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The social meaning of common knowledge across development

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ABSTRACT

Common knowledge can be a potent sign of shared social attributes among people, but not all knowledge is socially meaningful to the same extent. For instance, compared to shared knowledge of cultural practices, knowledge of self-evident facts might be a poorer indicator of shared group membership among individuals. Two studies explored adults' and 6-to-9 years old children's social inferences based on what others know as well as their sensitivity to the distinctions in the diagnostic potential of different kinds of knowledge. Participants were presented with targets who were knowledgeable about familiar things that are either culture-specific (e.g., a traditional dance) or general (e.g., a self-evident fact), and asked to make inferences about their language and where they live. Adults and 8-year-olds privileged culture-specific knowledge over general knowledge when making both kinds of inferences about the targets, whereas 6-year-olds did not distinguish between the two knowledge types. Thus, what others know is socially meaningful from early in life, and across development, children become increasingly aware of the diagnostic potential of culture-specific knowledge when making social inferences about others. These findings suggest novel social implications of knowledge assessment.

1. Introduction

Understanding what others know is a critical ability. An extensive literature suggests that sensitivity to others' epistemic states is evident remarkably early in life with important social implications. It allows us to make sense of, anticipate and influence others' behaviors and to effectively communicate with them, as well as facilitating learning by directing us to reliable and relevant information sources. A crucial social implication yet to be explored is whether what knowledge we do and do not share with others is recognized as socially meaningful. Here, we begin investigating this issue by asking whether children and adults use others' knowledge to make diagnostic social judgments about them and whether they distinguish different kinds of knowledge when doing so.

Young children successfully track various situational, personal and social cues to infer others' knowledge states. They use individuals' physical conditions (e.g., Pratt & Bryant, 1990), their past accuracy (e.g., Birch, Vauthier, & Bloom, 2008; Koenig, Clément, & Harris, 2004), confidence (e.g., Jaswal & Malone, 2007), reasoning (e.g., Corriveau & Kurkul, 2014; Koenig, 2012) as well as their social attributes (e.g., Aldan & Soley, 2019; Kinzler, Corriveau, & Harris, 2011) to assess their knowledge. Children also understand that knowledge differs across time (Atance & Caza, 2018; Taylor, Cartwright, & Bowden, 1991) and depending on the area of expertise of individuals (Jaswal & Neely, 2006; Lutz & Keil, 2002). Knowledge assessment has several important social implications that are evident early in development. Both adults and children use others' knowledge states in guiding their moral judgments (e.g., Schroeder & Linder, 1976; Young & Saxe, 2011; Yuill & Perner, 1988) and their decisions to trust others (e.g., Birch et al., 2008; Koenig et al., 2004). Children actively seek information from knowledgeable rather than ignorant others (e.g., Danovitch & Keil, 2004; Kushnir, Vredenburgh, & Schneider, 2013; Mills, Legare, Grant, & Landrum, 2011), attribute more positive characteristics to them (Brosseau-Liard & Birch, 2010) and prefer to inform them (Kim, Kalish, Weisman, Johnson, & Shutts, 2016). Sensitivity to the knowledge states of others starts to play a critical role in communication also early in development. Similar to adults (e.g., Fussell & Krauss, 1992), 3–5-year-olds tailor information they provide to their communicative partners considering their knowledge access (Baer & Friedman, 2018; Köymen, Mammen, & Tomasello, 2016; Menig-Peterson, 1975; Nadig & Sedivy, 2002), and even infants take others' knowledge access into account when pointing to objects (Liszkowski, Carpenter, & Tomasello, 2008). Adults and children also guide their communication in light of their general inferences about what others are likely to know, or a *cultural common ground* (e.g., Clark, 1996; Fussell & Krauss, 1991; Lau, Chiu, & Hong, 2001; Liebal, Carpenter, & Tomasello, 2013).

A crucial social implication of keeping track of others' knowledge

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involves the inferences we make about individuals' social attributes, such as their social group membership. It has been proposed that attention to signals of ingroup/outgroup status might be adaptive, given that it facilitates tracking coalitional relationships in one's environment (Kurzban, Tooby, & Cosmides, 2001). While previous research has generally focused on overt cues to group membership or affiliation, such as race or accent (e.g., Pietraszewski, Cosmides, & Tooby, 2014; Pietraszewski & Schwartz, 2014a), individuals are also shown to be sensitive to certain covert cues, such as others' psychological attributes. For instance, both children and adults use shared preferences, attitudes and beliefs to infer affiliation among others (e.g., Byrne & Nelson, 1965; Liberman, Kinzler, & Woodward, 2014). It has been argued that such covert signals of social identity might be particularly useful for identifying group members in complex societies (for an extended discussion, see Smaldino, 2019). Shared knowledge might be a potent and reliable cue to shared social identity and group membership for at least two reasons: First, knowledge can be objectively evaluated, and is accordingly verifiable. Other psychological attributes such as preferences or beliefs, on the other hand, are often conveyed to others fallaciously (e.g., "preference falsification" Kuran, 1995). Further, the acquisition of certain knowledge is arguably more likely than other attributes such as preferences, to require social interactions with other group members, confining such knowledge more strongly within group boundaries. In line with this argument, adults are shown to be more likely to assume affiliation among individuals who share knowledge than those who share preferences without prior knowledge (Velez, Bridgers, & Gweon, 2019), and children prioritize shared knowledge over shared preferences in their social preferences (Soley & Spelke, 2016) and generalize knowledge, but not preferences across members of the same social group (Soley, 2019; Soley & Aldan, 2020).

Crucially, while knowledge can be a potent indicator of social history and identity, not all knowledge is socially meaningful to the same extent. Culture-specific knowledge such as knowledge of rituals, songs, or norms, which has discerned social groups throughout history (Pagel & Mace, 2004), might be particularly reliable as a cue to social group membership. An understanding of the conventionality of cultural knowledge emerges early (for a review, see Diesendruck & Markson, 2011). Preschool-aged children expect members of a social group to exhibit similar normative behaviors (Kalish, 2012; Weatherhead, White, & Friedman, 2016), enforce norms selectively to members of their own group (Schmidt, Rakoczy, & Tomasello, 2012) and consider social norms to be specific to social groups, but moral norms to be applicable to everyone (Liberman, Howard, Vasquez, & Woodward, 2018). Five- and 6-year-old children also expect members of a social category to share knowledge (Plötner, Over, Carpenter, & Tomasello, 2016) and selectively generalize cultural knowledge on the basis of social group membership (Soley, 2019; Soley & Aldan, 2020). Children's expectation of a *cultural common ground* between members of their social group and themselves concerning familiar objects or labels also guides their communications and interactions with others (Diesendruck, 2005; Goldvicht-Bacon & Diesendruck, 2016; Liebal et al., 2013).

In contrast, knowledge that is widely shared or that does not require social interaction such as knowledge of self-evident facts (e.g., that the sky is blue) might be less informative of shared social attributes among individuals. Past research suggests that adults and children are sensitive to the distinctions between different kinds of knowledge and how widely they are shared (e.g., Cimpian & Scott, 2012; Lockhart, Goddu, Smith, & Keil, 2016; Soley, 2019; Velez et al., 2019). For instance, around the age of 5, children correctly infer what knowledge can and cannot be self-acquired and what knowledge is easy or difficult to acquire (Lockhart et al., 2016), and expect generic factual knowledge to be shared more widely in comparison to non-generic knowledge (Cimpian & Scott, 2012). Further, children use group membership cues to make inferences about others' cultural knowledge, but not about their knowledge of generic facts (Soley, 2019) and adults make stronger affiliative inferences about others when the knowledge they share is relatively rare (Velez et al., 2019). These findings raise the possibility that different kinds of knowledge vary in their social significance for children as well as adults, such that they might use knowledge selectively as an indicator of one's social group membership.

The fact that children are selective in their inferences about others' knowledge based on their social group membership, however, does not necessarily warrant that a reverse inference would also take place. Indeed, it has been argued that these two types of reasoning (inferring individuals' attributes based on their group membership vs. inferring individuals' group membership based on their attributes) might be based on different mechanisms (e.g., Fernbach, Darlow, & Sloman, 2011; Tversky & Kahneman, 1980) and might follow different developmental paths (Gelman, Collman, & Maccoby, 1986). Because they are in line with the direction of causality, predictive inferences are considered to be easier to process compared to diagnostic inferences, which require reasoning from effect to cause (Fernbach et al., 2011; Tversky & Kahneman, 1980). In line with this, previous research suggests that children make the former type of inferences more readily. For example, after learning about a novel biological attribute of girls, 4–7 years old children expect that other girls would also have that attribute, but they do not infer that those who have that biological attribute would necessarily be girls (Gelman et al., 1986). Similarly, 3–5 years old children expect shared team membership to predict shared preferences, however based on shared preferences of agents, children do not make the diagnostic inference that they would belong to the same team (Vélez, Wu, & Gweon, 2018).

1.1. The present research

The present research begins exploring the social meaning of common knowledge across development, by asking whether adults and 6-to-9 years old children use others' knowledge to make diagnostic inferences about their social attributes and if so, whether they are sensitive to the distinctions in the diagnostic potential of different kinds of knowledge such as culture-specific knowledge (e.g., a traditional dance) and general knowledge (e.g., a self-evident fact). Given that cultural knowledge has discerned social groups throughout history (Pagel & Mace, 2004), making it a reliable signal of one's social identity, attributing social meaning selectively to shared cultural knowledge might emerge in childhood. This would not only allow children to readily identify group members, but would also facilitate their interaction and communication with others by contributing to their understanding of cultural common ground. We tested children who are 6 years and older given that while 5–6 year-old children associate social group membership and shared cultural knowledge (Soley, 2019; Soley & Aldan, 2020), previous research suggests that making diagnostic social inferences based on others' knowledge might emerge at a later age (e.g., Gelman et al., 1986).

We examined children's and adults' knowledge-based inferences about linguistic group membership of novel individuals. Language and accent are prominent cues that distinguished social groups throughout history (Baker, 2001; Henrich & Henrich, 2007; Moya & Henrich, 2016) and are robustly used as a basis for social categorization (Pietraszewski & Schwartz, 2014a, 2014b). Language is an inductively rich social category that is used to make various social judgments about novel individuals by adults (Giles & Billings, 2004; Labov, 2006; Pietraszewski & Schwartz, 2014a; Porter, Rhineschmidt-Same, & Richeson, 2016; Stewart, Ryan, & Giles, 1985), as well as by children (Hirschfeld & Gelman, 1997; Kinzler & DeJesus, 2013a; Weatherhead et al., 2016; Weatherhead, Friedman, & White, 2018). Children infer that speakers of the same language are more likely to be affiliated (Liberman, Woodward, & Kinzler, 2016) and share cultural knowledge (Soley & Aldan, 2020) than speakers of different languages, and they link language to other culturally-relevant social categories such as race or nationality (Hirschfeld & Gelman, 1997; Kinzler & DeJesus, 2013b).

In the present study, we also examined children's and adults'

inferences about individuals' geographic proximity based on what they know. Previous research suggests that both children and adults map certain culture-specific variations, such as linguistic cues onto geographic variations (Clopper & Pisoni, 2004; Kinzler & DeJesus, 2013a; McCullough, Clopper, & Wagner, 2019; Van Bezooijen & Gooskens, 1999; Weatherhead et al., 2016; Weatherhead, Friedman, & White, 2019). Cultural knowledge tends to vary across societies and geographic distance constraints social interactions among individuals, making cultural knowledge less likely to be shared among those who live far from one another. Accordingly, we asked whether children (and adults) are sensitive to these distinctions and expect those who have cultural knowledge in common to live close by or in the same country as themselves.

In two studies, participants were presented with targets who were knowledgeable about familiar things that are either culture-specific (e.g., knowing traditional dance, a social norm) or general (e.g., knowing a self-evident fact, a moral norm), and asked whether the knowledgeable targets would speak Turkish (native) or French (foreign) and whether they would live close by or far away (Study 1) or whether they would live in Turkey (same country) or in France (different country) (Study 2). Given that adults and children readily distinguish different kinds of knowledge and how widely they are shared (e.g., Cimpian & Scott, 2012; Lockhart et al., 2016; Soley, 2019; Velez et al., 2019), and also associate cultural knowledge with social group membership (Soley, 2019; Soley & Aldan, 2020), we expected that participants would be more likely to infer that individuals with common cultural knowledge would share similar social attributes as themselves (i.e., speak the same language and live close by).

2. Study 1

2.1. Study 1a: Adults

2.1.1. Method

2.1.1.1. Participants. Twenty-five adults (16 Females, mean age: 21.56 years, range 18 years – 29 years) participated in Study 1a. We targeted 20 participants for each age group based on the sample sizes of related past studies (e.g., Cimpian & Scott, 2012; McCullough et al., 2019; Weatherhead et al., 2018). Participants were students at a public, English-medium university and they received course credit for their participation. All participants were native speakers of Turkish and all participants reported to speak at least one additional language.[1] The study was approved by the university review board.

2.1.1.2. Materials. We compiled eight different knowledge items. Four of these items were classified as "culture-specific": a children's song (i.e., "Daha Dün Annemiz"), a traditional dance (i.e., "Halay"), a social norm (i.e., that one kisses elder people's hands on religious holidays), and a children's game (i.e., "İstop"). The other four items were classified as "general": an observable fact (i.e., that the sky is blue), an unobservable fact (i.e., that the earth is not flat), a moral norm (i.e., that one should not take others' belongings without their permission), and procedural knowledge (i.e., how to bike).

The distinction between "culture-specific" and "general" related to the specific items chosen within each of these categories (e.g., most people would know that the sky is blue whereas knowledge of a traditional dance is likely to be shared among those who belong to a particular cultural group). We do not claim that these labels apply to broad classes of items such that factual or procedural knowledge are culture-general.

Because we aimed to have items that would be highly familiar to children as well as adults, we compiled these items based on informal surveys with parents and teachers we had access to. To present along with each knowledge item, 16 drawings of children (8 girls and 8 boys) were created. The drawings had different colored-clothing and different facial features and hair.

2.1.1.3. Design and procedure. Testing took place in the laboratory. Stimuli were presented with an online survey tool and participants were instructed that they would be introduced to target individuals and then they would be asked questions about these individuals. Participants read instructions on a computer screen and recorded their answers by clicking on the survey options.

On each of eight trials, participants were shown one target child (male or female depending on the participant's gender) and were informed that the target was knowledgeable about one of the eight items. Then they were asked to indicate whether they think that the child would speak Turkish or French and whether the child lived close by or far away. After answering each question, participants were asked to indicate whether they were little sure or very sure of their answer, in an attempt to obtain a more nuanced scoring. As an example, participants might choose Turkish as opposed to French as the language of the target who is knowledgeable about a given knowledge item. Nevertheless, they might be more confident about this choice when the target knows something culture-specific, compared to when s/he knows something that is more widely-shared.

The item the target child was knowledgeable about varied across the trials. On four trials, the item was culture-specific (i.e., song, dance, social norm, game) and on four of the trials, it was general (i.e., observable fact, unobservable fact, moral norm, procedural knowledge). Participants were presented with these items in blocks such that culture-specific items and general items were always presented in the same order, but the order of the blocks was counterbalanced across participants. Similarly, the order of the language and proximity questions was kept constant across trials, but was counterbalanced across participants. Finally, the drawing-knowledge type pairings were also varied across the participants such that the target children that were introduced as being knowledgeable about general items for approximately half of the participants ($N = 13$), were introduced as being knowledgeable about culture-specific items for the rest ($N = 12$).

At the end of the survey, participants were asked whether they themselves were knowledgeable about each item and they were asked to indicate their age, gender and languages they speak.

2.1.2. Results and discussion

Participants' answers to two question types (whether the knowledgeable target would speak Turkish or French and whether the target would live close by or far away) were converted to scores ranging between −1.5 to 1.5 with higher scores representing stronger beliefs that the target speaks Turkish or lives close by, adapting the scoring used by Lei and Cimpian (2019). Specifically, participants' answers to the questions of whether the knowledgeable target would speak Turkish or French and whether the target would live close by or far away were coded as 1 for the choices of "Turkish" and "close by" as "-1" for the choices of "French" and "far away". Participants' choices to the question of how sure they were of their answer was coded as 0.5 for the choice of "a little sure" and 1.5 for the choice of "very sure". These scores were multiplied for each knowledge item. Thus, participants received positive scores, namely 0.5 (if they were a little sure of their answer) or 1.5 (if the they were very sure of their answer) for indicating that the target spoke Turkish or lived

[1] Turkey is a country with a majority (80%) ethnic Turk population, with the largest minority being Kurds (%13) (Konda, 2006). About 85% of the population is estimated to have Turkish as a native language and this is followed by Kurdish (12%) (Konda, 2006). While a few adult participants indicated that they spoke Kurdish, all participants in the final samples identified their native language as Turkish, suggesting that they would be familiar with the culture-specific items. In addition, participants were asked whether they were familiar with each knowledge item at the end of the study.

close by. Participants received negative scores, namely −0.5 (if they were a little sure of their answer) or − 1.5 (if they were very sure of their answer) for indicating that the target spoke French or lived far away.[2] These scores were added up separately across trials in which participants were asked about culture-specific knowledge and general knowledge. Thus, each participant received four scores, two for each question type: cultural knowledge-language, cultural knowledge-geographic proximity, general knowledge-language, and general knowledge- geographic proximity. Data and analysis script are available at https://osf.io/e3p7q/?view_only=fb260c7ee6af4c0fac071b5b16a87f36.

A repeated Analysis of Variance (ANOVA) was conducted on participants' scores with Question Type (Language vs. Geographic Proximity) and Knowledge Type (Cultural vs. General) as within-subject variables. Results revealed a significant main effect of Knowledge Type ($F(1, 24) = 42.05$, $p < .001$, $\eta p2 = 0.63$), suggesting that adults' overall scores were higher for cultural knowledge trials ($M = 6.6$, $SD = 2.45$) compared to general knowledge trials ($M = 0.44$, $SD = 4.95$). There was no significant effect of Question Type, $F(1, 24) = 2.41$, $p = .13$, $\eta p2 = 0.09$, but a significant interaction between Question Type and Knowledge Type ($F(1, 24) = 7$, $p = .014$, $\eta p2 = 0.22$). To follow up on the interaction effect, participants' scores were compared across question types (Language vs. Geographic Proximity), separately within each knowledge type (Culture-specific vs. General) with paired sample *t*-tests: Participants' language scores ($M = 3.72$, $SD = 1.54$) were higher compared to their geographic proximity scores ($M = 2.88$, $SD = 1.53$) for the culture-specific knowledge items ($t(24) = 2.25$, $p = .034$, $d = 0.45$), whereas they did not differ for the general knowledge items (Language: $M = 0.16$, $SD = 2.35$, Proximity: $M = 0.28$, $SD = 2.67$, $t(24) = 0.65$, $p = .52$).

In order to examine whether participants made diagnostic inferences based on different kinds of knowledge and for different types of questions, each of their four scores were compared to chance level (0) with one-sample, two-tailed t-tests. The results showed that adults used culture-specific knowledge to make inferences about the language targets spoke ($t(24) = 12.06$, $p < .001$, $d = 2.41$) as well as about where they lived ($t(24) = 9.37$, $p < .001$, $d = 1.87$). However, they did not use general knowledge to make any of these inferences ($ps > 0.6$) (See Fig. 1). Further analyses revealed that participants' language as well as proximity scores were significantly above chance for each of the cultural knowledge types (i.e., song, dance, social norm, game), (all $ps \leq 0.003$), whereas none of their scores differed from chance for the general knowledge types (i.e., observable fact, unobservable fact, moral norm, procedural knowledge) (all $ps > 0.39$). The means and the standard deviations of participants' scores across different knowledge and question types are provided in Table 1.

Finally, participants' answers to the question of whether they themselves knew each piece of information, were also converted to scores ("Yes" = 1, "No" = 0). These scores were summed separately across culture-specific knowledge and general knowledge trials and were compared with a two-tailed paired sample t-test. The results showed that participants' self knowledge scores were high and similar across cultural knowledge items ($M = 3.68$, $SD = 0.47$) and general knowledge items ($M = 3.88$, $SD = 0.33$), $t(24) = -1.73$, $p = .096$, $d = 0.35$).

Thus, participants were more likely to think that the target character was a speaker of Turkish or lived close by when the targets were knowledgeable about culture-specific items rather than general items. Further participants used all cultural knowledge items to infer what language the targets spoke and where the targets lived, whereas they did not use any of the general knowledge items to make such inferences, suggesting that adults distinguish between different knowledge types when making diagnostic social inferences about others. Building on these findings, the next experiment examined same inferences in 6-to-9 years old children.

[2] Analyses on participants' scores based solely on their responses to the first question, namely whether the target spoke Turkish or lived close by yielded similar results. These results are provided as supplementary materials.

2.2. Study 1b: Children

2.2.1. Method

2.2.1.1. Participants. Sixty-seven 6-to-9 years old children were tested. The data of two children were removed from the final sample because of experimenter error. Twenty-five of the children in the final sample were 6 years old (13 Females, Mean age = 6.57 years, Age range = 6 years to 6 years 11 months), 21 of them were 7 years old (13 Females, Mean age = 7.47 years, Age range = 7 years to 7 years 11 months), and 21 of them were 8 years old (10 Females, Mean age = 8.67 years, Age range = 8 years to 7 years 11 months). Children were recruited from public schools. All children were native speakers of Turkish and they were exposed to English in their schools. Children were tested individually in their schools. No specific information about parental socioeconomic status or ethnicity was collected. The study was approved by the university review board.

2.2.1.2. Design and procedure. These were identical to those used in Study 1a, except as follows: The stimuli were arranged into PowerPoint presentations and presented on a laptop computer. The instructions and the questions were communicated to children by the experimenter.

The experimental session started with a brief introduction during which children were told that they would see new child characters and be asked questions about these characters. Following this, on each of the eight trials, children were shown a child drawing and were told that the child depicted was knowledgeable about one of the culture-specific or general items (e.g., "This child knows that the sky is blue"). The children were then asked whether the target child spoke Turkish or French and whether s/he lived close by or far away (e.g., Do you think this child speaks Turkish or French?). Children were also asked to indicate how sure they were of their answer ("Are you a little sure or very sure?") by pointing to one of the two blue circles – one large, indicating that they are very sure, and one small indicating that they are a little sure (See Fig. 2).

As in Study 1a, at the end of the session, children were re-introduced to each of the knowledge items and they indicated whether they themselves knew them or not. Children's answers were recorded manually by the experimenter as "Yes" or "No".

Once the experiment was finished, the experimenter thanked the child and gave him/her a sticker.

2.2.2. Results

The scores were calculated in the same way as in Study 1a. A mixed Analysis of Variance (ANOVA) was conducted on children's scores with Question Type (Language vs. Geographic Proximity) and Knowledge Type (Cultural vs. General) as the within-subject variables and children's Age in Years (6, 7, and 8 years) as the between-subjects variable. Results revealed a significant main effect of Question Type ($F(1, 64) = 10.94$, $p = .002$, $\eta p2 = 0.15$), suggesting that children's overall scores were higher for the language questions ($M = 2.85$, $SD = 3.77$) than for the geographic proximity questions ($M = 0.76$, $SD = 4.36$). Results also yielded a significant interaction between Age and Knowledge Type ($F(2, 64) = 4.42$, $p = .016$, $\eta p2 = 0.12$). All other main effects and interactions were non-significant ($ps > 0.19$).

To follow up on the interaction effect, children's scores were compared across Knowledge Type (Culture-specific vs. General) separately within each age group. The results showed that 6-year olds' scores were similar across culture-specific knowledge trials ($M = 1.00$, $SD = 4.31$) and general knowledge trials ($M = 1.28$, $SD = 3.92$), $t(24) = -0.32$, $p = .75$. Similarly, 7-year olds' scores were similar across culture-

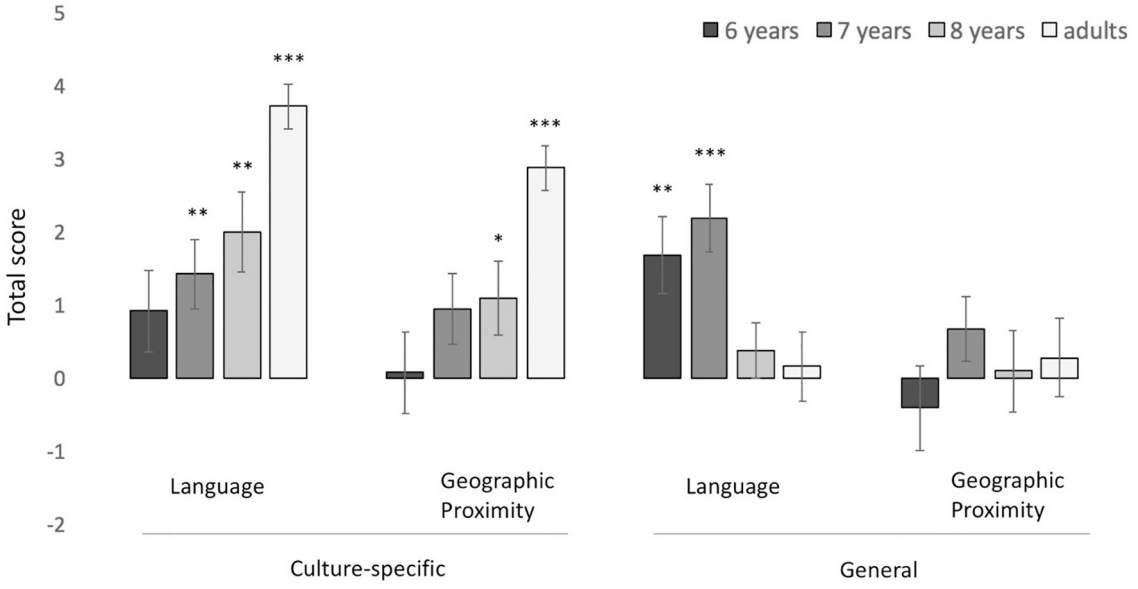

Fig. 1. Study 1 results: Total scores (range between −6 and 6) across age groups. *$p < .05$, **$p < .01$, ***$p < .001$. Error bars represent standard error.

Table 1
The means (and the standard deviations) of 6-, 7-, and 8-year-old children's and adults' scores for each knowledge item in response to the language (L) and the geographical proximity (P) questions in Study 1.

			Culture-specific				General			
			Song	Dance	Social norm	Game	Observ. generic fact	Unobserv. generic fact	Moral norm	Proced. knowledge
6 yrs.	L	*M* (*SD*)	0.50* (1.22)	−0.14 (1.32)	0.38 (1.20)	0.18 (1.34)	0.74*** (1.01)	−0.02 (1.36)	0.54* (1.30)	0.42 (1.32)
	P	*M* (*SD*)	0.46 (1.34)	−0.66** (1.14)	0.34 (1.43)	−0.06 (1.36)	−0.10 (1.32)	−0.26 (1.33)	0.22 (1.37)	−0.26 (1.42)
7 yrs.	L	*M* (*SD*)	0.93*** (1.25)	0.12 (1.59)	0.31 (1.48)	0.07 (1.55)	0.79*** (1.21)	0.21 (1.46)	0.88*** (1.28)	0.31 (1.52)
	P	*M* (*SD*)	0.26 (1.60)	−0.02 (1.59)	0.45 (1.46)	0.26 (1.62)	−0.07 (1.57)	0.02 (1.62)	0.21 (1.54)	0.50* (1.35)
8 yrs.	L	*M* (*SD*)	0.40 (1.43)	0.69** (1.29)	0.69** (1.36)	0.21 (1.41)	0.12 (1.43)	−0.21 (1.59)	0.79*** (1.19)	−0.31 (1.39)
	P	*M* (*SD*)	−0.21 (1.52)	0.36 (1.51)	0.60** (1.25)	0.36 (1.36)	−0.21 (1.48)	−0.12 (1.42)	0.69** (1.33)	−0.26 (1.48)
Adults	L	*M* (*SD*)	0.82*** (0.80)	1.34*** (0.37)	1.06*** (0.71)	0.50** (0.76)	0.06 (0.82)	−0.06 (0.82)	0.14 (0.81)	0.02 (0.91)
	P	*M* (*SD*)	0.70*** (0.37)	0.74*** (0.93)	0.86*** (0.86)	0.58*** (0.76)	0.10 (0.87)	0.02 (0.96)	0.10 (0.76)	0.06 (1.04)

*** $p \leq .001$.
** $p \leq .01$.
* $p \leq .05$.

specific knowledge trials ($M = 2.38$, $SD = 3.68$) and general knowledge trials ($M = 2.86$, $SD = 2.87$), $t(20) = -0.65$, $p = .52$. In contrast, 8-year-olds' scores were higher for trials with culture-specific knowledge ($M = 3.10$, $SD = 4.02$), than trials with general knowledge ($M = 0.48$, $SD = 3.26$), $t(20) = 3.29$, $p = .004$, $d = 0.72$). Thus, while 6- and 7-year-olds did not distinguish between culture-specific and general knowledge to make inferences about the language or the geographic proximity of the target individuals, 8-year-olds privileged culture-specific knowledge over general knowledge to make such inferences. Specifically, 8-year-olds were more likely to think that someone who is knowledgeable about a familiar culture-specific item would speak Turkish or live close by than someone who is knowledgeable about a familiar general knowledge item.

In order to examine whether children in each age group made diagnostic inferences based on different kinds of knowledge and questions, children's scores were also compared to chance level (0) with one-sample, two-tailed *t*-tests. The results showed that 6-year-olds only used general knowledge to make inferences about the language the targets spoke, $t(24) = 3.19$, $p = .004$, $d = 0.64$, whereas their scores did not differ from chance in the other conditions (*p*s > 0.11). Seven-year-olds used both culture-specific knowledge ($t(20) = 3.03$, $p = .007$, $d = 0.66$) and general knowledge ($t(20) = 4.75$, $p < .001$, $d = 1.04$) to make inferences about the languages targets spoke, however they did not use these knowledge types to make inferences about the where the targets lived (*p*s > 0.059). Eight-year-olds selectively used culture-specific knowledge to make inferences about the language targets spoke ($t(20) = 3.57$, $p = .002$, $d = 0.78$) as well as about where they lived ($t(20) = 2.12$, $p = .046$, $d = 0.46$), however, they did not use general knowledge to make any of these inferences (*p*s > 0.29) (See Fig. 1). The means and the standard deviations of children' scores across different knowledge and question types are provided in Table 1.

Children's answers to the question of whether they themselves knew each piece of information were also converted to scores ("Yes" = 1, "No" = 0) and these scores were summed separately across culture-specific

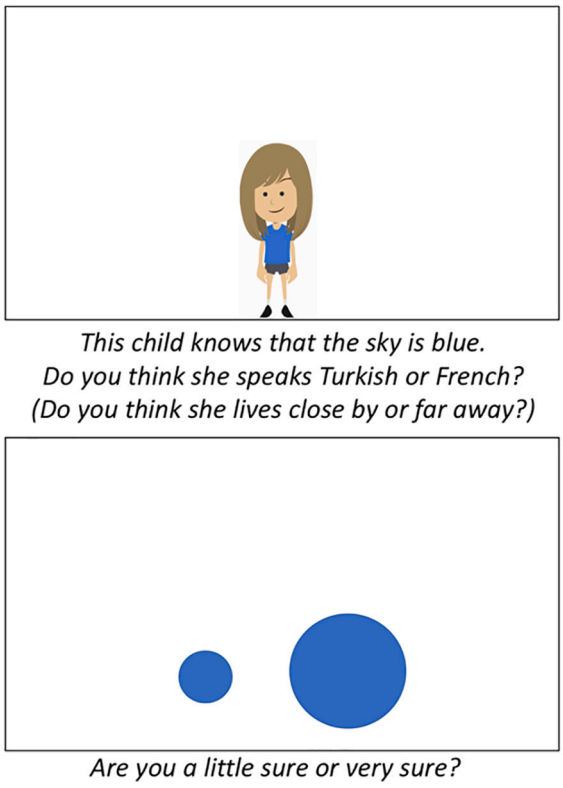

Fig. 2. Example display from Study 1b.

knowledge and general knowledge trials. These scores were then submitted to a mixed ANOVA with Knowledge Type (Culture-specific vs. General) as the within-subject variable and children's Age in Years (6, 7, and 8 years) as the between-subjects variable. The results yielded no significant main effect of Knowledge Type ($F(1, 64) = 0.45$, $p = .5$, $\eta p2 = 0.01$), Age ($F(2, 64) = 0.21$, $p = .82$, $\eta p2 = 0.01$), or an interaction between these variables ($F(2, 64) = 0.74$, $p = .48$, $\eta p2 = 0.02$). Thus, children of all age groups indicated that they were highly and equally knowledgeable about the culture-specific ($M = 3.39$, $SD = 0.82$) and the general knowledge items ($M = 3.51$, $SD = 0.84$) that they were presented with.

3. Interim discussion

Study 1 investigated adults' and 6-to-9 years old children's social inferences based on others' knowledge as well as their sensitivity to the distinctions in the diagnostic potential of different kinds of knowledge. The results show that all age groups made the inference that the targets would speak the same language as themselves based on common knowledge between themselves and the targets, however, there were notable developmental changes in terms of participants' sensitivity to the diagnostic potential of different kinds of knowledge. Targets were identified as native speakers based on common general knowledge by 6-year-olds, and based on both common general knowledge and culture-specific knowledge by 7-year-olds, however, these age groups did not make any inferences about where the targets would live based on their knowledge. Eight-year-olds and adults, on the other hand, selectively used culture-specific knowledge to make inferences about the language targets spoke as well as about where they lived. However, overall, they did not use general knowledge to make any of these inferences.

The results, thus, suggest that while 6- and 7 year-olds' use others' knowledge to make diagnostic inferences, they do not consistently distinguish between knowledge that is culture specific and general. In contrast, 8 year-olds, closely paralleling adults, selectively use culture-specific knowledge to guide their social inferences. Further, participants' selective use of culture-specific knowledge for diagnostic inferences cannot be explained by the difference in their own knowledge across these two domains, given that they reported to be equally knowledgeable about culture-specific and general items.

Study 1 provides insight into the developmental course of the sensitivity to others' knowledge as a cue to their social attributes, however, it also has a number of limitations that might potentially constraint the conclusions driven from its findings. Across all age groups, individuals' inferences about targets' languages were consistently stronger compared to their inferences about where they lived. Thus, individuals seem to be more confident when making diagnostic inferences about the group membership of others based on their culture-specific knowledge, and even though they use common cultural knowledge as a cue to geographic proximity, they might assume that geographic proximity does not strictly constraint group membership. In line with this, previous research shows that while children expect individuals speaking with a native accent to live close by (Kinzler & DeJesus, 2013b; Weatherhead et al., 2016; Weatherhead et al., 2018), they associate linguistic cues more strongly with place of origin compared to place of residence (Weatherhead et al., 2018). Although younger children (6 and 7 year-olds) did not use targets' knowledge to make inferences about where they lived, 8-year-olds and adults inferred that targets who had cultural knowledge in common with them would live close by. Thus, with age, children seem to realize that common cultural knowledge is likely to signify geographic proximity to others, whereas common knowledge that is widely shared does not inform them about individuals' geographic distance. Having said this, in the current study, the two questions asked about language and geographical proximity were not equally specific and this might be contributed to the differences observed. Specifically, the question about language offered choices between specific languages (Turkish or French), but the options offered by the proximity question were living close by or far away. Thus, the questions were not analogous.

In the current studies, we aimed to compile knowledge items that would be highly familiar to all participants and both children and adults reported to be knowledgeable about these items. On the other hand, because the items contained within each of these categories are heterogeneous, while some items are matched across conditions (e.g., social vs. moral norm), not all items are closely matched (e.g., song vs. a generic fact). Having items that are more closely matched across knowledge types, could allow making more precise comparisons across the two categories.

A notable finding of Study 1 is that children of all ages used shared moral norm knowledge (i.e., knowing that one cannot take others' belongings without their permission) as an indicator of shared language, even though it was intended as a general knowledge item. This might be because moral norms are harm-based, and ignorance of these norms, unlike in the cases of the other knowledge items, would have negative consequences for others. Before reaching a conclusion about moral norms in general, however, it is crucial to test whether this pattern would hold with different moral norms.

The fact that only 8-year-olds consistently distinguished between the two knowledge types, raises questions regarding the underlying mechanisms of this developmental pattern. One, task-related possibility is that, younger children could have had difficulty with the confidence scale, on which they determined how sure they were. While we found no difference in terms of the overall pattern of findings when the analyses are based solely on children's choices of Turkish vs. French or Close by vs. Far away (ignoring their responses regarding how sure they were), limitations with children's use of the scale, could have undermined younger children's ability to distinguish between culture-specific and general knowledge when making social inferences.

The next study aimed to address these limitations.

4. Study 2

Study 2 was identical to Study 1, with the following exceptions: The data collection took place online, not in the lab and the schools. The details of the online procedures are provided in the methods section of each study. Second, the geographic proximity question was modified as "Do you think this child lives in Turkey or in France?" in an attempt to make it more comparable to the language question. Additionally, in contrast to Study 1, these two questions were asked to different groups of participants because of the concern that they were too similar and this could particularly bias children's answers. Third, some of the general knowledge items were modified in an attempt to match the items more closely across two knowledge classes. Finally, we added a brief training phase to Study 2b to familiarize children with the procedure and to train them about how to answer the question of who sure they were of their answers.

4.1. Study 2a: Adults

4.1.1. Method

4.1.1.1. Participants. One hundred and forty-five adults (80 females, mean age: 21.08 years, range 18 years – 32 years) participated in Study 2a. Participants were university students drawn from the same pool as in Study 1. All participants were native speakers of Turkish and all participants reported to speak at least one additional language. Participants were randomly assigned to the Language ($N = 71$) or the Geographical Proximity conditions ($N = 74$).

4.1.1.2. Materials. We used the same song, dance, social norm and game items for culture-specific knowledge. We used how to sing, how to dance, how to bike and knowledge of a moral norm as general knowledge items. In Study 1, the moral norm item was "one should not take others' belongings without their permission". Given that this item yielded a different pattern of results compared to the other general knowledge items, we wanted to see if a different moral item would yield similar findings to test the generalizability of that particular finding. We instead used "one should help those who are in need of help" as the moral knowledge item. The rest of the materials were the same as in Study 1a.

4.1.1.3. Design and procedure. These were identical to Study 1a, except for the following: Participants answered questions on the online survey tool on their own devices instead of the laboratory computers. Participants were asked either about the language the targets spoke or about where they lived and they indicated how sure they were as before.

4.1.2. Results and discussion

Participants' answers were converted to scores using the same procedure as in Study 1. However, because Language and Geographical Proximity questions were asked to different groups of people, each participant received two scores, one for cultural knowledge and one for general knowledge.

A mixed Analysis of Variance (ANOVA) was conducted on participants' scores with Knowledge Type (Cultural vs. General) as within-subject variable and Question Type (Language vs. Geographical Proximity) as the between-subjects variable. Results revealed a significant main effect of Knowledge Type ($F(1, 143) = 499.33$, $p < .001$, $\eta p2 = 0.77$), suggesting that adults' overall scores were higher for cultural knowledge trials ($M = 4.13$, $SE = 0.143$) compared to general knowledge trials ($M = 0.21$, $SE = 0.13$). There was no significant effect of Question Type, $F(1, 143) = 0.13$, $p = .71$, $\eta p2 = 0.001$, and no significant interaction between Knowledge Type and Question Type ($F(1, 143) = 0.105$, $p = .74$, $\eta p2 = 0.001$.

Given that in Study 2, we matched each item individually across knowledge types, we also compared participant scores for each item pair with paired sample *t*-tests. The results showed that participants' inferences that the target would speak Turkish or live in Turkey were stronger if s/he was knowledgeable about the culture-specific items compared to the general items across all four item pairs ($ps < 0.001$).

In order to examine whether participants made diagnostic inferences based on different kinds of knowledge, each of their four scores were compared to chance level (0) with one-sample, two-tailed t-tests. Because Question Type yielded no significant main effect nor it interacted with Knowledge Type, data were collapsed across groups that were asked language and geographical proximity questions. Participants' scores were significantly above chance for each of the cultural knowledge items (i.e., song, dance, social norm, game), (all $ps < 0.001$). On the other hand, while the scores did not differ from chance for three of general knowledge items (i.e., how to sing, how to dance and how to bike) (all $ps > 0.07$), participants inferred that the target would speak Turkish or live in Turkey if s/he was knowledgeable about the moral norm ($p < .001$) (See Fig. 3).

Next, we calculated percentage of participants, who indicated that the target would live in Turkey or speak Turkish for each knowledge item and compared these to chance (50%) with non-parametric binomial tests. The distributions differed from chance for all of the culture-specific items as well as for the moral norm item ($ps < 0.001$), while the distributions for the other general knowledge items were at chance ($ps > 0.24$). These percentages are provided in Table 2.

Finally, participants' self knowledge scores were high and similar across cultural knowledge items ($M = 3.67$, $SD = 0.55$) and general knowledge items ($M = 3.58$, $SD = 0.58$), $t(144) = 1.67$, $p = .096$, $d = 0.13$).

The findings of Study 2a suggest that, overall, culture-specific knowledge is more strongly used by adults as a diagnostic social cue compared to general knowledge. Knowledge of culture-specific items were used to make social judgments about targets, and most of the general knowledge items were not used to make such judgments, with the exception of the moral norm. However, as all other general knowledge items, knowledge of the moral norm was used to a lesser degree than to its culture-specific equivalent, namely knowledge of the social norm, as a social cue. The next study examined 6-to-9 years old children's social inferences based on others' knowledge, using a similar design.

4.2. Study 2b: Children

4.2.1. Method

4.2.1.1. Participants. One hundred thirty-seven 6-to-9 years old children were tested. The data of nine children were not included in the final sample because the child was living outside of Turkey (2), was bilingual (1), did not complete the study (1) or answered neither of the training questions correctly (5) (See below for details). The final sample included 128 children with 62 children in the Language and 66 children in the Geographical Proximity condition. Forty-four of the children in the final sample were 6 years old (25 Females, Mean age = 6.43 years, Age range = 6 years to 6 years 10 months), 41 of them were 7 years old (17 Females, Mean age = 7.47 years, Age range = 7 years to 7 years 11 months), and 43 of them were 8 years old (16 Females, Mean age = 8.44 years, Age range = 8 years to 7 years 11 months). Children were recruited through social media accounts of the laboratory. All children were native speakers of Turkish. Children were tested individually online via Zoom. No specific information about parental socioeconomic status or ethnicity was collected.

4.2.1.2. Design and procedure. Children were tested via Zoom and the PowerPoint slides used in Study 1b were modified for online testing. Example slides are available on the OSF page. After obtaining consent

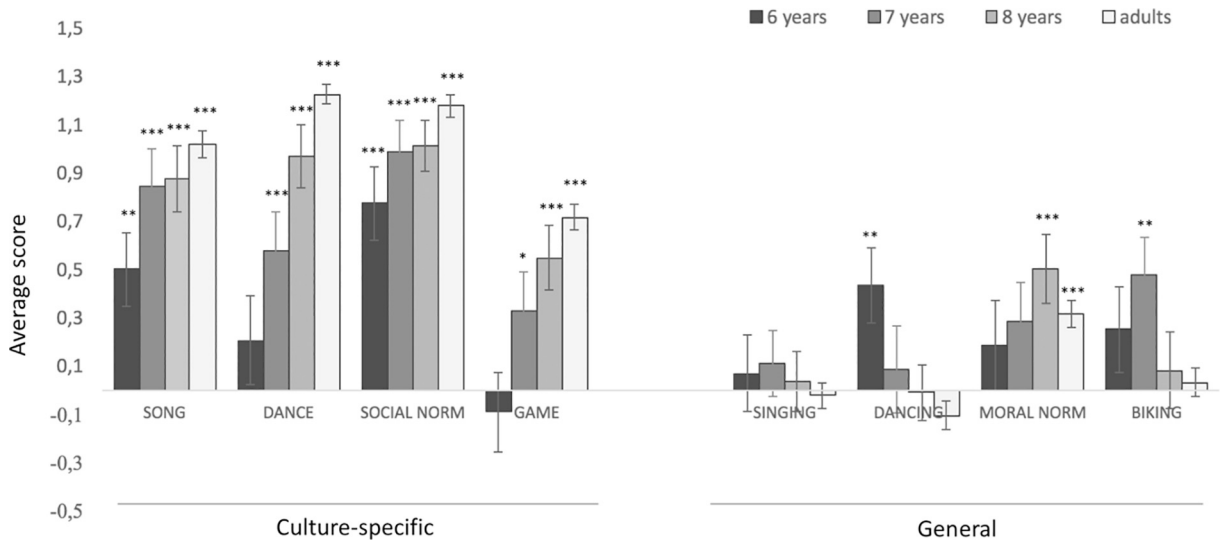

Fig. 3. Study 2 results: Item scores (range between −1,5 and 1,5) across age groups. *$p < .05$, **$p < .01$, ***$p \leq .001$. Error bars represent standard error.

Table 2
Percentages of 6-, 7-, and 8-year-old children and adults who indicated that the knowledgeable target would speak Turkish or live in Turkey for each knowledge item in response to the language or the geographical proximity questions in Study 2.

		Culture-specific				General			
		Song	Dance	Social norm	Game	Singing	Dancing	Moral norm	Biking
6 years	%	73**	50	77***	36	52	70*	59	61
7 years	%	83***	68*	90 ***	68*	54	49	59	73**
8 years	%	81***	86***	93***	70*	51	51	77***	51
Adults	%	94***	98***	97***	88***	49	45	71***	54

*** $p \leq .001$.
** $p \leq .01$.
* $p \leq .05$.

from the parent and assent from the child, the researcher initiated the warm up session. During warm up, the experimenter showed two slides, each with a different colored bar, and two slides, each with a different animal, and asked children to name the colors and the animals they see on the screen. All children answered these questions correctly, indicating that they were able to see the visual stimuli and hear the instructions/questions.

Next, the experimenter moved on to the training trials, where s/he explained the child that s/he would see new child characters and be asked questions about these characters. S/he said: (Showing a child character with a blue t-shirt) "I will show you children like this one and ask you questions about them. I will also ask you how sure you are about your answer." Following this, one small and one large black circle appeared on the screen and the Experimenter said: You can answer "a little sure" or "very sure", as a red rectangle appeared first around the small and then the large circle. Then the experimenter asked "What color do you think this child's t-shirt is?". Once the child answered "blue", the two circles appeared on the screen with the click of the experimenter, and the child was asked "How sure are you? Are you a little sure or very sure?" As the experimenter asked the child to indicate how sure s/he was, a red square appeared around the small or the large circles, indicating which one the experimenter referred to. Then the red squares disappeared and the experimenter asked: "How old do you think this child is?", and once the child answered, the experimenter repeated the question about how sure the child is about his/her answer as before. If the child indicated that s/he was very sure about the t-shirt color and a little sure about the age, the experimenter moved to the experimental session. If the child answered differently, then the experimenter asked the child why s/he answered that way and explained, for instance, that while one can be very sure about the t-shirt color, one cannot be very sure about the age because the child character could be of different ages. The experimenter further explained that the child character could be 6 years old or she could be 7 years old. Five children answered neither of the training questions correctly on the first trial. All of these children were 6 years old and while they were corrected and given further clarifications by the experimenter, their data were later removed from the final sample. Among children whose data were included in the final sample, 61.4% of the 6-year-olds 73.2% of 7-year-olds and 86% of the 8-year-olds answered both training questions as expected on the first trial. The remaining children were given further clarifications by the experimenter before moving to the test phase.

Following the training session, the test trials started. During test, on each of the eight trials, children were shown a child drawing and were told that the child depicted was knowledgeable about one of the culture-specific or general items as in Study 1b. The children were then asked whether the target child spoke Turkish or French if they were assigned to Language Condition and they were asked whether s/he lived in Turkey or in France in case they were assigned to the Geographic Proximity Condition. Children were also asked to indicate how sure they were of their answer. These questions were asked in the same way as in Study 1b.

As in Study 1, at the end of the session, children were re-introduced to each of the knowledge items and they indicated whether they themselves knew them or not. Children's answers were recorded manually by the experimenter as "Yes" or "No".

Once the experiment was finished, the experimenter thanked the child and debriefed the family.

4.2.2. Results and discussion

The scores were calculated in the same way as in Study 1a. A mixed Analysis of Variance (ANOVA) was conducted on children's scores with Knowledge Type (Cultural vs. General) as the within-subject variable and Question Type (Language vs. Geographic Proximity) and children's Age in Years (6, 7, and 8 years) as the between-subjects variables. Results revealed a significant main effect of Knowledge Type ($F(1,122) = 52.71$, $p < .001$, $\eta p2 = 0.30$), suggesting that children's overall scores were higher for the culture-specific items ($M = 2.47$, $SE = 0.19$) than for the general items ($M = 0.81$, $SE = 0.19$). Results also yielded a significant interaction between Age and Knowledge Type ($F(2,122) = 9.08$, $p < .001$, $\eta p2 = 0.13$). Finally, we found a significant main effect of Question Type ($F(1, 122) = 21.51$, $p < .001$, $\eta p2 = 0.15$), suggesting that children's overall scores were lower in the Language Condition ($M = 0.90$, $SE = 0.23$) compared to the Geographic Proximity Condition ($M = 2.38$, $SE = 0.22$). All other main effects and interactions were non-significant ($ps > 0.16$).

To follow up on the interaction effect, children's scores were compared across knowledge types (Culture-specific vs. General) separately within each age group. The results showed that 6-year olds' scores were similar across culture-specific knowledge trials ($M = 1.39$, $SD = 2.17$) and general knowledge trials ($M = 0.93$, $SD = 3.68$), $t(43) = 1.22$, $p = .229$. In contrast, 7- and 8-year-olds' scores were higher for culture-specific knowledge trials (7-year-olds: $M = 2.73$, $SD = 2.64$; 8-year-olds: $M = 3.40$, $SD = 2.24$), compared to general knowledge trials (7-year-olds: $M = 0.95$, $SD = 2.18$; 8-year-olds: $M = 0.6$, $SD = 1.93$), $t(40) = 4.85$, $p < .001$, $d = 0.75$; $t(42) = 6.36$, $p < .001$, $d = 0.97$, respectively).

As in Study 2a, participant scores for each item pair were compared with paired sample *t*-tests. The results showed that 6-year-olds inferences that the target would speak Turkish or live in Turkey were stronger if s/he was knowledgeable about the song vs. singing and social norm vs. moral norm ($ps \leq 0.022$), whereas the other knowledge items were similar across the two categories ($ps. > 0.16$). Seven-year-olds' social inferences were stronger for the culture-specific items compared to the general items across all pairs ($ps \leq 0.025$) with the exception of knowledge of game vs. biking ($p = .48$) and 8-year-olds social inferences were stronger if the target was knowledgeable about culture-specific compared to the general items for all four item pairs ($ps \leq 0.046$).

In order to examine whether children in each age group made diagnostic inferences based on different kinds of knowledge, children's scores were compared to chance level (0) with one-sample, two-tailed t-tests. Given that Question Type did not interact with Knowledge Type, data were collapsed across groups who were asked language and geographical proximity questions. Specifically, 6-year-olds did not show a consistent pattern in terms of their social inferences based on culture-specific and general knowledge categories. Seven-year-olds' scores for culture-specific items were above chance for all knowledge items ($ps < 0.05$), and they were at chance for all general knowledge items ($ps > 0.09$) with the exception for knowing how to bike: For this item, 7-year-olds inferred that the knowledgeable target would be more likely to speak Turkish or live in Turkey ($t(40) = 3.01$, $p = .005$, $d = 0.47$). Eight-year-olds' responses closely paralleled adults' responses: Their scores for culture-specific items were above chance for all knowledge items ($ps < 0.001$). The scores for general items were at chance ($ps > 0.6$) with the exception for the moral norm: For this item, 8-year-olds inferred that the knowledgeable target would be more likely to speak Turkish or live in Turkey ($t(42) = 3.54$, $p = .001$, $d = 0.54$) (See Fig. 2).

Percentages of children who indicated that the target would live in Turkey or speak Turkish for each knowledge item were compared to chance (50%) with non-parametric binomial tests. These percentages are provided in Table 2 and they closely match the results of the parametric test results reported above. Note that these results do not involve children's confidence ratings, suggesting that the patterns observed are mainly driven by children's answers to the initial question where they were asked to indicate what language the target spoke and where s/he lived.

Finally, children's answers to the question of whether they themselves knew each piece of information, were also converted to scores ("Yes" = 1, "No" = 0) and these scores were summed separately across culture-specific knowledge and general knowledge trials. These scores were then submitted to a mixed ANOVA with Knowledge Type (Culture-specific vs. General) as the within-subject variable and children's Age in Years (6, 7, and 8 years) as the between-subjects variable. The results yielded only a significant main effect of Age ($F(2, 125) = 3.56$, $p = .031$, $\eta p2 = 0.054$, but no main effect of Knowledge Type ($F(1, 125) = 2.89$, $p = .091$, $\eta p2 = 0.023$), or an interaction between these variables ($F(2, 125) = 0.11$, $p = .89$, $\eta p2 = 0.002$). Thus, while children were equally knowledgeable about the culture-specific ($M = 3.27$, $SE = 0.071$) and the general knowledge items ($M = 3.45$, $SE = 0.078$) that they were presented with, overall, older children indicated that they were more knowledgeable compared to younger children (6-year-olds: $M = 3.17$, $SE = 0.087$, 7-year-olds: $M = 3.45$, $SE = 0.091$, 8-year-olds: $M = 3.47$, $SE = 0.088$).

Study 2 aimed to address some of the limitations of Study 1 by asking more comparable questions about language and geographical proximity as well as more closely matching culture-specific and general knowledge items. The results suggest that 6-year-olds used common knowledge of some of the culture-specific items such as the song and the social norm, to infer that the target would speak the same language or live in the same country as themselves. On the other hand, while targets' knowledge of a traditional dance or game did not yield diagnostic inferences in 6-year-olds, "knowing how to dance" did. Both 7 and 8 year-old children and adults inferred common social attributes between themselves and the knowledgeable target for all of the culture-specific items. On the other hand, 7 year-olds also made similar inferences based on the knowledge of how to bike and 8 year-olds and adults, based on the knowledge of the moral norm.

These results, mainly paralleling the results of Study 1b, suggest that, across elementary school years, children increasingly use culture-specific knowledge to make social inferences and privilege culture-specific knowledge over general knowledge to guide their social inferences.

5. General discussion

The present research aimed at exploring the social meaning of common knowledge across development, by asking whether adults and 6-to-9 years old children use others' knowledge to make diagnostic social inferences about them and if so, whether they are sensitive to the distinctions in the diagnostic potential of different kinds of knowledge. Participants were presented with targets who were knowledgeable about highly familiar items that are either culture-specific or general, and asked whether the knowledgeable targets would speak Turkish (native) or French (foreign) and whether they would live close by or far away (Study 1) or whether they would live in Turkey or in France (Study 2).

Findings of two studies suggest that at the age of 6 years, children already use others' knowledge to make diagnostic social inferences about them, but in contrast to older children and adults, their response patterns do not align with the culture-specific vs. general knowledge classes. Using more closely-matched knowledge items across the two knowledge classes, Study 2 show that around the age of 7, children use knowledge as a social cue more selectively and are more likely use culture-specific knowledge to make diagnostic social judgments about others. To sum up, common knowledge is socially meaningful for both children and adults, and across elementary school years, children increasingly become aware of the diagnostic potential of culture-specific knowledge when making social inferences about others.

Previous research suggests that 4–7 year-old children can distinguish different kinds of knowledge in terms of how widely they are shared (Cimpian & Scott, 2012), and that 5–6 year-old children generalize culture-specific knowledge but not generic knowledge based on group

membership (Soley, 2019). The current findings suggest that selectivity in children's reversed inferences appear somewhat later in development, around the age of 7 years. It has been argued that because there are more alternatives individuals have to consider, diagnostic inferences are more difficult to process compared to the predictive inferences (Fernbach et al., 2011; Tversky & Kahneman, 1980). The developmental trend observed in children's knowledge-based inferences is in line with this argument and past research revealing an asymmetry between inferring attributes of the individuals based on their group membership vs. making diagnostic inferences about individuals based on their attributes (Fernbach et al., 2011; Gelman et al., 1986; Vélez et al., 2018). On the other hand, in Study 2, older children reported to be, overall, more knowledgeable about the items used in the study, compared to younger children. While we did not observe any difference across the two knowledge classes, younger children's higher level of ignorance of the items could have also contributed to their ability to selectively use these items to make social inferences.

A surprising finding that was observed across the two studies was that both children (Study 1 and 2) and adults (Study 2) used shared moral norm knowledge as an indicator of shared social attributes, even though it was intended as a general knowledge item. As discussed earlier, this might be because moral norms are harm-based, and ignorance of these norms, unlike in the cases of the other knowledge items, would have negative consequences for others. Thus, children's attribution of same-group membership to those who are knowledgeable about moral norms might reflect ingroup favoritism, outgroup discrimination, or both. Indeed, past research has shown that social group identity can influence individuals' enforcement of moral norms in children and adults, where individuals are more likely to punish behaviors that disadvantage ingroup members (Jordan, McAuliffe, & Warneken, 2014; Schiller, Baumgartner, & Knoch, 2014). It is also important to note, however, that across all age groups, participants' social inferences were stronger when the target was knowledgeable about the social norm compared to the moral norm, suggesting selectivity in using culture-specific knowledge as a diagnostic social cue, even though both adults and children treat moral norms differently than the other general knowledge types.

Another pattern that was observed across all age groups was that individuals' social judgments based on others' game knowledge were consistently weaker compared to their judgments based on other culture-specific knowledge items. This might be driven by the specific game used in the current studies. Alternatively, because there are many children's games that appear in different cultures with different names (e.g., *hide and seek*), individuals might assume that this particular knowledge type is less diagnostic of group membership.

It is important to re-emphasize that while the knowledge items were more closely matched in Study 2, they included a mix of specific items vs. broad categories of knowledge (e.g., knowing how to dance Halay vs. knowing how to dance) and contrasts between specific items (e.g., playing Istop vs. riding a bicycle). The distinction between "culture-specific" and "general" relate to the particular items chosen within each of these categories and we do not claim that these categories apply to broad classes of items. For instance, throughout history, different human societies have developed diverse procedural or factual knowledge to help them endure different geographies and conditions. Thus, factual or procedural knowledge can be diagnostic of where someone lives or what language someone speaks. Relatedly, different types of knowledge can be more or less diagnostic depending on which groups are being compared. In the current studies, certain knowledge items were selected to look at the specific social attributions tested (e.g., whether someone speaks French or Turkish), however, we do not argue, for instance, that the culture-general items never mark social group membership.

These findings raise several important questions. A critical question concerns the mechanisms of how children come to distinguish between different kinds of knowledge and their social significance. For instance, the nature of different kinds of knowledge could contribute to children's recognition of these kinds as culturally specific or general. Specifically, culture-specific knowledge that is causally opaque such as a traditional dance or a ritual might be easier to recognize as diagnostic of group membership than knowledge that is causally effective (e.g., procedural knowledge). Adults, for instance, are more likely to infer that two artifacts with similar properties would have been created as a result of social transmission (i.e., that they were copied from one another), unless they were designed in a way to be causally effective (Schachner, Brady, Oro, & Lee, 2018). In that case, they infer the two artifacts were created independently (Schachner et al., 2018). In a similar vein, knowledge that is causally opaque might be assumed to be transferred socially and more readily recognized as diagnostic of social group membership. Future studies exploring children's intuitions about how culture-specific knowledge is acquired, in relation to other kinds of knowledge, will be important for understanding the mechanisms underlying the emergence of cultural-knowledge as a socially meaningful cue.

In the current experiments, we chose culture-specific and general knowledge items that would be highly familiar to all participants and both children and adults reported to be knowledgeable about these items. Further, we did not observe any difference in terms of adults' and children's own knowledge of culture-specific and general items that could potentially account for the differences in the diagnostic potential of these two knowledge types, nor did we observe any age-related changes in these reports, with the exception that in Study 2, older children reported to be more knowledgeable than younger children. Future research should also contrast familiar and unfamiliar culture-specific knowledge from individuals' own culture and other cultures as well as presenting targets as being ignorant instead of knowledgeable about different kinds of knowledge. For instance, past research suggests that 4–5 years old children prefer those who share their knowledge state: They prefer those who know songs that are familiar, and also those who do not know songs that are unfamiliar (Soley & Spelke, 2016). An interesting question arising from these findings is whether shared ignorance could signify shared group membership, particularly when some knowledge is widely shared. Such studies would shed further light on the role of common knowledge in guiding individuals' diagnostic social inferences.

In addition to children's common ground understanding, these findings might also have crucial implications regarding the development of inter-group perception. Around the age of 5, children selectively attribute culture-specific knowledge to same-group members (Soley, 2019; Soley & Aldan, 2020) and starting around 6 years, they also make diagnostic group membership inferences about others based on their culture-specific knowledge. Together these findings raise the possibility that culture-specific knowledge, which is socially meaningful to children from an early age, can be used as a way to increase children's awareness of other social groups. Indeed, some studies suggest that interventions, whereby children are familiarized with cultural traditions of other groups, might be a useful way to reduce social biases and prejudices of children (e.g., Neto, Pinto, & Mullet, 2016; Sousa, Neto, & Mullet, 2005). The current findings might be informative about at what age such interventions are more likely to be effective.

Our results show that over the course of development, children become increasingly aware of the abstract attributes, such as culture-specific knowledge, that reliably mark group membership of potential social partners. These findings suggest a novel social implication of knowledge assessment and contribute to our understanding of children's epistemological awareness by revealing the developmental course of distinguishing the social meaning of different kinds of knowledge. Future studies should further explore the mechanisms through which cultural knowledge and social groups are connected over the course of development. Such studies might provide new insights into the exceptionally complex nature and the unifying power of human culture.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cognition.2021.104811.

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