from chance to above chance at 6 years (Figure 1) for LFB,  $\chi(4) = 17.13$ ,  $p = .002$ , Cramer's  $V = 0.35$ , and CFB,  $\chi(4) = 15.36$ ,  $p = .004$ , Cramer's  $V = 0.34$ . No age effects were observed in the DD task  $\chi(4) = 1.03$ ,  $p = 0.91$ , Cramer's  $V = 0.09$ , the HE task,  $\chi(4) = 6.64$ ,  $p = .16$ , Cramer's  $V = 0.22$ , the BE task  $\chi(4) = 3.93$ ,  $p = 0.42$ , Cramer's  $V = 0.17$  and DB,  $\chi(4) = 1.78$ ,  $p = .78$ .

In the LFB task, children were asked to justify why the protagonist looked in a specific location. The vast majority of responses referred to the object's original location, and this was particularly so for the participants who passed the task. Those who failed the task were

more likely to refer to the object being in the new location. Only one participant referred to the mental state of the protagonist as a justification for their searching behavior.

In the BE task, participants also provided two justifications. Of the children who answered the first justification question correctly—why the protagonist would experience a particular emotion—93% gave explanations that were congruent with their answer: that they desired the Twisties, or noted their presence or had a goal to eat the Twisties. For the second justification—why they felt a particular emotion on discovery that what they expected was not in the packet, most children indicated correctly that the protagonist would feel sad, and the vast majority of their justifications referred to the presence of the offending leaves. Very few children referred to the child's mental states in justifying their sadness.

## Deontic tasks performance

In our next analysis, we examined the pass rates for the deontic-based tasks. Table 2 presents the summary statistics for the deontic-based tasks by age group. Overall, children passed both the DR task,  $\chi(1) = 27.13$ ,  $p < .001$  and the IRFB task,  $\chi(1) = 22.43$ ,  $p < .001$  and failed the ERFB task,  $\chi(1) = 0.008$ ,  $p = .93$ .

In line with H3, the results of the DR task showed that children in all age categories were significantly above chance in endorsing that the protagonist would comply with the rule or social norm over their internal states. The majority of explanations of the protagonists' behavior focused on the class rule in explaining the action, however, this justification was representative of those who passed the desire task. For children who failed the task, or responded they would take the painting home, the predominant explanation referred to their internal desire to do so.

There was only one task that showed an age effect: ERFB,  $\chi(4) = 17.28$ ,  $p = .002$ , Cramer's  $V = 0.33$ . Children in the explicit rules task moved from consistently choosing the incorrect response at age 4 and 5 years, to chance responding at 6 and 7 years, to then passing the task at 8 years (Figure 2).

Children also gave justifications for their answers in both the explicit and implicit rules false-belief tasks. In the ERFB task, 76% of children who passed the task referred to the original location of the object. This contrasted somewhat with the IRFB task in which under half of children who answered correctly referred to the initial location, and around 40% indicated that the protagonist was searching for the object, or had a goal of getting the object.

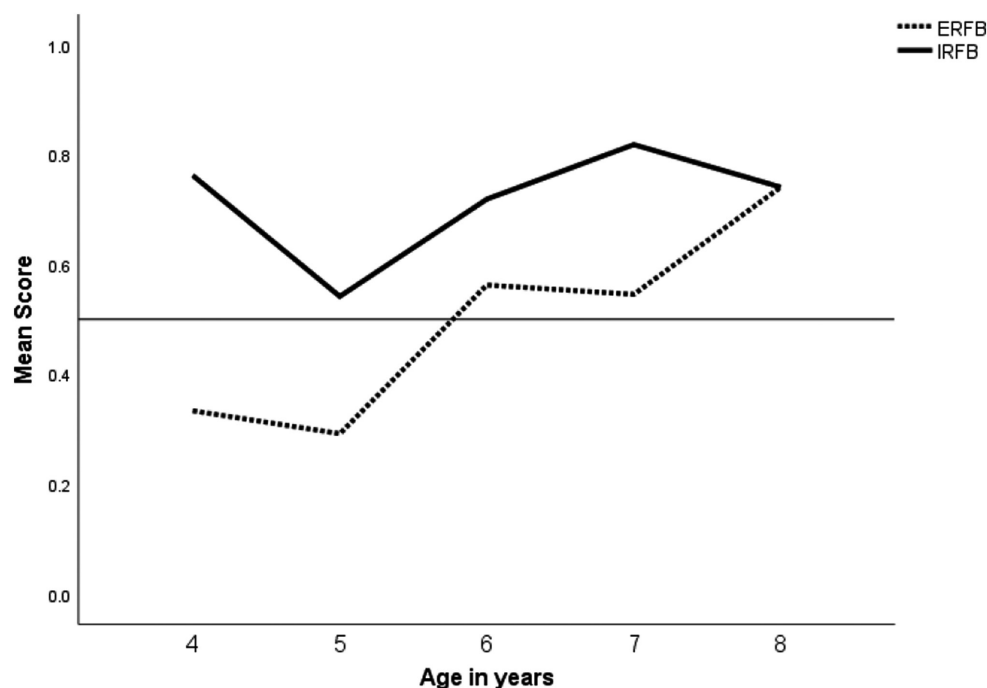
The final task examined how children's understanding of a protagonist's ignorance and knowledge would influence their adherence to a rule. Over 90% of all

**TABLE 2** Percentage pass rates for each deontic task by age group

|       | 4 Years | 5 Years | 6 Years | 7 Years | 8 Years | Total   |
|-------|---------|---------|---------|---------|---------|---------|
| DR    | 76.0**  | 75.0*   | 74.2**  | 65.2    | 76.0**  | 73.4*** |
| IRFB  | 75*     | 52      | 71.9*   | 81.8**  | 74.1*   | 70.8*** |
| ERFB  | 33.3    | 28.0*   | 52.9    | 56.5    | 74.1*   | 49.6    |
| RKI_K | 70.4*   | 63      | 73.5**  | 91.3*** | 84***   | 75.7*** |
| RKI_I | 50      | 46.2    | 70.6*   | 86.4*** | 74.1*** | 65.2*** |

Note: Only those who remembered the rule were included. This resulted in  $n = 124$  for the DR task,  $n = 130$  for the IRFB task, and  $n = 133$  for the ERFB task. Abbreviations: DR, desires rules; IRFB, implicit rules false belief; ERFB, explicit rules false belief; RKI\_I, ignorance condition; RKI\_K, knowledgeable condition.

\*Refers to statistically different from chance performance,  $*p < .05$ ,  $**p < .01$ ,  $***p < .001$ .



**FIGURE 2** Mean scores for explicit rules false-belief (ERFB) and implicit rules false-belief tasks (IRFB) by age category

children correctly answered what the protagonists should do following the rule change, indicating that they understood the new obligations the protagonist was under. Overall, children passed both the Ignorance (RKI\_I),  $\chi(1) = 12.45$ ,  $p < .001$ , and Knowledgeable (RKI\_K) conditions,  $\chi(1) = 36.03$ ,  $p < .001$ , meaning they were able to indicate that the protagonist would do the new behavior depending on their knowledge or ignorance of the rule change. There was an age effect for the ignorance condition,  $\chi(4) = 12.51$ ,  $p = .01$ , Cramer's  $V = 0.35$ . Children's responses in the ignorance condition moved from chance responding at 4 and 5 years to above chance responding at 6 years. That is, by age 6 children began to correctly indicate that a person will behave in a certain way as a function of their knowledge or ignorance of the rule governing that behavior. Our analysis of the proposal that younger children would provide more correct responses if the protagonist was aware of the rule change than if the protagonist was unaware, yielded mixed results. Four-year-olds were above chance in their responding that the protagonist will adhere to the new rule if they were aware of it and similarly, 5-year-olds were more likely to give the correct response in the knowledgeable condition, although this was statistically at chance. Six-, 7- and 8-year-olds were above chance in the knowledgeable condition. That is, before age 6, children were more likely to correctly predict that a person's behavior would follow a rule if they did not have to take into account the person's mental state or knowledge of the rule. By age 6, children were correctly taking into account the protagonist's mental state when predicting whether a person would behave on the basis of a rule.

Overall, a higher percentage of children correctly assigned blame depending on their level of knowledge

(Figure 3). For instance, when the protagonist was ignorant of the rule, children were less likely to assign blame  $\chi(1) = 4.56$ ,  $p = .03$ , whereas they were more likely to assign blame if the protagonist knew the rule,  $\chi(1) = 34.00$ ,  $p < .001$ . There were specific age effects, however. Only the 7- and 8-year olds were significantly more likely to assign correct conditional blame than any other coding category,  $\chi(1)_{7\text{years}} = 13.92$ ,  $p = .008$  and  $\chi(1)_{8\text{years}} = 22.82$ ,  $p < .001$ .

### Comparisons between rule-based false-belief tasks

We then compared task performance on the ERFB, the IRFB task, and the RKI\_I tasks. First, recall that both ERFB and IRFB tasks were concerned with an object's change in location, but each task was prefaced with either an explicit (ERFB) or an implicit rule (IRFB). Our hypothesis was that children would perform more accurately in the implicit task because of the additional emotional and contextual information provided in the scenario (H4). Table 2 displays the mean scores for each task. Overall, the children found the implicit rules task easier than the explicit rules tasks with significantly more children passing  $\chi(1) = 15.63$ ,  $p < .001$ . The ignorance condition of the knowledge ignorance task was concerned with how a person would behave on the basis of their knowledge of a new rule. This task bears hallmarks of the false-belief change of location object tasks because a person's behavior—where they will correctly put an object—will depend on the *protagonist's* (rather than the group's) knowledge about the rule governing where that object should go. Overall, children found the ignorance condition easier than the explicit rules tasks,  $\chi(1) = 7.61$ ,

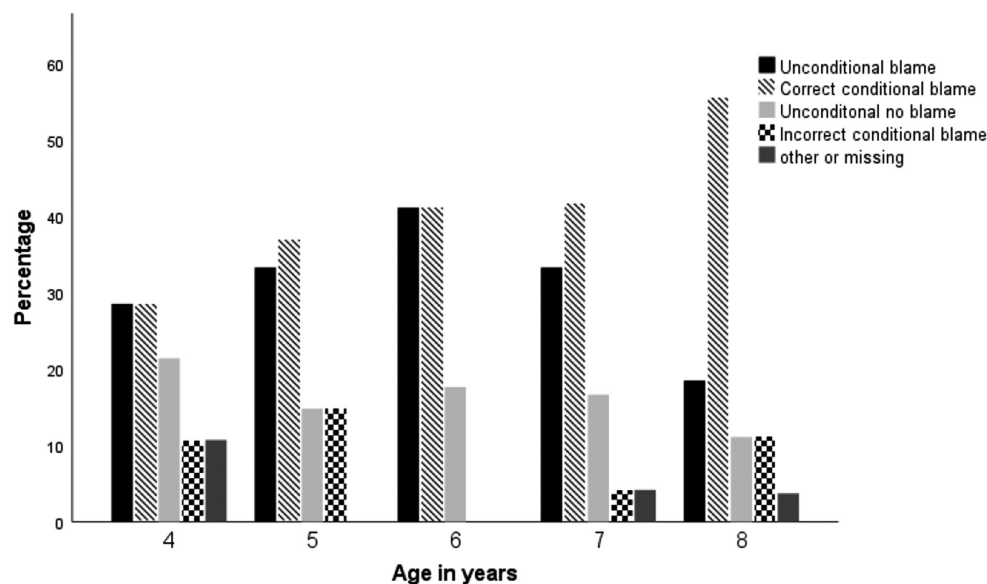


FIGURE 3 Conditional and unconditional blame assignment by age category for rules knowledge-ignorance task

TABLE 3 Spearman's zero-order correlations between false-belief ToM and deontic tasks

|       | ERFB   | IRFB   | RKI_I  | LFB    | CFB |
|-------|--------|--------|--------|--------|-----|
| ERFB  | -      |        |        |        |     |
| IRFB  | .400** | -      |        |        |     |
| RKI_I | .393** | .259** | -      |        |     |
| LFB   | .560** | .282** | .254** | -      |     |
| CFB   | .422** | .185*  | .233** | .450** | -   |

\* $p < .05$ , \*\* $p < .01$ .

Abbreviations: CFB, contents false-belief; ERFB, explicit rule false-belief; IRFB, implicit rule false-belief; LFB, location false-belief; RKI\_I, ignorance condition of rules knowledge-ignorance task; ToM, theory-of-mind.

$p = .006$ , but there was no difference in pass rates between the implicit rules, and ignorance condition,  $\chi(1) = .39$ ,  $p = .53$ .

### Relation between ToM and deontic false-belief tasks

Our final analysis was to examine the associations between the false-belief versions of the mental state and deontic tasks (Table 3). All tasks were moderately correlated with each other, however, there were significant differences in the success rates for the various tasks, Friedman's test,  $\chi(4) = 19.96$ ,  $p = .001$ . As our interest was in the relation between rules-based tasks and their purely mentalistic counterparts, we performed three sets of paired sample analyses. After correcting for family-wise error of 0.05, IRFB performance was significantly better than LFB,  $Z = -2.41$ ,  $p = .016$ , and CFB,  $Z = -2.02$ ,  $p = .043$  whereas there was no difference in performance between ERFB, LFB, and CFB. Although on average children's pass rates for RKI\_I were higher than LRF and CFB, this did not reach significance.

## DISCUSSION

The goal of this research was to assess in a single study the developmental profiles, and relation between ToM and deontic tasks in a group of children from Tonga, a predominantly collectivistic society. Our first finding demonstrated that there was a clear grouping of tasks that Tongan children on average passed and those that they found difficult. From the set of ToM tasks, children passed DD, KA, HE, and belief emotion. Success on these tasks is the reverse to that found in a Western context where HEs and belief-emotion (BE) are typically grouped as more difficult (Wellman & Liu, 2004). As a group, Tongan children failed on average the false belief tasks, and the diverse belief task. In terms of the tasks that included rules about normative behavior, children clearly demonstrated knowledge of rules, and in two tasks used this knowledge to successfully predict how people would behave. Children predicted that others

would be highly motivated to follow rules, even when in conflict with their desires. Children's performance in a false-belief task was significantly higher when an implicit rule was present, suggesting that children may be using the rule as an external motivator for a person's actions. We discuss each task in turn and then in the context of data from other Pacific contexts.

First, children showed skill in understanding the source of knowledge, relative to diversity of belief. In fact, diversity of belief was the most difficult task for children. Relative success in understanding KA is consistent with an emphasis in Tongan child socialization of drawing children's attention to behavior or activities, with particular emphasis on the act of looking at something to draw attention. Although children found the DB task especially hard, the finding is consistent with an emphasis on accepting and not disputing knowledge and information dispensed by elders and those with a higher status.

Children also showed relative skill in understanding that one's emotional response can and should be concealed under certain circumstances, and by age 5 years children were on average passing this task. Similarly, by age 5 years, children on average were successful in understanding how a person may feel toward something that contained a desired object, where they had a belief that the desired object was present. The findings demonstrate a level of consistency with data from a Vanuatu context, where the HE and BE tasks were also passed earlier than the standard false-belief tasks. Dixson et al. (2018) suggest that this relative skill in emotion understanding reflects a socialization emphasis away from mental state representation, and a stronger focus on interpersonal relatedness. Although our data showed a greater tendency for parents to endorse relational goals which privilege the group's social relationships over individual mental states, there was no direct association between their goals and the child ToM or deontic tasks. Almost 70% of parents endorsed relational goals more highly, but the questionnaire items may have been too distally related to pick up on the features of interactions that might promote success on the tasks. For instance, Tongan children are socialized from an early age to restrain emotional responses, and are encouraged to attend to non-verbal cues that signal others' preferences and desires (Morton, 1996).



Chronic engagement with particular psychological processes may lead to specific shaping of core psychological construals (e.g., Tsai et al., 2007). Thus, chronic engagement in belief attribution, through specific socialization practices from an early age, fosters children's attention to specific mentalistic attributions. Tongan children's relative skill in understanding mental state attribution in the context of emotional experiences compared to contexts that do not include emotion, is consistent with an interdependent focus and reflects a chronic engagement in noticing non-verbal cues that are an essential part of young Tongan children's socialization, such as learning through observation. This chronic engagement is likely reinforced by the ways in which parents engage with their children in discussions about mental states (Taumoepeau, 2015). Although, in the present study we did not code adult-child interactions with their Tongan children, an analysis of 5-year-old Tongan children's language environments suggests a minimal focus on discussion about mental states (Fonua, 2004).

Our results also help advance our understanding of the purported relation between deontic reasoning and mentalistic explanations for behavior, and how cultural mandates might influence the propensity to apply particular forms of reasoning. Children were highly likely to suggest that others would follow rules in a school context, even when this went against their desires, and they explained their behavior with reference to the rules and to the consequences of rules. Although the findings are largely consistent with similar studies in non-Pacific contexts, Tongan children's expectation that others would follow rules, appears higher on average to a comparable study conducted in a European context (Bernard et al., 2016).

Similar to Clement et al. (2011) we found that performance on the implicit rules false-belief task was significantly better than in the false-belief conditions where there was no deontic rule. However, unlike Clement et al. (2011), we did not find a similar advantage in the explicit rule condition, despite the vast majority of children remembering the rule. If the rules themselves help children infer behavior without recourse to mentalizing about individual perspectives then children should have been similarly advanced in both conditions.

A closer examination of the two rules tasks, however, reveals potential explanations for this disparity. First, in the explicit rules task, the rule governing what "must" happen to the pack of cards was specific to the household, and not a widely held social norm. It was also not stated what sanctions would occur if the rule were broken. Thus, this particular context may not have been salient enough to trigger an inference based on the rule itself, but rather required the child to make mentalistic inferences about the protagonist's behavior, leading to similar results to the non rule-based tasks. In contrast, the implicit task's church context inherently may have

primed children to think about the rules that govern people's behavior.

We also argue that like the HE and BE tasks the inclusion of the emotional component was a socially relevant cue for understanding and attending to behavior. Emotional expression as an evaluation of behavior, and the potential sanction associated with violating the rule are both avenues for learning what constitutes a norm, and how norms can be evoked for explaining the causes of behavior. Together, the emotional expression of the door keeper (a regular feature of Tongan churches) and his position of authority may have helped reinforce the saliency of the rule as well as the potential sanctions of breaking the rule. Both these features of the task may have signaled more explicitly the deontic route as a reinforcer of the original location of the object. There is evidence that authority figures who make deontic rules are more likely to trigger deontic reasoning in young children (Dack & Astington, 2011), and although the rule in our implicit task was not explicitly stated by the person in authority, children would be very familiar with the power of the authority figure to make rules.

Consistent with Wang et al. (2011) there was emerging evidence that younger children—4- and 5-year-olds—were less likely to coordinate information about the protagonist's individual mental state—their knowledge of the rule, when explaining behavior. Younger children were able to identify the rule and recruit this deontic knowledge to explain the protagonist behavior, however, children from age 6-year-olds children were showing evidence of applying both types of knowledge—deontic and mentalistic when predicting behavior. Similarly, younger children were highly unlikely to take into account the protagonist's knowledge state when assigning blame, suggesting that children were applying a simpler rule—if they break rule *then* punish. In contrast, 7- and 8-year-old children were much more likely to say that punishment should be conditional—if they broke the rule, *and* they were ignorant of the rule change, *then* punish. Wang et al's sample was a Chinese sample, where they argue that the emphasis on respect for parents and elders, similarly seen in Tongan culture, would influence the extent to which actions are constrained by social rules.

These findings thus suggest an intricate role between deontic reasoning and mentalistic reasoning. In a cultural context, such as Tonga where group harmony and social cohesion are highly valued, children are enculturated to be particularly sensitive to norms. Although our data suggest that for Tongan children rules may trigger particular inferences about the behavior of a third person without recourse to mentalistic, individual-level explanations, the extent to which children apply a normative stance versus an intentional stance may depend on the saliency of the rule and how easily the rule can be generalized to others' behavior.

Uniquely, however, we were also able to compare children's performance on the knowledge-ignorance rule-based task to their performance on purely mentalistic false-belief tasks as well as the rule-based false-belief tasks. Older children's above chance performance in the condition where they needed to appeal to the protagonist's knowledge of the rule to explain behavior was in line with their above chance ability from age 6 on the purely mentalistic tasks. It is worth noting as well that children's above chance performance on several tasks converged on 6 years, suggesting a link to children's schooling experience. Wang et al. (2016) have suggested that the pedagogical experience, and in particular inquiry-based forms of learning, may be more important than a general culture explanation in understanding differences in mental state task performance between cultures. Arguably, schooling in itself is not culture free, and Tongan children's exposure to Western style education, which is compulsory from age 6, may be especially impactful on fostering a more intentional stance. Pedagogical experiences, including greater exposure to book reading may also increase children's exposure to metacognitive language, which in turn may impact children's attention to individual mental states (Lecce et al., 2010).

An alternative explanation for the particular pattern of findings may be due to emotionally salient features of the scenarios that facilitated children's reasoning about behavior. Both mentalistic and rule-based tasks that included an emotional component tended to be acquired earlier than the tasks that did not explicitly refer to emotions. The ability of children to engage with emotions may in fact facilitate children's capacity to think about the perspectives and behaviors of others. Future work could examine more systematically ways in which Tongan children are socialized through emotions to internalize social norms, and the differential effects of the salience and valence of the emotional displays (Röttger-Rössler et al., 2013).

There are several limitations in our study which point to specific ways in which we could build on this research. The study leaves open unanswered questions regarding the effects of rules issued by authority figures over general but highly normative social rules. Further studies could attempt to disambiguate the relative effects of these social contexts on the tendency of children to take up the opportunities to apply deontic reasoning when explaining the behavior of others. Although conceptually comparable, future work could also make the LFB tasks more directly comparable with the implicit-rules task. In the implicit rules tasks, the object is first moved from the original location (front) to the back location by the protagonist. The friend then moves the object back to the front location. The child may reason that the protagonist will look to the back (original location) not because of reasoning about rules, but rather by ruling out the front location because it has already been visited by the protagonist. As a cross-sectional study, we were also unable

to establish to what extent mentalistic reasoning underpins children's performance on deontic tasks, nor were we able to assess the specific role that language plays in children's task performance. Methodologically, each task was specifically adapted for the Tongan experience, and so it is unlikely that children may have had more experience with each scenario, it is plausible, however, that some scenarios were more easily simulated than others.

## Conclusions

Despite these limitations, the results contribute to ongoing efforts to explore the effects of culture on the developmental progression of social cognition in two ways. First, we add to knowledge of the growing diversity of children's early trajectories of mental state understanding by showing that Tongan children's early understanding of others' behavior was characterized by attention to knowledge and emotion states rather than belief states.

Second, we examined for the first time a range of tasks that included both mentalistic and deontic attributions. The findings reinforced that Tongan children are highly attentive to normative behavior, and that in circumstances where the rule is highly salient and associated with emotion, normative behavior assisted them in making correct predictions about the actions of an individual. The results from this study raise further questions regarding the privileged status of belief attribution and our theoretical framing within developmental psychology, which reinforces an individual cultural mandate in which the successful ascription of 'belief' states is the epitome of an independent self-construal.

Greenfield (2000) proposes a common "deep structure" underlying culture which is characterized by the single postulate of how cultures manage the relationship between the person and the group. Within this theoretical framework, the strength of the links between the self and the group are either maximized in the case of the interdependent ideal or minimized in the independent ideal. From a developmental perspective, we can observe how socialization goals for children are critical in serving developmental cultural mandates that maximize links to either group versus self. Thus, although the ascription of belief and the accompanying reasoning about these belief states may not be a relevant social goal for all children, children the world over successfully engage in their social worlds. How children do this within communities that hold different conceptions of the role of the mind in understanding behavior remains an important question, which we hope this study has gone some way in helping answer.

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## ORCID

Mele Taumoepeau  <https://orcid.org/0000-0002-5015-8151>

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