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RESEARCH ARTICLE

A cross-linguistic approach to children's reasoning: Turkish- and English-speaking children's use of metatalk

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Abstract

When collaboratively solving problems, children discuss information reliability, for example, whether claims are based on direct or indirect observation, termed as "metatalk". Unlike English in which evidential marking is optional, languages with obligatory evidential marking such as Turkish, might provide children some advantages in communicating the reliability of their claims. The current preregistered online study investigated Turkish- and English-speaking 3- and 5-year-old children's ($N = 144$) use of metatalk. The child and the experimenter (E) were asked to decide in which of the two houses a toy was hiding. One house had the toy's footprints. When E left the Zoom meeting, an informant told the child that the toy was in the other house without the footprints in three within-subjects conditions. In the *direct-observation* condition, the child witnessed the informant move the toy. In the *indirect-witness* condition, the informant checked both houses and said that the toy was in the other house. In the *indirect-hearsay* condition, the informant simply said that the toy was in the other house. When E returned, the child had to convince E about how they knew the toy was in the other house using metatalk (e.g., "I saw it move"). Turkish-speaking children used metatalk more often than did English-speaking children, especially in the direct-observation condition. In the two indirect conditions, both groups of 5-year-olds were similar in their use of metatalk, but Turkish speaking 3-year-olds produced metatalk more often than did English-speaking 3-year-olds. Thus, languages with obligatory evidential marking might facilitate children's collaborative reasoning.

KEYWORDS
cross-linguistic differences, evidentiality, metatalk, reasoning

Research Highlights

- Children as young as 3 years of age can produce metatalk.
- Turkish-speaking children produce metatalk more often than English-speaking children.
- The difference between the two linguistic groups is more pronounced at age 3.

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1 | INTRODUCTION

Although reasoning is traditionally viewed as an individual skill, recent theories highlight its social dimension by which speakers present reasons for their proposals and evaluate one another's reasons for their proposals to make joint decisions (Mercier & Sperber, 2011). Our ability to reason with others rests on our uniquely human propensities for cooperation (Tomasello, 2019). When reasoning with another mind, individuals have *cooperative motives*, as they seek a solution that is mutually beneficial; and individuals rely on *cooperative cognition*, as they evaluate the relative strengths of reasons supporting conflicting claims and go with the claim supported by better reasons to make the best decision. In the context of collaborative problem solving, it is important for speakers to refer to the reliability of the evidence or the information sources that their proposals are based on (e.g., whether their proposals based on first-hand observation or indirect observation) to reach the correct joint decision. This kind of reason-giving about the reliability of information sources has been called "metatalk" (Köymen & Tomasello, 2020; Kuhn et al., 2013; Mahr & Csibra, 2018; Resnick, 1991).

Although adolescents have been documented to produce metatalk in their reasoning (Kuhn & Udell, 2003; Kuhn et al., 2013; Papathomas & Kuhn, 2017), recent studies investigated whether young children could produce metatalk. In one study by Köymen and Tomasello (2018), 5- and 7-year-old German-speaking peer dyads were tasked with jointly deciding what a novel creature needed (e.g., its food). Each child individually received conflicting information about the creature's needs from an informant (e.g., that it ate rocks vs. sand). In the critical condition, one informant was more reliable than the other—one child heard a first-hand report from the animal itself ("We eat rocks"), whereas the other child heard a girl's report based on hearsay ("Someone told me they eat sand"). Only the 7-year-olds were able to produce metatalk about the reliability of their information sources (e.g., "with me, there was a selk, and they said they only eat rocks," "she said someone told me"; see also Köymen & Engelmann, 2022). Using the same task, Hartwell et al. (2022) had 5- and 7-year-old English-speaking peer dyads hear both informants together (both informants gave conflicting information and both children within a dyad heard the informants together). Five-year-olds could produce metatalk (e.g., "because she said she knows they eat rocks").

Most relevant to the current study, Hartwell et al. (2022, Study 2) investigated whether younger children, 3- and 5-year-old English-speaking children, could produce metatalk in a task that was less linguistically demanding. That is, instead of listening to informants' testimonies which involved grammatically complex sentences with multiple clauses ("someone told me …", "I heard …"), children witnessed the event themselves and could produce metatalk by simply reporting what they saw. Children teamed up with an adult experimenter to jointly find out in which of three houses a toy was hiding. One house had the toy's footprints in front of it. After choosing the house with the footprints (and before the correct location was revealed), the experimenter left the room, and the child witnessed the toy being moved to a different house without footprints. When the experimenter returned and children proposed a new house, children needed to refute the experimenter's reasoning ("but there are no footprints there?") by producing metatalk about their knowledge access (e.g., "it's in that house now, because I saw it there"). However, neither 5-year-olds nor 3-year-olds engaged in metatalk; they simply stated "it moved" without explicitly mentioning that they actually witnessed the relocation.

All these studies on young children's use of metatalk were carried out with English- or German-speaking children. Languages, however, can differ, with some explicitly marking the reliability of the information through obligatory use of evidential markers. Unlike English and German in which evidential marking is optional (when reporting an event, speakers do not have to state whether they witnessed this event), in languages with grammaticalized evidentiality such as Turkish, it is obligatory to express whether the speaker is reporting direct observation or not. That is, in Turkish, speakers must choose one of two evidential markers attached to the end of the verbs, when reporting past tense events: (1) direct evidential marker *-di* for the events they witnessed (*Çocuk bir elma yeDİ* "The child ate an apple (I saw it)"; (2) indirect evidential marker *-miş* for the events they did not witness (*Çocuk bir elma yeMİŞ* "The child ate an apple (I heard/inferred)"; Göksel & Kerslake, 2005). Turkish-speaking children are reported to correctly use these evidential markers around age 3 in corpus studies (Aksu-Koç, 1988) and around age 6 in experimental studies (Öztürk & Papafragou, 2016), although they use the direct evidential marker earlier and more frequently than the indirect evidential marker (Aksu-Koç, 1988; Uzundağ et al., 2018). Moreover, children are documented to use the indirect evidential marker for different kinds of indirect observations: one for marking an event which was not witnessed at all (Aksu-Koç, 1988) and one for an event which was not witnessed but inferred or discovered (Uzundağ et al., 2018).

Languages with evidential marking provide a special case for investigating the role of language in collaborative reasoning. Stating whether a claim is based on first- or second-hand observation allows speakers to accurately communicate the strength of their claims and listeners to evaluate the reliability of these claims or to be epistemically vigilant (Mercier & Sperber, 2011; Sperber et al., 2010). From a developmental perspective, having to state whether their claims are based on direct or indirect observation might make children (e.g., Turkish-speaking children) more alert to information reliability and communicate the reliability of their claims more effectively through metatalk in their argumentation at an earlier age than children speaking languages with optional evidential marking (e.g., English-speaking children, see Aydın & Ceci, 2009, 2013).

The current preregistered online study, thus, investigated Turkish- and English-speaking 3- and 5-year-old children's use of metatalk. We modified the procedure of Hartwell et al. (2022, Study 2) to an online set-up. The child and the experimenter (E) were asked to decide in which of the two houses a toy was hiding (one house had the toy's footprints). After the child and E chose the house with the footprints, E left the Zoom call. An informant appeared on the screen and told the child that the toy was in the other house without the footprints in three within-subjects conditions. Since Turkish evidential markers distinguish between direct-observation and different kinds of indirect observation, we had a direct-observation condition and two indirect

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observation conditions (indirect-witness and indirect-hearsay). In the *direct-observation condition*, the child witnessed the informant move the toy. In the *indirect-witness condition*, the informant looked inside of both houses, so the child witnessed the informant discover the location of the toy. In the *indirect-hearsay condition*, the informant simply said that the toy is in the other house. When E returned, the child had to convince E about how they knew the toy was in the other house, using metatalk (e.g., "I saw it move," "The girl saw it there," "The girl said it is there"). Like Hartwell et al. (2022, Study 2), we partnered children with an adult experimenter, instead of a peer partner, because we wanted to standardize the number of prompts children received for producing metatalk and the experimenter could simply ask children "why" and elicit metatalk.

We had three sets of predictions. First, we predicted that Turkish-speaking children would produce metatalk more often than English-speaking children, but we expected the difference to be the greatest in the direct-observation condition, especially for 3-year-olds, as English-speaking children are documented to seldomly mark that they witness relocations (Hartwell et al., 2022). In the other two indirect conditions, we predicted that children in both linguistic groups would produce metatalk less often, because (a) they may not try to convince E about something they did not witness, or trust the informants less when they report indirect observations (Köymen & Tomasello, 2018; Lane et al., 2018); (b) Turkish-speaking children would produce the indirect evidential marker less frequently than the direct evidential marker (Aksu-Koç, 1988). We also predicted that the children in both linguistic groups would produce metatalk in similar frequency in the two indirect conditions because they would rely on similar constructions (e.g., "The girl saw it in that house," "The girl said it is in that house"). Second, for the Turkish-speaking sample, we predicted that children would be more likely to use the indirect evidential marker *-miş* more in the two indirect observation conditions than in the direct-observation condition in which they would use the evidential marker *-di* (e.g., *Oyuncağı oraya götürDÜ* "I saw she took the toy there"). Finally, we predicted both linguistic groups would choose the house without footprints or revise their beliefs in all three conditions but might do so more in the direct observation condition in which they witnessed the toy's relocation than in the other two conditions in which they did not witness toy's relocation (Robinson et al., 1999).

We chose to recruit 3- and 5-year-olds because any cross-linguistic differences would likely to be observed in this age range (see Hartwell et al., 2022). We did not include 7-year-olds, because both German- and English-speaking 7-year-olds (speakers of languages without obligatory evidential marking) could produce metatalk in more complex forms (metatalk involving grammatically complex sentences with mental state verbs "She said she knows they eat rocks," Hartwell et al., 2022; Köymen & Engelmann, 2022).

2 | METHOD

The procedure, hypotheses, and statistical analyses are preregistered at https://osf.io/6xrcp[1].

2.1 | Participants

The Turkish-speaking sample based in Turkey included 36 3-year-old (*M* = 3;9 [years; months], *Range* = 3;4–4;0, 15 girls) and 36 5-year-old (*M* = 5;5 [years; months], *Range* = 4;11–6;0, 17 girls) and the English-speaking sample based in the UK included 36 3-year-old (*M* = 3;8 [years; months], *Range* = 3;4–4;1, 16 girls) and 36 5-year-old (*M* = 5;6 [years; months], *Range* = 5;0–5;11, 18 girls). Each child participated in all three experimental conditions.

An additional three English-speaking 5-year-olds and one Turkish-speaking 5-year-old could not be included in the analyses because they could not complete the task due to technical problems (e.g., internet connection breaking, Zoom failing to record, sound cut-off). Also, one 3-year-old Turkish speaking child did not complete the final trial, thus we only included their response for the two trials (out of three). All English-speaking children were exposed to English more than 80% of their time on an average week based on their parents' reports. All Turkish-speaking children were native speakers of Turkish. Participants were recruited through the databases of children whose parents consented their participation in developmental studies and through advertisements through social media. The study was approved by Research Ethics Committees of University of Manchester (2021-0936-20245) and Koç University (2021.300.IRB3.130).

2.2 | Materials

A PowerPoint slideshow with static drawings was presented to participants. There were six trials in total: one warm-up trial, three experimental trials (one in each condition), and two filler trials. In the warm-up and experimental trials, a target object was hidden in one of two houses of different colours. One house had footprints of the target in front of the door, and the other had no footprints. The children with an adult partner (the experimenter) were tasked with finding in which house the target was hidden. In the two filler trials (in between the three experimental trials), children saw a set of footprints and were tasked with guessing to which of the two animals the footprints belonged.

2.3 | Procedure

The animations were built in PowerPoint, and the online meetings were conducted and recorded over Zoom, in which the experimenter shared her screen with the participant. After the technical set-up (screen adjustments and soundcheck), the warm-up trial began. E told the child that they were going to play a hide-and-seek game. There were two empty houses. Then, E introduced the target object on the screen, the snail, "This snail loves to play with paint." Then children saw the snail moving and leaving footprints behind. E then explained, "This snail will hide in one of the two houses, and we will find out which house it is in." On the next slide, the two houses reappeared, only this time the snail's footprints were in front of one of them, and E asked, "In

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which house do you think the snail is? The white house or the black house?" After the child chose the house with the footprints, E asked, "Why do you think it is in the black house?" Most of the participants chose the house with footprints and justified their decision by saying, "because of the footprints." If the child chose the wrong house, made no choice, or did not justify why they had chosen the correct house, E explained to the child that it must be in the house with the footprints, and they agreed to select the house with the footprints. At the end of the trial, children saw that the snail was hidden in the house with the footprints.

Then, the three experimental trials began (one in each condition in counterbalanced order). If the first experimental trial was the *direct-observation condition*, E said they will continue playing hide and seek and introduced the informant (a drawing), "This is [informant's name]. She is going to give us some clues to help us in the game." Then E introduced the target object on the screen, a baby, who likes to play with paint. The procedure proceeded similar to the warm-up phase. E and the child had to decide which house the baby was hiding in. One house had the baby's footprints, which the child and E chose. Right before they were going to see in which house the baby was hidden, E pretended her phone was ringing and told the child that she had to take the call. She told the child to keep looking at the screen while she was gone because the informant would come and help. Then, E pretended to leave the Zoom call by turning off her camera and muting her microphone. The informant appeared on the screen (with a sound effect), went to the house with the footprints and took the baby from that house. Then she cleaned the baby's feet and put the baby inside the house without the footprints. While doing these, she narrated what she was doing with a pre-recorded audio, "I will go to the yellow house now [the house with the footprints]. I'm taking the baby from the yellow house. Now I'll clean the baby's feet. And now, I will walk towards the red house [the house without the footprints]. I'm putting the baby in the red house" (see the Appendix for the wording in Turkish and English). Thus, the child witnessed the relocation of the target object herself/himself. Then, E came back (turned her camera back on and unmuted herself) and asked, "We said the yellow house [the house with the footprints], right? Which one do we choose? The yellow house or the red house?" If the child spontaneously produced metatalk (e.g., "I saw that she moved the toy"; see coding section below for the operationalization of metatalk), E asked, "So which one do we choose then?" If the child chose the house without the footprints without any explanation, E challenged the child's response and said, "But the footprints are in front of the yellow house." If the child did not offer any metatalk, E asked, "Why do we choose the red house?" If the child chose the house with the footprints, the experimenter said, "Hmm, the footprints are in front of the yellow house." Then, if the child did not offer any metatalk, the experimenter asked, "Why do we choose the yellow house?" After the child stated their final decision, they saw the correct answer, that is, the baby was inside the house without the footprints. Children received no feedback and they moved to one of the two filler trials.

In the *indirect-witness condition*, the same procedure was repeated with a new target object, a dog, and a new informant. Everything was the same as the previous condition, except that when E left the Zoom call, the new informant walked towards the house with the footprints first and the other house last. She looked inside each house and narrated, "I will go to the blue house now [the house with the footprints]. Oh, the dog is not in the blue house. Very strange! How can it be? Let me go and check out the green house [the house without the footprints]. Oh, the dog is in the green house." Thus, the child did not see the dog's location, but witnessed the informant discover the dog's location.

In the *indirect-hearsay condition*, the same procedure was repeated with a new target object, a car, and a new informant. Everything was the same as the previous condition, except that when E left the Zoom call, the new informant said, "A girl was here. She went to the orange house [the house with the footprints]. She took the car from the orange house. Then she cleaned the car's wheels. After that, she walked towards the purple house [the house without the footprints]. She put the car in the purple house." Thus, the child did not see the car and only heard the informant's testimony in past tense. In the Turkish script, the informant used the direct evidential marker *-di*.

We used two short filler games in between three experimental conditions to minimize carry over effects. Children saw two objects and a set of footprints. They were asked to choose which of the two objects the footprints belonged. In the first filler they saw an elephant versus a ball and then the footprints of the elephant. In the second filler, they saw a truck versus a frog and then the footprints of the frog. The procedure lasted around 20 min.

2.4 | Coding

First, we coded whether children produced any metatalk, which was defined as any reason explaining how they know the target object's location (witnessing or not witnessing the relocation). Then, for each instance of metatalk, we coded whether this metatalk marked direct or indirect observation. Metatalk marking *direct observation* included justifications which suggested that children witnessed the target object's location, such as:

- (In English) *I saw a little girl put it into that one*; *Maisy moved it, I saw her*.
- (In Turkish) *Bebeği oraya koyDU* 'She put the baby there (I saw it)'; *Bebeği oraya koymuşTU* 'She put the baby there (I saw it)'; *Çünkü onu kırmızı eve koyduğunu görDÜK* 'Because we saw her putting (it) in the red house'; *O evdeyDİ* 'It was in that house (I saw it)'

Metatalk marking *indirect observation* included justifications about:

- their lack of knowledge access, such as:
  - (In English) *I didn't see her take the car from there*
  - (In Turkish) *Mavi evde yokMUŞ, yeşil eve girMİŞ* 'It was not in the blue house, it went into the green house (I heard it)'
- what they heard in the form of reported speech, such as:
  - (In English) *Jenny said it was in that green house*
  - (In Turkish) *Çünkü yeşil evin içinde dedi* 'Because she said that it is in the green house'

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- the informant's knowledge access, such as:
  - (In English) *Because she saw it inside the green house*
  - (In Turkish) *Yeşil eve baktı*, *yeşil evde* 'She looked in the green house, it is in the green house'
- their inferences about the relocation, such as:
  - (In English) *Because she saw it inside the green house, she might have hided the car in the … orange house.*
  - (In Turkish) *Oradan oraya gitMİŞ olabilir* 'It might have moved from there'

For both linguistic groups, if they produced metatalk but it was incorrect (e.g., in the direct-observation condition, the child said he/she "heard" that the baby was in the red house, but she/he actually "saw" the baby), we did not code those as metatalk. Also, occasionally children produced multiple instances of metatalk marking both direct and indirect observation within the same trial, in which case we counted the one that corresponded to the correct metatalk, that is, *direct metatalk* in the direct observation condition, and *indirect metatalk* in the two indirect conditions.

Next, following our preregistration for the Turkish sample, we singled out children's use of the evidential marker *-miş* in their metatalk. Finally, we coded whether children revised their beliefs and chose the house without the footprints.

A Turkish-English bilingual coder, who is blind to the conditions and hypotheses, recoded the presence and the kinds of metatalk in 25% of the transcripts (36 children: 9 in each linguistic group and age group), and the agreement was $\kappa = 0.97$.

3 | RESULTS

The anonymized dataset and the scripts for the statistical analyses can be found at: https://osf.io/fdbcg/. We ran three sets of analyses.

We first analysed whether children's use of metatalk differed across conditions, age groups, and linguistic groups, using Generalized Linear Mixed Models (GLMM) with binomial error distribution. The unit of analysis was each condition. The response variable was the binary measure of whether the child produced metatalk. The full model included the predictors condition (direct-observation, indirect-witness, indirect-hearsay), age (3, 5), linguistic group (Turkish, English), and their three-way interaction; as well as the control predictors of gender and condition order (1-3) and the random intercept of child (because we observed each child in each condition). The null model only included the control predictors and the random intercept. The full model improved the fit as compared to the null model ($\chi^2 = 100.37$, $df = 11$, $p < 0.001$). The three-way interaction between condition, age groups, and linguistic groups was not significant ($\chi^2 = 2.58$, $df = 2$, $p = 0.275$). The reduced model with three two-way interactions, revealed a significant interaction between condition and linguistic group ($\chi^2 = 33.22$, $df = 2$, $p < 0.001$) and a marginally significant interaction between age and linguistic group ($\chi^2 = 3.76$, $df = 1$, $p = 0.053$). Since age did not significantly interact with condition or linguistic group, we removed the two two-way interactions involving age. Thus, the final reduced model included condition, linguistic group, and their interaction, age, gender, condition order, and the random intercept of child (see Supplementary Materials, Table 1 for the model summary). This model revealed a significant two-way interaction between condition and linguistic group ($\chi^2 = 34.76$, $df = 2$, $p < 0.001$) and a significant main effect of age ($\chi^2 = 5.68$, $df = 1$, $p = 0.017$, see Figure 1). Turkish-speaking children produced more metatalk than did English-speaking children in the direct-observation condition and indirect-witness condition (especially in the former), whereas the two linguistic groups produced metatalk equally (in)frequently in the indirect-hearsay condition. Five-year-olds produced metatalk more often than did 3-year-olds, however this age difference was driven by the English-speaking children, hence the marginally significant interaction between age and linguistic group.

Second, we analysed whether Turkish-speaking children's use of the evidential marker *-miş* in their metatalk for indirect observation differed across conditions and age groups, using a GLMM with binomial error distribution. The unit of analysis was each condition. The response variable was the binary measure of whether the child used the evidential marker *-miş*. The full model included the predictors condition (direct-observation, indirect-witness, indirect-hearsay), age (3, 5), and their interaction; as well as the control predictors of gender and condition order (1-3) and the random intercept of child (because we observed each child in each condition). The null model only included the control predictors and the random intercept. The full model improved the fit but only marginally ($\chi^2 = 9.60$, $df = 5$, $p = 0.087$; see Supplementary Materials, Table 2 for the model summary of the full model). Although children used the evidential marker *-miş* more often in the two indirect conditions than in the direct-observation condition, this difference was not significant due to the overall infrequent use of this marker (see Figure 2).

Finally, we analysed whether children's belief revision (switching from the choosing the house with the footprints to choosing the house without footprints) differed across conditions, age groups, and linguistic groups, using the same GLMM model as in the first set of analyses on metatalk. The response variable was the binary measure of whether children selected the house without the footprints. The full model had convergence problems. In our preregistration, we stated that we would run the same analysis for each trial, if we encounter such problems. However, since we did not predict a three-way-interaction, we instead simplified the model by removing the three-way interaction and went ahead with the reduced model with three two-way interactions which did not have convergence problems. This reduced model improved the fit as compared to the null model ($\chi^2 = 92.75$, $df = 9$, $p < 0.001$). However, none of the 2-way interactions was significant (χ^2's < 2.12, p's > 0.347). Then, we removed all the interaction terms from the model, and this final model revealed significant main effects of condition ($\chi^2 = 50.61$, $df = 2$, $p < 0.001$), age group ($\chi^2 = 40.25$, $df = 1$, $p < 0.001$) and condition order ($\chi^2 = 27.49$, $df = 1$, $p < 0.001$; see Supplementary Materials, Table 3 for the model summary). Children were more likely to revise their beliefs in the direct-observation condition than in the indirect-witness condition and in the indirect-hearsay condition ($z = -5.13$, $p < 0.001$, $z = -5.49$, $p < 0.001$ respectively, see

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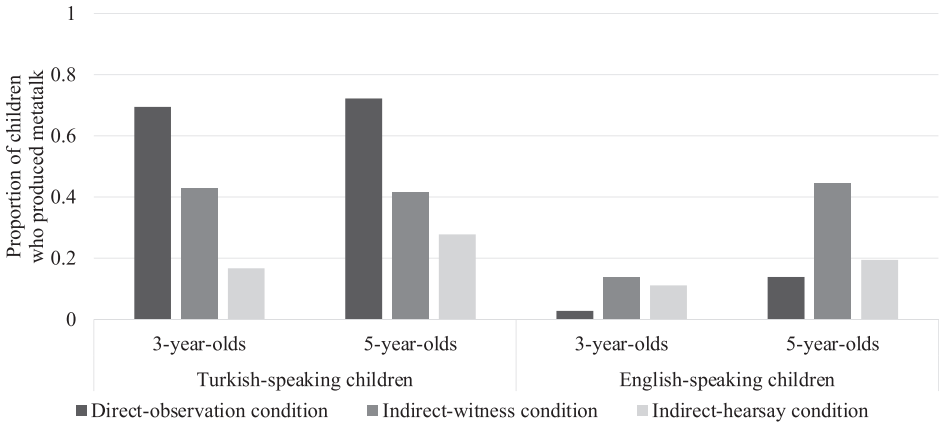


FIGURE 1 Proportion of children who produced metatalk across conditions, age groups, and linguistic groups.

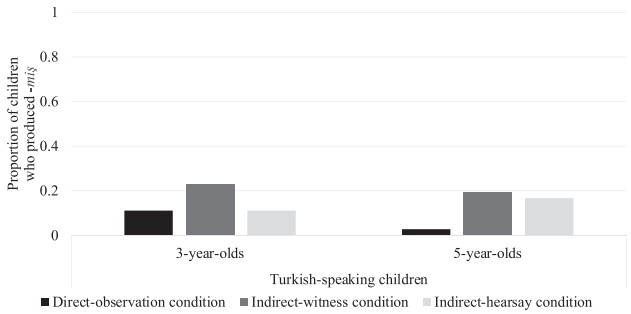


FIGURE 2 Proportion of Turkish-speaking children who used the evidential marker *-miş* across conditions and age groups.

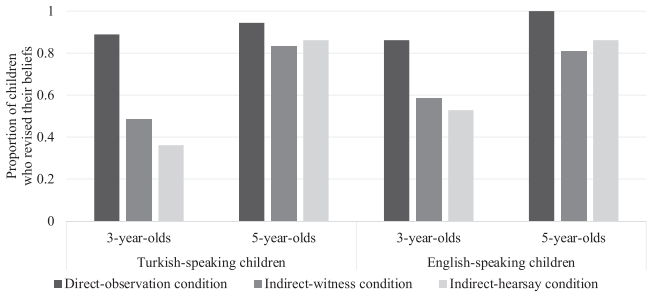


FIGURE 3 Proportion of children who revised their beliefs across conditions, age groups, and linguistic groups.

Figure 3). There was no significant difference between the two indirect conditions ($z = 0.65$, $p = 0.514$). Three-year-olds were significantly less likely to revise their beliefs than 5-year-olds. Children were more likely to revise their beliefs in later trials. It should be noted that there was no significant difference between the two linguistic groups ($\chi^2 = 1.09$, $df = 1$, $p = 0.297$).

4 | DISCUSSION

Our results underline how linguistic properties of a language might provide children with advantages in their production of metatalk and collaborative reasoning. Turkish-speaking children overall produced metatalk significantly more often than did English-speaking children. This difference was greatest in the direct-observation condition; it was smaller in the indirect-witness condition; and it disappeared in the indirect-hearsay condition. Moreover, 5-year-olds produced metatalk more often than did 3-year-olds. This age difference was more pronounced in the English-speaking sample than in the Turkish-speaking sample. In fact, Turkish-speaking 3-year-olds displayed almost the same pattern as the 5-year-olds in their production of metatalk. Thus, our study is first to document that (a) children as young as 3 years of age can produce metatalk and (b) obligatory evidential marking in a language facilitates young children's production of metatalk.

The largest difference between the two linguistic groups was observed in the direct-observation condition, in which children witnessed the informant moving the toy from one house (the house with the footprints) to the other (the house without the footprints). To convince E, children had to say they *saw* the toy in the house without the footprints. Turkish-speaking children predominantly used the evidential marker *-di*, which conveys that they *saw* the toy's location. English-speaking children, on the other hand, almost never marked that they *saw* the toy—a finding that replicates previous studies with English-speaking children (Hartwell et al., 2022). One concern could be that when English-speaking children produced simple sentences in past tense such as "She moved the toy there," they actually meant that they saw the relocation of the toy, and so perhaps our coding did not give enough credit to English-speaking children. However, we observed that English-speaking children produced similar sentences (e.g., "she moved it", "it moved") in all three conditions so we concluded that these sentences may not necessarily indicate that they saw the toy.

The grammatical complexity of metatalk in each language might have also contributed to this difference between the two linguistic groups. Producing metatalk in English requires complex multi-clausal sentence structures (I saw her move it to the other house) whereas in Turkish, this can be expressed in a simple past-tense sentence (*Kız oyuncağı o eve koyDU* 'She moved the toy into that house (I saw it)'). Children who speak languages without obligatory evidential marking, such as English and German, do not frequently produce these complement clause constructions in preschool ages (Brandt et al., 2010;

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Diessel, 2004; Diessel & Tomasello, 2001; Köymen et al., 2016). Thus, being able to express what one witnessed in a grammatically simple sentence could facilitate Turkish-speaking children's production of metatalk and their collaborative reasoning.

In the two other conditions, the indirect-witness condition and the indirect-hearsay condition; however, the metatalk produced by children in both linguistic groups did match in grammatical complexity. In the indirect-witness condition, in which children witnessed the informant discover the location of the toy, both linguistic groups could produce simple sentences in the form of metatalk such as *Kız o eve baktı* 'She looked inside that house (I saw it)'. Turkish-speaking children produced metatalk more frequently than English-speaking children, especially the English-speaking 3-year-olds. Interestingly, English-speaking children produced metatalk most often in the indirect-witness condition. Unlike the other two conditions in which metatalk would often be formulated in grammatically complex sentences, in the indirect-witness condition, English-speaking children could rely on grammatically simple sentences with one clause "She looked inside the box." This might have reduced the difference between the two linguistic groups, particularly with the 5-year-olds.

In the indirect-hearsay condition, in which children encountered hearsay, both linguistic groups produced metatalk equally infrequently and mostly in the form of reported speech (also grammatically complex sentences) such as "a girl said it is in that house." One explanation for the difficulty for the indirect-hearsay condition for both linguistic groups is that what the informant said was not supported by visuals as it was in other two conditions. That is, in the direct-observation condition and the indirect-witness condition, the informant moved the toy or checked the inside the boxes, as she narrated what she did. In the indirect-hearsay condition, however, children had to produce metatalk solely based on what the informant said, which is cognitively and linguistically more demanding to process.

Although the linguistic properties of a language force speakers to clearly convey what they did or did not witness in grammatically simple sentences, we argue that the main advantage for Turkish-speaking children was that they could be more flexible in their argumentation and could express metatalk to support their claims in more diverse ways than English-speaking children could. They could rely on evidential markers, as well as other strategies that English-speaking children relied on, such as describing what the informant saw ("she checked the houses") and reported speech ("she said it was in that house"). As the analysis on Turkish-speaking children's use of the indirect evidential marker *-miş* suggests, children did not use *-miş* very frequently in line with the previous literature (Uzundağ et al., 2018). Similarly, a study with Quichua speakers (a language with grammaticalized evidential markers) living in a small-scale society, showed that speakers do not always use the indirect evidential marker (Castelain et al., 2019). Thus, the presence of evidential markers might get children in the habit of communicating the reliability of their claims accurately in their argumentation, even if they do not always rely on these markers (Aydın & Ceci, 2009; Castelain et al., 2019).

The difference between linguistic groups was more pronounced amongst 3-year-olds than 5-year-olds. In other words, Turkish-speaking 3-year-olds showed the same pattern as 5-year-olds. This earlier use of metatalk might be mostly due to the affordances of the language: Turkish-speaking 3-year-olds could rely on grammatically simple sentences to convey what they witnessed and what they did not witness. At age 5, as English-speaking children's linguistic abilities, particularly their production of grammatically complex sentences, advance (Ambridge & Lieven, 2011; Diessel, 2004), the language advantage weakened or even disappeared in our indirect-witness and indirect-hearsay conditions.

Our findings have implications for children's belief revision based on testimony. When we analysed children's belief revision based on their observations of the informants, we found no difference between the linguistic groups: children revised their decisions and chose the house without the footprints more often in the direct-observation condition, when they saw the toy's location, than in the other two conditions. The lack of difference between the two linguistic groups in their choices is likely due to the fact that children could rely on the visuals only for making this decision and not necessarily on verbal testimony. Thus, seeing the toy's location first-hand in the direct-observation condition might have overridden the verbal testimony in the two indirect-observation conditions (hence the main of condition in belief revision), especially for 3-year-olds. Although research suggests that children trust verbal testimony and revise their beliefs, particularly when the informants' claims are based on first-hand observation ("I saw X," Koenig, 2012; Lane et al., 2018; Mercier et al., 2014; Rakoczy et al., 2022; see also Jaswal, 2010), our results suggest that children trust their direct observation more often than they trust verbal testimony (Robinson et al., 1999).

4.1 | Limitations and future directions

Although studies suggest that providing metatalk predicts better decision making (Köymen et al., 2020), we cannot say much about whether producing metatalk facilitated making better decisions or whether the linguistic properties of the language mediated this relationship. In our study, children had an adult partner, and we standardized the amount of resistance the partner displayed (e.g., if children proposed the house without the footprints, the partner challenged this by saying, "but footprints are towards the other house"). However, at the end, the adult partner let the child decide. If children were partnered with same-age peers who would contribute to the decision-making, children who produced metatalk would arguably be more convincing and end up making better decisions with their partners than those children who did not produce metatalk for their partners. Thus, future cross-linguistic studies could investigate whether producing metatalk predicts good collaborative decisions and whether linguistic properties of the language mediate this relationship.

5 | CONCLUSION

The structural properties of languages (e.g., presence of grammaticalized evidential markers) seem to influence how well children can

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provide reasons in the form of metatalk when supporting their claims. Languages with obligatory evidential marking may not only get children in the habit of expressing whether their claims are based on first-hand observation or not, but also equip children with a wider range of linguistic strategies to choose from and allow them to clearly communicate the reliability of their claims. Cross-linguistic studies like ours highlight how different linguistic contexts support children's reasoning and collaborative problem solving.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The procedure, hypotheses, and statistical analyses are preregistered at https://osf.io/6xrcp. The anonymized dataset and the scripts for the statistical analyses can be found at https://osf.io/fdbcg/.

ETHICAL STATEMENT

The procedure of the study reported in this manuscript was approved by Research Ethics Committees of University of Manchester (2021-0936-20245) and Koç University (2021.300.IRB3.130) in accordance with the Declaration of Helsinki.

ENDNOTE

[1] In the preregistration, the condition labels are slightly different. The indirect-witness condition is referred to as indirect-observation condition 1; the indirect-hearsay condition is referred to as indirect-observation condition 2.

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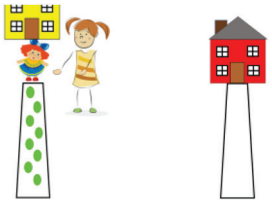
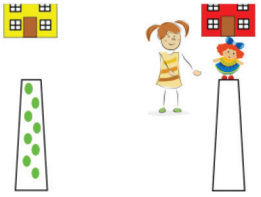
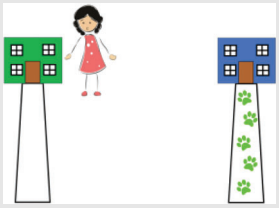
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APPENDIX 1: STIMULI AND NARRATION IN TURKISH AND ENGLISH

Condition	First Slide		Last Slide	
Direct-observation				
	ENGLISH: I'm here! I will go to the yellow house now. I'm taking the baby from the yellow house. Now I'll clean the baby's feet.	TURKISH: Ben geldim! Şimdi sarı eve gideceğim. Bebeği sarı evden alıyorum. Şimdi bebeğin ayaklarını temizleyeceğim.	ENGLISH: And now, I will walk towards the red house. I'm putting the baby in the red house.	TURKISH: Şimdi de, kırmızı eve doğru yürüyeceğim. Bebeği kırmızı eve koyuyorum.
Indirect-witness				
	ENGLISH: I'm here! I will look at the blue house now. Ooh! The dog is not in the blue house. Very strange! How can it be?	TURKISH: Ben geldim! Şimdi mavi eve bakacağım. Aaa! Köpek mavi evde değil. Çok garip! Nasıl olabilir?	ENGLISH: Let me go and check out the green house. Ooh! The dog is in the green house.	TURKISH: Bir de gidip yeşil eve bakayım. Aaa! Köpek yeşil evde.
Indirect-hearsay				
	ENGLISH: A girl was here. She went to the orange house. She took the car from the orange house. Then she cleaned the car's wheels.	TURKISH: Bir kız geldi. Turuncu eve gitti. Arabayı turuncu evden aldı. Sonra, arabanın tekerlerini temizledi.	ENGLISH: After that, she walked towards the purple house. She put the car in the purple house.	TURKISH: Ondan sonra, mor eve doğru yürüdü. Arabayı mor eve koydu.

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