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What's the Evidence Say? The Relation Between Evidential-Trust and Theory of Mind

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ABSTRACT

Previous research has shown that linguistic cues such as mental and modal verbs can influence young children's judgments about the reliability of informants. Further, certain languages include grammatical morphemes (i.e. evidential markers), which clarify the source of information coming from testimony (e.g., Bulgarian, Japanese, Turkish). Accordingly, the first aim of the current study is to examine whether Turkish-speaking children's reliability judgments change based on evidential markers (i.e. the past-tense *direct* evidential marker, *-DI*, and the past-tense *indirect* evidential marker, *-mİş*). The literature has also investigated whether selective trust abilities are related to understanding the epistemic states of others (i.e., Theory of Mind). Therefore, the second aim is to examine the relation between selective trust based on evidential markers and ToM abilities by including a comprehensive ToM battery. Eighty-six Turkish-speaking pre-school and elementary school children between the ages of 4 and 7, residing in a metropolitan city in Turkey, participated in a selective trust task based on evidential markers, a general language task, and a ToM battery. The results of the current study showed that after the age of 6, Turkish-speaking children start to selectively trust the informant using the past-tense direct evidential marker, *-DI*, over the past-tense indirect evidential marker, *-mİş*. Selective trust performance was related to receptive vocabulary but not to ToM abilities after controlling for participant gender and age. Overall, the results contribute to current discussions about children's selective trust ability based on linguistic cues and its relation with ToM.

KEYWORDS

selective trust; theory of mind; evidential markers; reliability; Turkish

Due to its opaqueness, children need reliable testimony to learn cultural knowledge about many aspects of the physical and social world. Learning about sources of testimony is thus necessary to grasp whether such information is reliable or not. In order to explore the reliability of testimony, questions such as “Based on what?” or “Where did you get your information?” could be asked. The informant's reply could be based on *direct* (first-hand) experience such as “I saw the event,” or *indirect* (second-hand) experience, “I heard it from someone.” Research has shown that by the age of 3, children's judgments about the reliability of informants vary based on (non-linguistic) epistemic cues such as past accuracy (Jaswal & Neely, 2006; Koenig & Harris, 2005; Pasquini, Corriveau, Koenig, & Harris, 2007) and social cues such as familiarity (Corriveau & Harris, 2009). Children also use language cues that could be both epistemic and social (Corriveau, Kinzler, & Harris, 2013). Certain

languages include grammatical morphemes (i.e., evidential markers) to clarify the *source* of testimony (e.g., Turkish, Bulgarian, Japanese). Accordingly, children may use these linguistic cues (i.e., evidential markers) to selectively trust a given informant. One of the main aims of the current study is to explore whether Turkish-speaking children's reliability judgments about a source of testimony are influenced by the use of evidential markers.

Research has also examined whether selective trust skills are related to one's understanding of epistemic states based on false-belief comprehension (Fusaro & Harris, 2008; Lucas, Lewis, Pala, Wong, & Berridge, 2013; Pasquini, Corriveau, Koenig, & Harris, 2007). Koenig and Harris (2005) originally found that 4-, but not 3-year-olds, selectively trusted a consistently accurate informant over a consistently inaccurate informant. The authors suggested that the inability of 3-year-olds was due to a lack of false-belief comprehension for deciding whom to trust. While subsequent research showed that 3-year-olds could also use epistemic cues, there are mixed findings on the relation between false-belief comprehension and selective trust performance. First, research showed that 3-year-olds could succeed on tasks that require selective trust toward accurate informants if additional induction trials were used (i.e., 4 instead of 3, Birch, Vauthier, & Bloom, 2008; Pasquini, Corriveau, Koenig, & Harris, 2007). Second, for studies using the same number of induction trials, a relation between false-belief comprehension and selective trust performance has not always been found (Koenig & Harris, 2007; Pasquini, Corriveau, Koenig, & Harris, 2007). However, other studies did find a relation between false-belief and selective trust (DiYanni, Nini, Rheel, & Livelli, 2012; Fusaro & Harris, 2008; Lucas, Lewis, Pala, Wong, & Berridge, 2013) or between a knowledge-ignorance and trust (Allen, Sümer, & Ilgaz, 2021).

The selective trust task in the current study was focused on linguistic cues (i.e., evidential markers), which provide information about the *quality* of evidence that informants have (indirect vs. direct) for making claims. Because evidentiality has been linked to false-belief understanding (Aksu-Koç, Ögel-Balaban, & Alp, 2009), the selective trust task in the current study might also involve an understanding of mental states. Accordingly, the current study included a Theory of Mind (ToM) battery to investigate whether Turkish-speaking children's ToM abilities are related to a selective trust task that uses evidential markers (i.e., evidential-trust).

Selective trust based on linguistic and non-linguistic Cues

Research has shown that children can use a variety of non-linguistic cues to evaluate the reliability of informants (e.g., Fusaro & Harris, 2008; Jaswal & Neely, 2006; Koenig & Harris, 2005; Robinson & Whitcombe, 2003). By the age of four, preschoolers' reliability judgments are influenced by non-linguistic cues such as accuracy from past utterances, accessibility to information, and bystanders' gestures (i.e., non-verbal signs of approval and disapproval). For a powerful example, Robinson and Whitcombe (2003) showed that children could effectively use perceptually relevant information about an object's location to make trust judgments. In that study, children were asked to decide which of two objects, identical except for their color, was in an opaque tunnel. Children selectively trusted an informant who had visual access to the object over tactile access through touch (and vice versa).

The literature also provides evidence for children's use of linguistic cues (e.g., mental and modal verbs, and adjuncts) to evaluate a speaker's certainty in English-speaking children by five years of age (e.g., Hirst & Weil, 1982; Moore, Bryant, & Furrow, 1989; Moore, Pure, &

Furrow, 1990). For instance, children selectively trusted the informant who stated the object's location with "know" statements over "think" statements (Moore, Bryant, & Furrow, 1989). Children also selectively trusted the informant with "must" statements over "might" and "could" statements. Another type of linguistic cue that seems to influence children's reliability judgments is evidential markers. Evidential markers (i.e., grammatical morphemes specific to some languages) indicate the source of a speaker's knowledge, which allows the listener to evaluate the reliability of the given information. Previous research has shown that Bulgarian-, Japanese-, and Turkish-speaking children begin to evaluate a speaker's reliability based on evidential markers in the early school-age years (e.g., Fitneva, 2008; Matsui, Yamamoto, & McCagg, 2006; Ozturk & Papafragou, 2016).

Evidentiality

Evidentiality enables listeners to evaluate information in terms of its source. There are various types and levels of evidential markers that are used in different languages. In English, the source of knowledge is typically indicated through lexical items (e.g., I *saw* that the vase was broken vs. I *heard* that the vase was broken), or a qualifier (e.g. apparently, reportedly, etc.) can be added to the sentence to express that the information is not a result of direct/perceptual experience (Tosun, Vaid, & Geraci, 2013). However, the grammatical structures of some languages allow their users to express the source of information through verbal affixes or particles. Further, for most of these languages, the use of evidentiality is grammatically obligatory (e.g., Turkish, Bulgarian) in that the source *must* be indicated.

Selective Trust Based on Linguistic and Non-linguistic Cues

Two verb suffixes in Turkish (*-DI* & *-mİş*) indicate the source of a speaker's knowledge and the use of them is required when referring to the past (Aksu-Koc, 1988).¹ Past-tense *direct* evidence for the speaker's information can be indicated through *-DI*. In contrast, *-mİş* is used for past-tense *indirect* evidence that includes both hearsay and inference (for more on the use of the past-tense indirect evidential marker, *-mİş*, see Slobin & Aksu, 1982):

- (1) Vazo kırıl – di.

Vase break – PAST. Direct

The vase was broken; I saw that.

- (2) Vazo kırıl – mış.

Vase break – PAST. Indirect

'The vase was broken; I heard this./I have made an inference on the basis of some observable evidence.'

Both sentences refer to an event that happened in the past, but sentence (1) indicates that the speaker has direct/perceptual evidence for the event while sentence (2) indicates that the

¹There is also another evidential marker (*-DIR*) used for the present tense and allows speakers to make a logical deduction about facts and regularities (for more on the types of evidential markers in Turkish, see Aksu-Koc, Ögel-Balaban, & Alp, 2009).

speaker has indirect evidence for the event such that it is either heard from someone else or inferred through existing knowledge (e.g., seeing cracks from where the vase has been glued).

Production and Comprehension of Evidentials for Turkish-Speaking Children

Turkish-speaking children's production of evidential markers is earlier than their comprehension. Turkish-speaking children start to *use* the direct evidential marker *-DI* from an early age (1.5–2 years) while expressing what they observe. Their use of the indirect evidential marker *-mİş*, happens a few months later in the context of joint attention with adults to express the state of attending to an object. For instance, looking for a toy: “Bak, buraday-mış!” (“Look, [I have realized] it is here;” Aksu-Koc, 1988; Aksu-Koç, Ögel-Balaban, & Alp, 2009). Relatively complex uses of *-mİş* involving inference are observed in Turkish-speaking children's speech at around two years of age, for example, realizing that a toy was broken: “Burası çık-mış” (“[To my surprise] This part has come off”). This example suggests that toddlers can differentiate knowing through direct experience from inferences based on evidence (i.e., seeing broken parts of the toy). The hearsay form of *-mİş* also begins to be *used* around the same age, for example, expressing a heard statement of the mother: “Anne saçını kestirecekmiş” (“[I am told that] Mother will have a haircut”). In short, by around two years of age, Turkish-speaking children can use language that reflects epistemological states that are based on either perceptual or non-perceptual (i.e. purely linguistic) content (Aksu-Koç, Ögel-Balaban, & Alp, 2009).

In contrast to production, Turkish-speaking children's comprehension of evidential markers seems to develop much later (Aksu-Koc, 1988). Aksu-Koc (1988) conducted a study on Turkish-speaking children's comprehension of the *inference* function of *-mİş* (indirect evidential marker) where an informant had either direct or indirect evidence about an event (e.g., observing *the breaking* of a vase vs. inferring it from *the already broken* vase). Then children were asked to identify which evidential marker (i.e., *-mİş* or *-DI*) should be used by the informant. The results showed that Turkish-speaking children have difficulty in identifying which evidential marker should be used by the informant up until around the age of 6. Aksu-Koc (1988) also conducted a comprehension study on the *hearsay* function of *-mİş*. In that study, Turkish-speaking children were told a story by an informant and asked where they got the information and whether they saw the event in the story or not. The results showed that Turkish-speaking children's “full” comprehension of the hearsay function of *-mİş* was not until around 6 years of age. Ünal and Papafragou (2016) also conducted a series of experiments on the production and comprehension asymmetries in the development of Turkish evidentiality. That study found a delay in Turkish-speaking children's evidential comprehension (i.e., production at around 3-years of age and comprehension at around 6-years of age). The delay persisted across multiple tasks although the memory and metalinguistic demands were minimized. That is, even when there was no need to match two different characters or two different knowledge sources (i.e., perceptual vs. inferential) with two different evidential morphemes (i.e., direct vs. indirect) for a given story.

Evidentiality as a Cue for Selective Trust

In order to measure the relation between children's false-belief understanding and evaluations of informant certainty based on comprehension of evidential markers (i.e., evidential-

trust), Matsui, Yamamoto, and McCagg (2006) presented Japanese-speaking children with conflicting statements. These conflicting statements were based on the evidential markers –*yo*, which marks direct evidence, and –*tte*, which marks indirect evidence about an object's location. Results indicated that Japanese-speaking children who were 6-year-olds performed above chance in terms of preferring the informant using the direct evidential marker –*yo* over the indirect evidential marker –*tte*. Evidentiality and trust has been also studied with a Turkish sample (Ozturk & Papafragou, 2016). In their paradigm, Ozturk and Papafragou found results similar to the Japanese study. That is, Turkish-speaking children used evidentiality as a cue for reliability starting around age 6.

Fitneva (2008) conducted a similar study with Bulgarian-speaking children; however, Bulgarian-speaking children's use of evidentiality for selective trust judgments seemed not to develop until 9 years of age. Bulgarian evidentiality differs from the evidential systems in other languages (e.g., Japanese, Korean, and Turkish). It provides a more precise distinction between the modality (i.e., perceptual vs. cognitive) and authorship (first-hand vs. second-hand) of information. First-hand vs. second-hand evidence could refer to an event for which the informant provides either perceptual information (e.g., “She *saw* the event.”) or cognitive information (e.g., “She *thought* about the event.”) However, Japanese, Korean, and Turkish do not explicitly mark the distinction between modality and authorship. The indirect evidential markers in Japanese and Turkish encompass both perceptual (i.e., hearsay) and cognitive (i.e., inference) information, and Korean only provides “hearsay” for second-hand information. In addition, the task questions in the Fitneva (2008) study were based on vignettes but both studies with Japanese (Matsui, Yamamoto, & McCagg, 2006) and Turkish (Ozturk & Papafragou, 2016) samples were based on short statements uttered by informants. However, none of the targets of the conflicting statements in these studies were real objects; instead, they were animated figures or agents from vignettes which might influence children's evaluation of the source reliability.

Selective Trust and Theory of Mind (ToM)

Starting around age 3, children can use both social and epistemic cues to indicate informant reliability; however, only by age 4 do children seem to switch from social cues to more relevant epistemic cues (Harris & Corriveau, 2011; Harris et al., 2012). Whether this age 4 transition is accounted by developments in false-belief understanding remains an open question. Some researchers have proposed that children's performance on selectively trusting the accurate informant does not require explicit mental state attribution (Birch, Vauthier, & Bloom, 2008; Nurmsoo & Robinson, 2009). Further, some studies have failed to find a relation between false-belief tasks and performance on selectively trusting an accurate informant (Allen, Sümer, & Ilgaz, 2021; Pasquini, Corriveau, Koenig, & Harris, 2007). However, other studies have found a relation (DiYanni, Nini, Rheel, & Livelli, 2012; Fusaro & Harris, 2008; Lucas, Lewis, Pala, Wong, & Berridge, 2013).

Lucas, Lewis, Pala, Wong, and Berridge (2013) found a Turkish advantage for both selective learning based on accuracy and false-belief understanding compared to their Chinese and English peers. These authors suggested that the reason for the advantage may be due to Turkish grammar in terms of evidentiality. If children are required to monitor the source of information (i.e. whether it is direct vs. indirect), then perhaps that creates an advantage for tracking reliability and perspective. Further, Aksu-Koç, Ögel-

Balaban, and Alp (2009) has argued that exposure to evidential markers may facilitate reasoning about who knows what and may lead to an advantage on false-belief tasks. Obligatory production of one's own and others' source of knowing through evidential markers, might also boost children's reliability judgments about informants' perspectives (interestingly, Allen, Sümer, & Ilgaz, 2021 found a relation between a knowledge-ignorance tasks and trust judgments but not false-belief understanding with a Turkish sample). Therefore, evidentials could help Turkish-speaking children to more easily develop both selective learning and false-belief understanding, which might "... have further mediating effects on each other" (Lucas, Lewis, Pala, Wong, & Berridge, 2013).

Ünal and Papafragou's (2016) study also provided evidence that the delay in Turkish-speaking children's evidential comprehension results from difficulty in understanding others' knowledge and perspectives. Specifically, they found that even when the evidential language is removed from a source-monitoring task, children's difficulty in tracking the other's source knowledge persists. Similarly, Aksu-Koc (2009) argues that evidential comprehension requires representing the speaker's "knowledge perspective" to identify the source of information on a given event. Although the conceptual justification for a link between evidential-trust and false-belief understanding is sound, Matsui, Yamamoto, and McCagg (2006) did not find a relation between the two. To our knowledge, this is the only study in the literature looking at the relation between children's ToM abilities and selective trust in which evidential markers were used as a cue for the informants' reliability. However, that study only included two measures of false-belief understanding, a first-order change of locations task and an unexpected contents task. Accordingly, in the current study, a more comprehensive measure of ToM abilities was included to explore the types of psychological perspective-taking that might be relevant for selective learning based on evidential cues.

One type of ToM abilities that might be particularly relevant for evidential-trust is to understand that having different sources of information may lead to different interpretations of the same situation. Therefore, the current study included an ambiguous figures task (Carpendale & Chandler, 1996) to investigate whether there is a relation between interpretive ToM and evidential-trust. In addition, a battery of ToM tasks was used that included first- and second-order false belief, hidden-emotions and appearance-reality. Finally, the current study is also the first to control for general language ability while testing for a relation between ToM and evidential-trust. Given the linguistic demands on the evidential-trust task (i.e., understanding the linguistic nuance in the testimony of the informants), the current study included a receptive measure of language ability.

Current study

The current study aimed to investigate how Turkish-speaking children's reliability judgments are influenced by linguistic cues. In the evidential-trust task, children were presented with two informants, one of whom always used the *past-tense direct* evidential marker, *-DI*, and the other one who always used the *past-tense indirect* evidential marker, *-mİş*. The informants provided conflicting information about the previous state of a target object (e.g., last night, a blue notebook as the target object, was described as having been yellow by one informant and green by the other informant). Children were expected to selectively trust the informant who always used the *past-tense direct* evidential marker, *-DI*, over the informant, using the *past-tense indirect* evidential marker, *-mİş*, for an event that happened "last

night.” As a past-tense marker, using a specific point in the past provides children with a more linguistically natural context for the suffix (i.e., increases the ecological validity of the task). Based on past research on evidential comprehension (Aksu-Koc, 1988; Ünal & Papafragou, 2016) and evidential-trust (Matsui et al., 2006 and Ozturk & Papafragou, 2016), children 6 and older were expected to perform better than chance in the evidential-trust task. However, it was also expected that evidential-trust performance would increase with age.

The second aim was to explore whether Turkish-speaking children’s reliability judgments based on evidential markers are related to their ToM abilities. Children with better ToM abilities were expected to have better performance on the trust task such that they would selectively trust the informant with the direct evidential marker, *-DI*, over the informant with the indirect evidential marker, *-mİş*, after controlling for children’s age and receptive vocabulary.

To our knowledge, this is the first study that investigates the relationship between ToM abilities and evidential-trust with a comprehensive ToM battery that includes not only standard false belief tasks (i.e., change of location and unexpected contents), but also ambiguous figures, hidden emotions, second-order false-belief, and appearance-reality. Further, real target objects (i.e., concrete referents) were used to explain an event that happened at a specific point in the past (i.e., “last night”) and the conflicting information was given by real people (although in a video format). In contrast, previous evidential-trust studies used animated figures or characters from vignettes. Thus, the current study provided more ecologically valid statements with children that could help them to better evaluate the informants’ source reliability.

Method

Participants

Eighty-six Turkish-speaking preschool and elementary school children (45 female) between the ages of 4 and 7 were recruited for the study from Turkish schools in a metropolitan city, also the capital of Turkey, Ankara: Twenty-seven 4-year-olds ($M = 53.89$ months, $SD = 4.61$, range = 46–61; 13 female), thirty-three 6-year-olds ($M = 77.42$ months, $SD = 4.47$, range = 69–83; 19 female), and twenty-six 7-year-olds ($M = 88.73$ months, $SD = 3.56$, range = 84–94; 13 female). All children were native speakers of Turkish and children participated with the written consent of their parents. A post-hoc statistical power analysis (G*Power 3.1; Faul, Erdfelder, Buchner, & Lang, 2009) revealed that our sample size of 76 participants with the four predictors used in the multiple regression would yield a power of 0.83 for the effect size of ($f^2 = 0.18$). Before the study began, Institutional Review Board approval was obtained from Bilkent University and permission was granted from the Ministry of Education of Turkey.

One 7-year-old (female) and four 6-year-olds (two female and two male) had missing data on the ToM battery (i.e., all of the ToM tasks) and language task (i.e., TIFALDI-receptive) because they did not want to play anymore. Due to an experimenter error, one 6-year-old (male) and one 7-year-old (male) child had missing data on the language task. One 4-year-old (female) and one 6-year-old (female) had evidential-trust scores that were excluded from the analyses due to being outliers

Table 1.

	<i>N</i>	# Missing points (%)	<i>Range</i>	4-year-olds		6-year-olds		7-year-olds	
				<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>	<i>M</i> (<i>SD</i>)	<i>n</i>
Evidential-Trust		2 (2%)	0–5						
Male	41			2.29 (1.00)	14	2.57 (0.85)	14	2.54 (1.05)	13
Female	43			2.33 (0.88)	12	3.05 (0.73)	18	3.38 (1.12)	13
Total	84			2.31 (0.93)	26	2.84 (0.80)	32	2.96 (1.15)	26
Ambiguous Figures		5 (6%)	0–1						
Male	39			0.43 (0.51)	14	0.42 (0.51)	12	0.77 (0.33)	13
Female	42			0.46 (0.51)	13	0.88 (0.51)	17	0.75 (0.43)	12
Total	81			0.44 (0.51)	27	0.69 (0.47)	29	0.76 (0.43)	25
Unexpected Content Total		5 (6%)	0–2						
Male	39			0.93 (0.73)	14	1.58 (0.67)	12	1.77 (0.44)	13
Female	42			0.77 (0.60)	13	1.76 (0.44)	17	1.58 (0.67)	12
Total	81			0.85 (0.66)	27	1.69 (0.54)	29	1.68 (0.55)	25
Hidden Emotions		5 (6%)	0–1						
Male	39			0.21 (0.43)	14	0.41(0.51)	12	0.38 (0.50)	13
Female	42			0.31 (0.48)	13	0.65 (0.49)	17	0.66 (0.49)	12
Total	81			0.26 (0.45)	27	0.55 (0.51)	29	0.52 (0.50)	25
First & Second-order FB		5 (6%)	0–2						
Male	39			0.71 (0.61)	14	1.25 (0.75)	12	1.62 (0.65)	13
Female	42			0.61 (0.65)	13	1.53 (0.62)	17	1.58 (0.51)	12
Total	81			0.67 (0.62)	27	1.41 (0.68)	29	1.60 (0.58)	25
TIFALD-Receptive		8 (9%)	0–104						
Male	36			61.62 (17.13)	13	77.00 (11.88)	11	90.83 (4.39)	12
Female	42			58.92 (12.55)	13	86.12 (5.78)	17	89.08 (5.90)	12
Total	78			60.27 (14.78)	26	82.54 (9.62)	28	89.96 (5.16)	24

and one 6-year-old (male) child's language score was also an outlier (i.e., scores higher than Quartile 3 + 1.5 × interquartile range or lower than Quartile 1–1.5 × interquartile range). Little's MCAR test was conducted to check whether the values for all constructs were missing at random (i.e., evidential-trust task, all tasks in the ToM battery, the language task, age, and gender). The MCAR test was nonsignificant, $X^2 = 20.60$, $df = 26$, $p = 0.764$. Therefore, we concluded that no biases should be expected due to the missing values. (See Table 1 for the number and gender of participants in each task by age).

Materials

For the trust task, children were shown videos of two informants for each trial on a 13-inch laptop. Videos for each trial were recorded beforehand using two similar-looking females with either blue or red colored t-shirts. For the warm-up trials, a teddy bear was used to show the current state of the target object. For the five test trials, different target objects were used: a blue notebook for color, a middle-sized play-though for size, a clean whiteboard for pattern, a circle play-dough for shape, and a plush panda for location properties. Two pictures of possible old versions of the target objects that differed in color, shape, pattern, size, or location were also included in the test trials. The current state of the actual object was held by the experimenter and shown to the participants during the given warm-up and test trials.

Measures

Language Task

The receptive subtest of the Turkish expressive and receptive language test (TİFALDİ, Berument & Güven, 2010) was used to assess children's language. For this task, children were asked to find the object that was labeled by the experimenter from four pictures on a given page. The number of items for the receptive subtest was 104 (max. score 104).

Theory of Mind (ToM) Task

To evaluate children's ToM understanding, six tasks were included: ambiguous figures (AF, Carpendale & Chandler, 1996), hidden emotions (HE, Wellman & Liu, 2004), unexpected contents, including both self- and other-oriented questions (UC, Wellman & Liu, 2004), first-order false-belief (FB1), second-order false-belief (FB2, Astington, Pelletier, & Homer, 2002), and appearance and reality (AR, Flavell, Flavell, & Green, 1983). All tasks were adapted to Turkish by our lab through translation and back translation and have been used in other studies (total score "6"²).

Design and Procedure

The experiment included two testing sessions that were held approximately one week apart. Both sessions were conducted individually in a separate room at children's schools and each session took approximately 30 minutes. In the first session, the evidential-trust task³ was completed and in the second session, both the ToM battery and TIFALDI-receptive were completed. A 13-inch laptop computer was used in the evidential-trust task that included the videos of the two informants. After seeing the related videos of informants on each trial, the experimenter repeated what the informants said and asked a related question based on the protocol (see [Appendix](#)). There were two warm-up trials before the test trials.

Warm-Up Trials

Warm-up trials were used to acquaint children with the two informants and their use of evidential markers in the statements as each informant continued to use the same evidential marker (*-mİş* or *-DI*) for a given child's evidential-trust task. While holding a teddy bear in her hand, the experimenter started a video of one of the two informants. In the video, the informant gave information about what the teddy bear was doing last night using an evidential marker (*-mİş* or *-DI*). Then the experimenter put two pictures in front of the participant in which the teddy bear was either *sleeping* or *walking*. One of the pictures was consistent with what the informant said and the other one was not. Then the experimenter repeated what the informant said while referring to her with the T-shirt color and children were asked to pick the picture that reflected what the teddy bear did last night. After the child pointed out the correct picture, the experiment continued to the second warm-up

²Note that the appearance-reality task was excluded from all analyses. See ToM results section for details.

³Two additional conditions were piloted for a second study in which the direct evidential marker was pitted against the indirect marker with a source (e.g., "best friend"). Both of these conditions were conducted after the current trust task was completed.

trial. In the second trial, the second informant stated the other possible action of the teddy bear (*sleeping* or *walking*) with the other evidential marker (*-mİş* or *-DI*), and after repeating what was said by the second informant, children were asked to pick from the same pictures.

During the warm-up trials, the experimenter held the teddy bear in her hand to highlight that informants were mentioning a previous state of the teddy bear (i.e., *walking* or *sleeping*). If the child answered incorrectly in one of the warm-up trials, the same trial was repeated until the child answered correctly. In the warm-up trials, the informants' t-shirt color (red or blue) and the verbs used (*sleeping* or *walking*) were counter-balanced across participants. Thus, each participant saw a particular informant with either a red or blue t-shirt, but whether that particular informant wore a red or blue t-shirt varied across participants. Each participant heard a particular informant use either the direct evidential marker, *-DI*, or the indirect evidential marker, *-mİş*, but whether that particular informant used the direct evidential marker varied across participants (see [Appendix](#)).

Test Trials

The trials always began with the same two informants from the warm-up trials but the videos were placed side by side instead of appearing one at a time. The test phase included five trials in which the two informants provided conflicting statements about the target object. There were five trials where a property was used to provide conflicting statements about the target object. The five properties included: color (i.e., yellow vs. green), size (small vs. big), pattern (lined vs. dotted), shape (triangle vs. square), and location (under the bed vs. on the table). The current state of the target objects was shown to the participants while doing the test trials so as to highlight that it had a previous state that was different. The object in the experimenter's hand was the current state and was always different from the possible old versions referred to in the conflicting statements. The possible old versions of the target objects were provided as photo options (e.g., a blue notebook as the target object while green and yellow notebook photos as conflicting options, see [Appendix](#)).

Before starting each test trial, two pictures were placed in front of the children by the experimenter and children were asked to name the two conflicting object properties used in the upcoming test trial to make sure that they comprehended the information that was going to be stated (e.g., "Can you show me which one is green and which one is yellow?"). If the children could not answer correctly, the child's answer was corrected by showing the correct labels for each option and they are again asked to show the correct option for the relevant object property. After the child's correct response, the experimenter proceeded to the test trial. In the evidential-trust task, the conflicting statements were given by the two informants either with the direct evidential marker, *-DI* or the indirect evidential marker, *-mİş*. The informants always used the same evidential marker that they used in the warm-up trials and during all test trials for a given participant (i.e., one informant always used *-mİş* and the other informant always used *-DI* or vice versa):

(1) Bu not defter – I dün akşam sarı-y – dı.

This notebook – Acc last night yellow – PAST. Direct

This notebook was yellow last night; I saw that.

(2) Bu not defter – I dün akşam yeşil – miş.

This notebook – Acc last night green – PAST. Indirect

This notebook was green last night; I heard that.

As in the case of warm-up trials, after repeating what the informants said, children were asked to pick the picture that showed the correct feature of the target object from “last night.” For coding, children who preferred the picture with the property that was uttered by the informant with the evidential marker, *-DI* received “1” and children who preferred the opposite received “0” (total score “0–5”).

At test trials, the t-shirt colors of informants were counter-balanced across participants. Thus, each participant saw a particular informant with either a red or blue t-shirt at the warm-up trials. The order of the object properties was randomly assigned to the two groups so that the order of both evidential markers and features was independently counter-balanced across participants. Each participant heard a particular informant use one type of evidential marker (*-mİş* or *-DI*) with a particular order of the object properties (i.e., color, size, pattern, shape, location) but whether that particular informant used a specific evidential marker (and which order the object properties were given) varied across participants. The seating position of the informants (right vs. left side of the screen) was also counter-balanced within participants.

Coding

The experimenter and a coder simultaneously coded the child’s responses for each task. The reliability of the coding was checked after each testing session to see if there was any difference between the experimenter and coder’s sheets. The disagreement was immediately discussed and solved after the testing session. In the evidential trust task, the interrater reliability between the coder and experimenter was perfect, Cohen’s kappa was $\kappa = .95$. For the receptive vocabulary and ToM tasks, Cohen’s kappa varied $\kappa = .95$ –1.00.

Results

Preliminary Analyses

The data was analyzed for whether there were gender differences for any of the measures. A gender difference was only found for the evidential-trust task, $t(82) = 2.331$, $p = 0.022$, such that female participants ($M = 2.953$, $SD = 0.975$) performed better than male participants ($M = 2.463$, $SD = 0.951$). Therefore, gender was entered as a control variable for the regression analysis along with age and language.

Evidential-Trust

A one-way ANOVA indicated a significant main effect of age for evidential-trust performance, $F(2, 81) = 3.482$, $p = 0.035$, $\eta^2 = .08$. A LSD post-hoc analysis showed that 4-year-olds differed from 6-year-olds, $p = 0.038$, and 7-year-olds, $p = 0.016$, but 6- and 7-year-olds

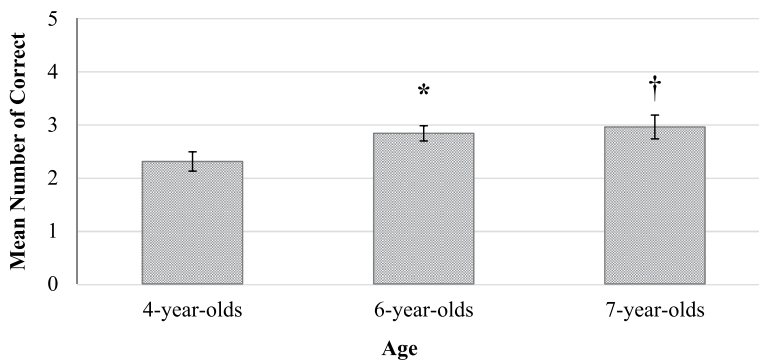


Figure 1. Mean number of correct responses in the Evidential-Trust Task.

did not differ from each other, $p = 0.644$. To further explore developmental change on the evidential-trust task, one-sample t -tests were conducted for each age group against chance levels ($M = 2.5$, meaning that participant preferred the informant with the evidential marker, $-DI$ as often as the informant with the evidential marker, $-mİş$). Four-years-olds ($M = 2.308$, $SD = 0.928$) did not differ from chance level, $t(25) = -1.056$, $p = 0.301$, but 6-years-olds ($M = 2.843$, $SD = 0.808$) did, $t(31) = 2.408$, $p = 0.022$, and 7-years-olds ($M = 2.961$, $SD = 1.148$) differed marginally from chance levels, $t(25) = 2.050$, $p = 0.051$ (see Figure 1).⁴

Relations Among Evidential-trust, ToM, & Linguistic Abilities

The appearance-reality task was omitted from all analyses as children showed a ceiling effect and it was the only ToM measure that was not correlated with age, $p = 0.118$. All of the other ToM tasks were included in children's Total ToM scores. Total ToM was significantly correlated with age, $r = .640$, $p < 0.001$. Age was also correlated with receptive vocabulary, $r = .792$, $p < 0.001$ (see Table 2).

Correlations for trust, ToM, and receptive vocabulary before and after controlling for age (in months) and gender can be seen in Tables 2 and 3, respectively. To compare the relation between false-belief understanding and evidential-trust in this study with previous research (Matsui, Yamamoto, & McCagg, 2006), two sub-components of the ToM battery were also analyzed separately: total false-belief (composite of first- and second-order FB and unexpected contents). Second, ambiguous figures was also analyzed separately but for conceptual reasons. Understanding the interpretive aspects of the mind might be specifically relevant to the evaluation of information that speakers hold (i.e., first-hand vs. second-hand). The evidential-trust task was marginally correlated with Total ToM and ambiguous figures before controlling for age, but not after. Of note, children's performance on the evidential-trust task was correlated with receptive vocabulary before and after controlling for age (see Tables 2 and 3).

⁴Eighty college-aged adults also participated in the evidential-trust task in a survey format. The findings revealed that adults significantly preferred the direct evidential informant using, $-DI$ over the indirect evidential informant using, $-mİş$, $t(79) = 10.548$, $p < 0.001$ (i.e., in accordance with expectations, adults found the informant with the direct evidential marker, $-DI$ more reliable than the informant with the indirect evidential marker, $-mİş$).

Table 2. Simple correlations among different measures.

Variable	Age in Months	Total ToM	Total False-Belief	Ambiguous Figures	TIFALDI-Receptive	Evidential-Trust
Total ToM	.640***					
Total False-Belief	.617***	.835***				
Ambiguous Figures	.279*	.627***	.375***			
TIFALDI-Receptive	.792***	.631***	.612***	.331**		
Evidential-Trust	.288**	.190	.154	.217 [†]	.344**	
Gender	.082	.143	.021	.182	.076	.249*

[†] $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3. Age partialled correlations among the ToM, language and trust tasks.

Variable	Total ToM	Total False- Belief	Ambiguous Figures	TIFALDI-Receptive
Total False-Belief	.725***			
Ambiguous Figures	.600***	.259*		
TIFALDI-Receptive	.262*	.253*	.202 [†]	
Evidential-Trust	.006	-.031	.146	.229*

[†] $p < 0.10$, * $p < 0.05$, *** $p < 0.001$.

A hierarchical regression analysis was conducted to determine whether ToM abilities predicted performance on the evidential-trust task after controlling for age (in months), gender, and receptive vocabulary. Age and gender were entered in step one and receptive vocabulary in step two, followed by Total ToM in step three. The overall model was significant, $F(4, 71) = 3.896$, $p = 0.006$, and explained 18% of the variance in children's evidential-trust performance. In the first step, age (in months), $\beta = .248$, $p = 0.027$, and gender, $\beta = .236$, $p = 0.035$, and in the second step, receptive vocabulary, $\beta = .352$, $p = 0.049$, were significant predictors for evidential-trust. However, in the third step, Total ToM, $\beta = -.126$, $p = 0.386$, was not significantly correlated with the evidential-trust task (see Table 4).

Discussion

One of the main goals of this study was to examine Turkish-speaking children's selective trust abilities based on their comprehension of evidential markers. Turkish-speaking children were expected to selectively trust the informant who used the direct evidential marker, *-DI*, over those who used the indirect evidential marker, *-mİş*. A second aim was to investigate whether Turkish-speaking children's ToM abilities have an influence on their selective trust performance when the cue to reliability is an evidential marker. While the literature provides conflicting findings on the general relation between selective trust and ToM abilities, it has been argued that children's "full" comprehension of evidential markers might require an "epistemic stance" (i.e., to see/know vs. to hear/infer) toward others Aksu-Koc (2009); Lucas, Lewis, Pala, Wong, and Berridge (2013). However, the current results showed no relation between Turkish-speaking children's selective trust and ToM performance. Instead, receptive language and gender predicted evidential-trust performance.

Table 4. Hierarchical multiple regression for variables predicting trust scores.

Step	Variable	Outcome: Evidential-Trust					
		ΔR^2	F-Change	B	β	<i>t</i>	<i>p</i>
1		.125*	5.225				
	Age			.016	.248	2.259	.027*
	Gender			.469	.236	2.154	.035*
2		.046*	3.994				
	Age			-.002	-.030	-.173	.863
	Gender			.458	.231	2.144	.035*
	TIFALDI-Receptive			.021	.352	1.999	.049*
3		.009	0.761				
	Age			.001	.016	0.087	.931
	Gender			.473	.238	2.202	.031*
	TIFALDI-Receptive			.024	.393	2.154	.035*
	Total ToM			-.076	-.126	-.872	.386

* $p < 0.05$.

Evidential-Trust

Starting at age 6, Turkish-speaking children selectively trusted the informant who used the direct evidential marker, *-DI*, over the informant using the indirect evidential marker, *-mİş*. In contrast, 4-year-olds' reliability judgments were not influenced by an informant's use of evidential markers. Interestingly, while 6-year-old showed a significant effect, 7-year-olds showed only a "marginally significant" influence ($p = 0.051$). These results might be related to a lack of statistical power for 7-year-olds' related sample size. Due to COVID-19, an equal number of participants for each age group (i.e., 32 participants for each age group) could not be collected. However, the overall findings are consistent with the development of evidential *comprehension* abilities for Turkish-speaking children that develop around age 6 (Aksu-Koc, 1988). The current findings are also consistent with prior studies using Turkish (Ozturk & Papafragou, 2016) and Japanese (Matsui, Yamamoto, & McCagg, 2006) samples. Both of those studies found that children's reliability judgments could be influenced by evidential markers starting at around age 6.

This pattern is different from the study with Bulgarian-speaking children in which children did not prefer the informant using the direct, versus indirect, evidential marker until the age of 9 (Fitneva, 2008). In that study, 6-year-olds preferred cognitive to perceptual evidence for the modality questions and their performance did not differ with respect to authorship (i.e., first-hand vs. second-hand evidence). Fitneva (2008) explained the findings in the modality condition based on children's developing interpretive ToM abilities such that, before 9-years of age, children may not fully appreciate the constructive nature of the mind (Carpendale & Chandler, 1996). That is, 6-year-olds still do not fully appreciate that the mind involves subjectivity while interpreting information. However, in the current study there was little support for a relationship between interpretive ToM and selective trust (more on this below).

Trust, ToM, & Language

There was a relation between children's ToM abilities and receptive language skills. Considering the support in the literature (Milligan, Astington, & Dack, 2007; Wellman,

2014) for a relation between general language and ToM abilities (especially false-belief), the current findings are expected. However, there was only a marginal correlation between Turkish-speaking children's evidential-trust performance and ToM abilities before, but not after, controlling for age and gender. This suggests that Turkish-speaking children's more general development is responsible for this marginal correlation instead of a specific relation involving ToM. These findings are aligned with both empirical and theoretical positions that argue against the possibility that children's selective trust skills depend on their mental state understanding (Birch, Vauthier, & Bloom, 2008; Matsui, Yamamoto, & McCagg, 2006; Nurmsoo & Robinson, 2009). However, researchers have advocated strongly for the assumption of a relation between trust and ToM in general (Koenig & Harris, 2005; Wellman, 2014) and for evidential-based trust in particular (Aksu-Koç, Ögel-Balaban, & Alp, 2009; Lucas, Lewis, Pala, Wong, & Berridge, 2013; Matsui, Yamamoto, & McCagg, 2006). Specifically, it has been argued that the comprehension of evidential markers requires an understanding of the "epistemic stance" of others (Aksu-Koc, 2009; Matsui, Yamamoto, & McCagg, 2006) or that selective trust more broadly is a form of ToM in action (Wellman, 2014). The notion of an epistemic stance has been elaborated in terms of the development of metarepresentational abilities (i.e., explicit mental state attribution). Another metarepresentational ability (tracking source knowledge) has also been argued to be a pre-requisite for the comprehension of evidential markers (Ünal & Papafragou, 2016). The acquisition of these metarepresentational abilities then enables children to improve their "epistemically modalized language" about mental states (e.g., use of direct and indirect evidential markers).

Given the compelling arguments for a relation between (evidential-) trust and ToM, three interpretations could be provided to explain the lack of empirical relationship between ToM and trust in the current study. First, the current study found a similar lack of relation to Matsui, Yamamoto, and McCagg (2006) despite the inclusion of a more comprehensive ToM battery. In that study, the authors considered an explanation for the lack of a relation between evidential-trust and false-belief based on the idea of "implicit cognition." Specifically, that 3-year-olds could have used implicit ToM abilities to selectively trust based on the linguistic certainty markers (i.e., *-yo* vs. *-kana*). While the current measure of ToM was more comprehensive than the one used in Matsui et al., the tasks were all explicit. That said, there does not seem to be any empirical evidence in the literature to support this conjecture about "implicit cognition" and trust. Perhaps the closest evidence comes from an early explicit ToM task and trust in terms of knowledge-ignorance being related to selective trust before and after controlling for age (Allen, Sümer, & Ilgaz, 2021). However, that study also did not find relations with any of the other ToM abilities measured, including false-belief understanding.

A second explanation is that children's interpretive ToM might be more important for children's reliability judgments based specifically on evidentiality (Fitneva, 2008). Interpretive ToM emphasizes the importance of going beyond understanding the false-beliefs of others. It can be defined as understanding that others might have different interpretations of the same information. Past research has shown that interpretative ToM has a gradual development from 5- to 8-years of age (Carpendale & Chandler, 1996; Chandler & Lalonde, 1996; Lalonde & Chandler, 2002). Understanding that different sources of evidence (first- vs. second-hand) result in different interpretations of the same event might require interpretative ToM skills. In the current study, the ambiguous figures

task was marginally correlated with the evidential-trust task before, but not after, controlling for age and gender. Accordingly, it might be better to include a more comprehensive measure of interpretive ToM that includes the doodles task (Chandler & Lalonde, 1996; Lalonde & Chandler, 2002) and/or a story-based task where ambiguous information is presented (Pillow, 2012).

A third explanation is that the current sample is relevantly different from those used in other studies involving Turkish-speaking children's ToM abilities. Aksu-Koç and colleagues (2005) indicated that more than 80% of 3.5- to 4-year-old children passed self- and other-oriented questions on the unexpected contents false-belief task, but, in the current study, only 14% of 4-year-old children passed both questions while the passing rate for the 6- and 7-year-old children was 72% and 75%, respectively. That is, Turkish-speaking children in the current study did not “outperform” samples from other cultures as in the case of Aksu-Koç, Aydın, Avcı, Sefer, and Yasa (2005). It is unclear what may have caused this difference but in a recent study with over three hundred 3- to 5-year-old Turkish-speaking children, performance on the unexpected contents task was similar to the current sample and did not “outperform” other cultures (Ilgaz, Allen, & Haskaraca, 2022). In that study, only 17% of 3-year-olds passed the unexpected contents task and the success rate increased to 40% in the 4-year-olds and 58% in the 5-year-olds. Although the samples from the current study and Ilgaz, Allen, and Haskaraca (2022) were drawn from mostly middle- to high-SES, it is possible that demographic or regional factors are at play.

Trust, Language & Gender

Receptive language skills were related to Turkish-speaking children's performance on the evidential-trust task after controlling for age and gender. These findings could be explained by performance factors in terms of the task characteristics that children need in order to comprehend the sentences. That is, to evaluate the reliability of the statements, Turkish-speaking children need to have sufficient comprehension of abstract linguistic constructions involving different levels of complexity. However, the receptive vocabulary and evidential-trust tasks were correlated after controlling for age. Further, the regression analysis also showed that a relation between receptive vocabulary and evidential-trust remained significant despite age being included as a predictor. This means that the relation between evidential-trust and receptive language may be more constitutive than instrumental. That is, receptive language skills may be an aspect of the evidential-trust competence rather than a language-comprehension performance factor.

Past research on evidential-trust has not reported testing for gender differences (Fitneva, 2008; Matsui, Yamamoto, & McCagg, 2006; Ozturk & Papafragou, 2016). In the current study, female participants were significantly better than male participants before and after controlling for age and language. This suggests that any female advantage is not the result of advanced general development or advanced general language abilities. It has been argued recently that selective trust is grounded in interpersonal aspects like mutual understanding, cooperation, commitment, and responsibility (Koenig & McMyler, 2019; Koenig, Li, & McMyler, 2021). So perhaps girls are more advanced in their inter-personal competencies (Eisenberg, Fabes, & Spinrad, 2006) such that there were consequences for their evidential-trust performance. This effect might be further investigated with additional age groups and direct measures of interpersonal competence.

Conclusion

This research was conducted to further explore Turkish-speaking children's development of selective trust based on their comprehension of evidential markers. The findings suggest that by 6-years of age Turkish-speaking children can selectively trust an informant based on their use of evidential markers and that girls were better at this than boys after controlling for age and language. A general argument has been made in the literature for a relationship between selective trust and ToM understanding; and a specific argument has been made for the use of evidential-trust and ToM. However, there was no evidence in the current study for such a relationship although the study used a comprehensive battery that included a higher-order ToM task (i.e., second-order false belief), and an interpretive ToM task that measures understanding of different interpretations of the same information. Future research could further examine the theorized relation between evidential-trust and ToM abilities by conducting studies that include additional measures of ToM (additional interpretive measures – e.g., Doodles, early explicit measures – e.g., knowledge-ignorance, and implicit measures – e.g., anticipatory-looking and interactive ToM paradigms).

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Authorship

Note that the first authorship is shared by B. Çelik and N. Ergut. Data collection and data analyses were performed by B. Çelik and N. Ergut under the supervision of J.W.P. Allen. All authors wrote the manuscript.

Disclosure statement

No potential conflict of interest was reported by the authors.

Data availability statement

Data can be made available on request.

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Appendix

Example of a Vignette from the Evidential-Trust Task

Warm up Trial 1

Bu kız görüyor musun? Bu **KIRMIZI** renk tişörtlü kız şimdi sana bu ayıcığın dün akşam ne yaptığını söyleyecek. Onu çok dikkatlice izlemeni istiyorum. Sonra senden ayıcığın dün akşam ne yaptığını göstermeni isteyeceğim. Haydi dinleyelim!

Do you see this girl? This girl who wears **RED** colored t-shirt will tell you what the teddy bear was doing last night. I want you to watch her carefully. Then I will ask you to find what the teddy bear was doing last night. “Let’s listen!”

After watching the video, the experimenter says:

KIRMIZI renk tişörtlü kız “Ayıcık dün akşam uyuyor – MUŞ.” dedi. Bak ayıcık dün akşam bu resimlerdekinden birini yapıyormuş. Peki sen şimdi, ayıcığın dün akşam bunlardan hangisini yaptığını gösterir misin?

The girl with **RED** colored t-shirt said that “Last night, the teddy bear was *sleeping*–MIŞ.” Look teddy bear was doing one of these pictures last night. Well now, can you show me which of these teddy bear was doing last night?

Test Trial Object 1 (color-coated notebook)

Bu kızları görüyor musun? Biri kırmızı, diğeri mavi tişört giymiş. Şimdi ikisi de sana bu defterin dün akşam nasıl görüldüğünü söyleyecekler. Onları dikkatlice dinleyelim. Tamam mı? Sonra senden bu defterin dün akşam nasıl görüldüğünü bulmanı isteyeceğim. Haydi izleyelim!

“Do you see these girls? One of them wears blue; the other one wears a red t-shirt. Now both of them are going to tell you how this notebook looked like last night. Let’s listen to them carefully. Okay?” Then I will ask you to find how the notebook looked like last night. Let’s listen!

After watching the video, the experimenter says:

KIRMIZI renk tişörtlü kız “Bu defter dün akşam yeşil – MİŞ” dedi, **MAVİ** renk tişörtlü kız “Bu defter dün akşam sarı-y – DI.” dedi. Sence bunlardan hangisi defterin dün akşamki hali? Gösterir misin?

The girl in the **RED** shirt said “This notebook was green-MİŞ last night,” the girl in the **BLUE** shirt said, “This notebook was yellow-DI last night.” Which one do you think is the notebook as it was last night? Can you show me?