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Toddlers Prefer Adults as Informants: 2- and 3-Year-Olds' Use of and Attention to Pointing Gestures From Peer and Adult Partners

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Two- and 3-year-old children (*N* = 96) were tested in an object-choice task with video presentations of peer and adult partners. An immersive, semi-interactive procedure enabled both the close matching of adult and peer conditions and the combination of participants' choice behavior with looking time measures. Children were more likely to use information provided by adults. As the effect was more pronounced in the younger age-group, the observed bias may fade during toddlerhood. As there were no differences in children's propensity to follow peer and adult gestures with their gaze, these findings provide some of the earliest evidence to date that young children take an interlocutor's age into account when judging ostensively communicated testimony.

Throughout the second year of life, infants and toddlers come to spend a greater amount of time in the presence of same-age and older peers. While older siblings and peers are able to provide care and teaching (Howe, Brody, & Recchia, 2006; Howe, Della Porta, Recchia, & Ross, 2016; Howe & Recchia, 2014), the interaction with age-mates throughout the second year of life is centered on very basic social interactions. Children enjoy sharing emotions and attention to each other and revel in affiliative imitation games (Eckerman & Didow, 1996). However, they have only limited means of coordinating their behavior (Brownell & Carriger, 1990; Brownell, Ramani, & Zerwas, 2006) and rarely engage in communicative interactions like those that they experience with adult caregivers (Bakeman & Adamson, 1984, 1986). The limitations on children's interactions with age-mates in the second year are manifold. For instance, interactions suffer from the absence of a shared memory system and communicative repertoire (Bakeman & Adamson, 1984), and children's inability to plan and integrate multiple roles in cooperation (Ashley & Tomasello, 1998; Brownell et al., 2006). While communicative exchanges with alternating communicative acts begin to emerge between 18 and 24 months (Brownell, 1990), it is only around 2.5 years that children begin to engage in structured conversations with one another (Hay, 2006), and their interactions remain predominantly nonverbal until well into their third year (Eckerman & Peterman, 2001). It is not until 3–4 years of age that children engage in longer and focused interactions

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Ethics, consent and conflict of interest: This study confirms with recognized standards (e.g. the Declaration of Helsinki) and was approved by an internal ethics committee at the Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany. Informed consent has been obtained from all participants and actors that helped to create stimulus material. The authors declare no conflict of interest.

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with peers (Eckerman & Didow, 1988; Williams, Ontai, & Mastergeorge, 2010). Thus, children's communicative interactions with each other lag substantially behind those with adult interlocutors, and suggest that there may be differences in how children of different ages utilize their communicative skills with peer and adult partners. To the extent that very young children rely on a caregiver scaffolding to have focused interactions with others, peer interactions provide a conservative test-case for young children's social skills and communicative repertoire.

While encounters with peers provide valuable social experiences (Smiley, 2001; Viernickel, 2009), children's interactions with peer and adult partners offer distinct learning affordances (Tudge & Rogoff, 1999). These likely shape the expectations and motivations with which they approach encounters with others. Children have demonstrated remarkable skills for seeking (Begus, Gliga, & Southgate, 2014), eliciting (Begus & Southgate, 2012), and selectively attending to or using information from individuals with differing levels of competence (Chow, Poulin-Dubois, & Lewis, 2008; Zmyj, Buttelmann, Carpenter, & Daum, 2010). It may be that age-related differences in children's peer–peer communication reflect the competence of younger communicators. That is, 2-year-old children may not turn to peers in the same way they engage with adults as they do not expect to gain from interacting with them communicatively (Franco, Perucchini, & March, 2009; Ninio, 2016).

An example to illustrate how children can profit in different ways from discriminating behavior in interaction with peers and adults comes from imitation. Around the second year of life, toddlers join peers in imitation games, which provides a privileged opportunity to affiliate and interact (Adamson & Bakeman, 1985; Bakeman & Adamson; Eckerman, Davis, & Didow, 1989). However, such interactions are likely to be centered on actions that are already in the child's repertoire—limiting the extent to which children can acquire new behavior. Following Užgiris (1981), Zmyj and Seehagen (2013) proposed that infants' and toddlers' imitation of peers primarily serves a social function, while imitation of adults seems to serve a pedagogical function. Crucially, Zmyj, Daum, Prinz, Nielsen, and Aschersleben (2012) were able to demonstrate that infants at 14 months already prefer to imitate novel forms of instrumental behavior (head-touch paradigm; Gergely, Bekkering, & Király, 2002) from an adult model but show higher rates of imitation of familiar behavior (clapping, putting beads into a cup) from a peer model.

Similar patterns of behavior seem to characterize children's communication with peer and adult partners. Though at lower rates than with adults, children in the second year of life can engage with peers in episodes of joint attention (Bakeman & Adamson, 1984). They also follow a peer's point to objects in their immediate environment (Franco et al., 2009) and respond appropriately to peers' requests for objects expressed in pointing gestures and grasping movements (Hay, Castle, Davies, Demetriou, & Stimson, 1999; Hepach, Kante, & Tomasello, 2016). Infants and toddlers have been shown to point in order to share attention and provide information both with adults (Liszkowski, 2005; Liszkowski, Carpenter, Striano, & Tomasello, 2006; Liszkowski, Carpenter, & Tomasello, 2008) and peers (Franco et al., 2009; Kachel, Moore, & Tomasello, 2018). However, they engage in lower levels of pointing with peer partners (Franco et al., 2009; Kachel et al., 2018; Ninio, 2016). Authors discuss these findings in the light of pragmatic reasons: peers are less likely to reply appropriately to the intentions underlying communicative acts, and are poor sources of information (Ninio, 2016). This has been shown to limit the amount of pointing that young children produce with adults who have been established as unreliable interlocutors (Begus & Southgate, 2012).

However, as peers become more competent and knowledgeable interlocutors throughout the preschool years (Brownell et al., 2006; Garnier & Latour, 1994), young children do not generally neglect learning opportunities provided by peers but rather rationally attune to their learning affordances. That is, children turn to engage their age mates increasingly as peer interactions become more rewarding and they do so in sophisticated ways. An illustration of intelligent use of social contexts is provided by VanderBorght and Jaswal (2009). They found that preschoolers prefer peers as informants on questions about toys. They still prefer adult advice about the nutritional value of food items. This work not only shows how preschoolers can overcome a neglect of peers as sources of information but do so intelligently by acknowledging that different groups have special areas of expertise. In addition, Jaswal and Neely (2006) also demonstrate that while 3- and 4-year-olds generally prefer adults as informants in a word-learning task, they can quickly update and even reverse their preference when an adult informant proves unreliable.

In order to investigate the development of children's preference for peer and adult partners in the third year, the comprehension of informative pointing gestures makes a very promising test case as children are well able to produce and comprehend pointing gestures at the end of the second year. However, Kachel et al. (2018) found that in a cooperative object-choice task with either peer or adult partners, 2-year-olds are significantly less likely to follow pointing gestures produced by peers. As a group, children merely performed at chance when using peers' points to find a hidden toy, even though they had clearly attended the ostensively produced and unambiguous pointing gestures (Kachel et al., 2018).

A central methodological challenge when testing young children's performance in dyads with peer and adult partners is to control both production contexts in a way that allows for highly controlled experimental comparisons. In a direct comparison with adults, the behavior of naïve peer partners will naturally be less focused and more volatile than that of an instructed experimenter. Peers might therefore appear to be poor interlocutors. Differences in children's responses to pointing gestures could arise either from these dynamic features of participants' interactions, or from children's different motivations and expectations for engaging with partners of different ages (Franco et al., 2009; Kachel et al., 2018). If young children still react differently with peer and adult partners under more carefully controlled conditions, this would constitute better evidence of the ways in which young children come to structure their own learning experience by valuing information differently when provided by peer and adult partners. Specifically, if children continue to prefer adults over peers even after dissimilarities in their communicative behavior have been further controlled, this would confirm that they place a higher value on the same information when it is provided by adults.

In order to test children's comprehension of informative pointing gestures with peer and adult partners under tightly controlled conditions, this study pioneers a semi-interactive set-up in which participants play a game of hide-and-seek vis-a-vis pre-recorded video clips of children and adults. We chose to compare the performance of 2- and 3-year-olds acting with peer and adult partners, because these age groups include, respectively, children who are likely to be inexperienced at communicating with peers, and children who have started to engage in more sustained, adult-like communicative exchanges with peers. Since both 2- and 3-year-olds are relatively experienced at communicating with adults, the planned comparisons would tell us both how peer–peer communication in 2-year-olds differs from 2-year-olds' communication with adults, and whether and how peer–peer communication becomes more adult-like in the third year of life.

In an object-choice task, children were presented with life-size video presentations of age-mates or adults pointing to one of three hiding locations directly in front of the screen. (Follow this link to [Video S1] for an illustration from the participants' perspective.) The use of video recordings makes it possible to minutely match participants' in-test experience across conditions. This paradigm also makes it possible to collect both a behavioral measure, in the form of participants' responses in the object-choice task, and an online measure of attention, namely participants' looking time as measured by an eye-tracker. For the first time, this study provides a controlled comparison of peer–peer and adult–child communication that controls for the different interactional dynamics arising with peer and adult partners. It therefore makes it possible to test what participants themselves contribute to these interactions under identical conditions. We predicted that young children would be more willing to use information provided by adults than peers at 2 years of age—replicating a previous finding (Kachel et al., 2018). We also predicted that children's preference for using points produced by adult communicators would decrease over the third and fourth year of life as they have more frequent and rewarding experiences with peers. Specifically, in a 2 (*age*: 2-year-olds, 3-year-olds) × 2 (*condition*: peer, adult) design, a significant interaction between age and condition would provide the strongest support for our hypothesis. Looking time data were collected to explore whether a potential difference in children's choice behavior could be due to them not using pointing gestures or simply not attending to them in the same way.

Method

Participants

Full Sample

A total of 96 children were tested in a 2 × 2 between-subjects design. Twenty-four 2-year-olds were tested in the peer condition (M_{age} = 25.71 months,

SD = 0.45 months, range = 25–26 months; 12 female) and another twenty-four 2-year-olds participated in the adult condition (M_{age} = 25.67 months, SD = 0.55 months, range = 25–27 months; 12 female). As studies indicate that children around 3–4 years of age become gradually better at interacting with peers (Brownell et al., 2006; Garnier & Latour, 1994), we also tested twenty-four 3-year-olds in interaction with a peer partner (M_{age} = 37.54 months, SD = 0.5 months, range = 37–38 months; 12 female) and the same number of participants in interaction with an adult (M_{age} = 37.58 months, SD = 0.49 months, range = 37–38 months; 12 female). All participants were recruited in Leipzig, a medium-sized middle-European city, and come from a predominantly white population of middle to high income families. They were contacted via a database of participants for child development studies to which their parents had voluntarily signed up. Appointments were made on the basis of parents' and children's availability. All studies described below were reviewed and approved by an internal ethics committee at the Max-Planck-Institute for Evolutionary Anthropology, Leipzig. Data collection was completed in 2016. In addition to the participants described earlier, another 13 children were tested in the study but were not included in the analyses. All of these children were part of the younger age group (peer: n = 6, adult: n = 7, 11.9% of all participants). Exclusions were made due to technical problems and experimenter errors (n = 5), persistent parental interference (n = 4) and restlessness (n = 2). Additionally, one child in the adult condition was excluded because she was too shy to look at the presentation in six out of nine trials, and one child in the peer condition was excluded for choosing the wrong box in all three warm-up trials.

Eye-Tracking Sample

Not all children participating contributed eye-tracking data. Fourteen children could not be calibrated but were tested anyway in order to elicit behavioral data. For ten children, no data were recorded during test trials as they probably leaned out of the focus of the eye-tracker. For 15 children, we could not collect enough data during an additional re-calibration sequence described below. Hence, a total of 39 children (40.6% of the full sample) did not contribute reliable eye-tracking data. The final eye-tracking sample consisted of 57 participants with twenty-six 2-year-olds (peer: n = 16, adult: n = 10) and thirty-one 3-year-olds (peer: n = 15, adult n = 16).

Questionnaire Data

As peer experience can have a significant impact on children's attitudes and performance with peer partners (Endedijk, Cillessen, Cillessen, Cox, Bekkering, & Hunnius, 2015; Schuhmacher & Kärtner, 2015; Seehagen & Herbert, 2011), parents were asked to provide background information on participant's experience in a paper-based questionnaire. For the 2-year-olds, parents indicated how much time children spend with peers between 2 and 3 years, yielding an average of 34.11 hr per week (peer: M = 32.43, SD = 11.1, Mdn = 35, range = 4–49; adult: M = 35.78, SD = 14.41, Mdn = 40, range = 0–56). Additionally, parents indicated how much time the 2-year-old participants spent with children that are between 3 and 5 years of age, yielding an average of 20.75 hr per week (peer: M = 26.39, SD = 26.11, Mdn = 20, range = 0–84; adult: M = 14.57, SD = 25.46, Mdn = 5, range = 0–84). For the 3-year-old participants, parents were only asked to indicate the average of time children spent with 3- to 5-year-olds. Again, ratings were generally high with a mean of 44.23 hr per week (peer: M = 43.83, SD = 13.78, Mdn = 40, range = 22–84; adult: M = 44.62, SD = 16.86, Mdn = 40, range = 20–84). All 3-year-olds attended daycare (peer: 24 in 24; adult: 24 in 24) and 87.5% of the 2-year-olds (peer: 21 in 24; adult: 21 in 24). Among the 2-year-olds, 62.5% of children in the peer condition had older or same-age siblings (M_{age}: 4.86 years, SD = 0.66, range 4–7) and 37.5% of children in the adult condition (M_{age}: 7.44 years, SD = 2.78, range 4–12). In the older age group, 20.83% of children in the peer condition (M_{age}: 5.4 years, SD = 1.81, range 3–8) and 45.83% of children in the adult condition (M_{age}: 5.3 years, SD = 2.0, range 3–10) had same-age or older siblings. Finally, all 3-year-olds and all 2-year-olds in the peer condition were indicated to have friends or regular playmates. For three children in the younger age group parents indicated that they had no friends and only rarely got to interact with peers. These children were tested in the adult condition to minimize negative effects on performance with peers. As these three children were not randomly assigned to the experimental conditions, we provide additional analyses excluding these children in the online summary of methods: https://github.com/GregorKachel/ET_PIP_supplements.

Finally, parents rated how comfortable their children felt around (a) familiar and (b) unfamiliar peers, whether they (c) appear interested in peers and (d) imitate their behavior and whether they are generally (e) more reserved or (f) outgoing when interacting with peers on a 5-point Likert scale. To arrive at a general peer sociality score, the response to Item 5 was reversed and then averaged with the ratings for all other items. Data indicated that their children feel generally comfortable around peers with an average score of 3.95 in the 2-year-olds (peer: $M = 3.94$, $SD = 0.5$, range = 2.83–4.67; adult: $M = 3.96$, $SD = 0.56$, range = 2.83–4.83) and an average score of 3.7 in the 3-year-olds (peer: $M = 3.6$, $SD = 0.54$, range = 2.33–4.33; adult: $M = 3.79$, $SD = 0.47$, range = 2.5–4.33).

Set-Up

The set-up consisted of a table with a high chair for the participants on one side and a flat screen (92 × 52 cm) on the other side. A board with three same-sized differently colored boxes served as hiding places in the object-choice task. This was placed adjacent to the presentation screen such that—from the participants' perspective—it would look as if the peer and adult models on screen were pointing at the boxes directly in front of the screen. The presentation surface was covered in white cloth hiding the rim of the screen and leaving only the projection surface visible. When watching the stimuli this created the impression of looking through a window into a dressing room-sized cubicle in which the video-partner was sitting. Eye movements were recorded with a remote eye-tracker (120 Hz, Tobii X120; Tobii Technology AB, Stockholm, Sweden). The device was placed in an indentation in the middle of the table in such a way that the board with the boxes could be slid over it swiftly when children made their choices during test trials. The eye-tracker was placed opposite children at a distance of approximately 60 cm and was mounted on a separate stand to avoid interference from children banging on the table. The side on which the experimenter stood was counterbalanced across participants to avoid a possible confound in the looking time data resulting from children looking back and forth between the presentation and the experimenter.

Procedure

Prior to testing, children played with the experimenter (E) in a warm-up room for a period of approximately 15–20 min. Parents were asked to complete questionnaires on their children's experience with peers while E got familiar with the participants. Children were not invited to the test room before they felt comfortable enough to participate in give-and-take exchanges with E during a warm-up game of feeding farm animals. Upon entering the test room, children were invited to sit in a high chair with parents seated next to them. If children were uncomfortable sitting on their own, they were seated on their parents' lap and parents were instructed to look to the side during the hiding game to avoid interfering in the eye-tracking measurements.

While the use of matched televised models enabled collection of both behavioral and attentional measures, this mode of presentation inevitably abstracts from real life interaction. Presentation of stimulus material on video is generally detrimental to infants' and toddlers' performance in imitation (Barr & Hayne, 1999; Hayne, Herbert, & Simcock, 2003), as well as in object-retrieval (Deocampo, & Hudson, 2005; Troseth, 2003a, 2003b; Troseth & DeLoache, 1998). This is generally referred to as the video deficit effect (Anderson & Pempek, 2005; Barr, 2010). As previous studies demonstrated that the video deficit is ameliorated by presenting the video screen as a window (Troseth & DeLoache, 1998, exp. 3), and introducing a video partner in socially contingent interaction (Nielsen, Simcock, & Jenkins, 2008; Troseth, 2003a, 2010), both features were incorporated into the introductory sequence of this procedure.

For the calibration, the screen was covered with a flat white cloth and the experimenter presented children with toy figurines at fixed positions on the cloth that corresponded to the fixation points where the operator-paced calibration animations occurred. Hence, children did not experience the presentation surface as a screen during calibration. In addition to the default five-step calibration provided by the Tobii presentation software, children were presented with a second four-point calibration sequence allowing testing and correcting of systematic shifts in the initial calibration. Following the calibration procedure, E presented children with a papier-mâché elephant and invited them to feed it with wooden marbles. While children were occupied, E placed an additional black occluder in front of the presentation surface and removed the white curtain from the screen. Next, E presented participants with the hiding places for the object-choice task: three differently colored same-size boxes placed on a tray. As children watched, E hid one marble under each box and allowed them to retrieve it immediately in order to feed the elephant. Children were required to correctly choose the baited boxes during these warm-up trials to ensure that they understood the purpose of the hide-and-seek game. Having introduced the hiding places, E remarked that the game is much more fun when played together with a partner, and mentioned that someone just behind the curtain wanted to play. E then started the presentation of an introductory sequence with a remote control and removed the occluder from the table. On screen, children first saw a still image of a white curtain. E announced that she would remove the curtain while reaching into an opening in the cloths surrounding the screen and acting as if opening the curtain displayed on video.

As E pretended to pull, the curtains separated and revealed on screen either a peer or an adult partner for the object-choice task. In time with the video presentation, E greeted the partner and waved, and the partner responded in kind (Figure 1A). E addressed the partner and introduced her to the participant ("And look, Mary, this is [participant]", see Figure 1B), whom the partner then greeted. To further create the impression that the video partner was present but behind a window in the cubicle, E presented another marble and asked if the partner would like to look at it (see Figure 1C). As soon as the video partner reached her hand out to take the marble, E reached behind the screen and his own hand appeared in the video, seemingly passing over a marble. The partner nodded as E asked whether the marble is ok for the hide-and-seek game. The marble was then returned to E through the opening next to the screen (see Figure 1D). E announced a game of hide-and-seek with the boxes on the table. E told the participant that it was her turn to search now and asked the partner whether she would help the participant find the ball. The video partner confirmed this by nodding.

For the first test trial, E placed the occluder on the table to hide the presentation screen when the introductory sequence ended (see Figure 1E). E moved the board with the hiding places behind the occluder. E presented the participant with a marble to focus their attention on the hiding game. E then moved the marble behind the occluder and hid it under one of the boxes, audibly lifting each box in order to mask auditory cues to the hidden object's location. Hence, participants could not see or hear where the marble was hidden.

Addressing both participant and partner, E said "Let's see if you two can find the ball together!", starting the first pointing video and removing the occluder. Participants watched as the video partner looked straight at them with ostensive eye contact and a relaxed smile, raised their hand to their face as an attention getter, and then pointed to one of the three boxes in front of the screen (see Figures 1F and 2). After the gesture, the partner looked straight at the participant again and E immediately shifted the board over to the participant for them to make a choice (see Figure 1G). E then placed the occluder on the table again to block visual access to the screen between the presentations of pointing

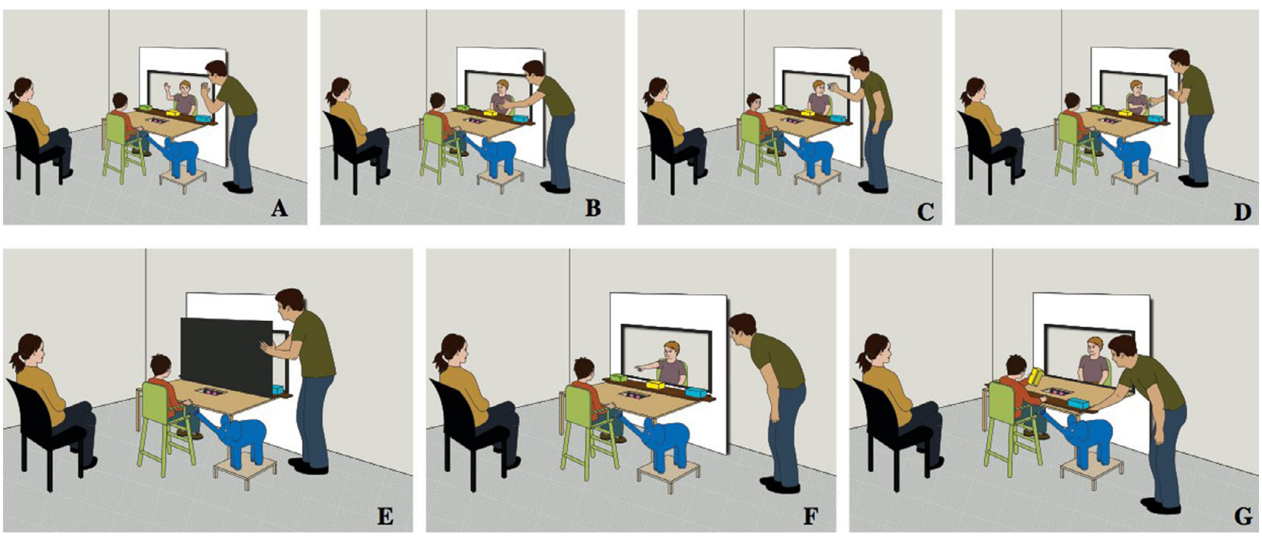

Figure 1. Set-up. Participants were watching an introductory sequence in which the experimenter interacted contingently with the partner on screen (A–D). During test trials, the televised partner points to a baited box in front of the screen (E-G).

Figure 2. Participants' perspective. Watching the life-size presentation of the stimulus material in the context of the set-up creates the impression that the peer or adult partner in the video is pointing to the boxes in front of the screen.

clips. If children found the marble, E moved to the next trial with the phrase "Great, you found the marble. Come on, let's give it another try". If children made an incorrect choice, E retrieved the marble and handed it to the children saying "That is not where the marble was. Here it is! Come on, let's give it another try" (follow this link to [Video S2] for an illustration of the introduction and first test trial).

E presented participants with a total of nine test trials starting each trial with the remote control when the participant was ready. The order of hiding places was counterbalanced but yoked across conditions. Each hiding place was used once in each set of three trials and the same box was never used twice in a row. All models contributed three individual pointing videos in which they pointed to the left, mid and right target, respectively. Participants saw each of the pointing clips three times over the course of the experiment. After the ninth trial, participants were presented with a good-bye video showing the partner waving before the curtain closed. Each session lasted approximately 10 min.

Stimulus Material

In a between-subjects design, participants were either presented with a peer or adult partner matching their own sex. To minimize potential effects of individual differences between video partners, counter pseudo-replication, and ensure that a possible effect of condition would be robust with regard to subtle differences in the timing or position of the pointing gestures, twelve sets of videos were created. The final set of stimuli featured six pairs of carefully matched adult and child models, half of which were female (follow this link to [Video S3] for a presentation of the stimulus material). Participants were randomly assigned to a model matching their own sex.

Stimulus material was recorded in the test room to match background and lightning conditions to the presentation setting. Six 4-year-old children (M_{age} = 51 months, SD = 0.08 months; three female) were invited as models. They played a game of hide-and-seek and asked to provide pointing cues for a hand-puppet that was acting as a searcher in an object-choice task identical to the one played in the test-setup. During the game, the puppet would be placed behind a camera that was recording the model children's pointing gestures from a central perspective directly in front of them. The placement of the puppet during recording ensured that when the actor looked at the puppet during the recording, this would create the impression of being looked at for the viewer of the final material. For the introductory sequence of the test procedure, we recorded a pre-scripted sequence in which the model children first greeted two puppets sitting on their side and in front of them. They then took a marble from the experimenter and returned, before agreeing to play the game with the puppets. For the pointing clips used in the test phase of the study, children were instructed to first raise their hand to their face, to produce the attention getter for the test trials, and then point to one of the three boxes in front of them, where the experimenter had previously hidden a marble. Sessions lasted 15–20 min with children providing up to 30 pointing gestures for the hand puppet. The video material was evaluated by the first author for clean execution of the gestures, positive emotional expression, the amount of shared gaze and overall level of engagement with the viewer as well as the alternation of gaze between addressee and target of the pointing gesture. The best recordings were then edited in Adobe Premiere and matched with the clips from the other models for zoom level and positioning. For the final set of stimuli, each child model contributed three pointing clips, an introductory sequence and a short goodbye video.

First recordings with 2- and 3-year-old children provided unsatisfying amounts of engagement and internal validity. This could have counteracted the study's aim of presenting ideal, ostensively communicating peers. We decided to use 4-year-old children as models in this task. As previous studies have found infants and toddlers to be most engaged and attentive to older peers (Zmyj, Daum, Prinz, & Aschersleben, 2012), the use of 4-year-old models might have contributed to make the procedure more engaging and, hence, highly conservative. In addition, the behavior of 4-year-old actors appeared overall more mature and neutral which allowed for the adult actors to copy it without appearing immature or notably child-like.

The stimulus material for the adult condition was recorded in a second step. Six adults (M_{age} = 28 years, SD = 2.09 years, range = 25–31 months; three female) were each assigned to one of the peer models and reenacted each of the peer video clips on a one to one basis. Models were filmed under identical lightning conditions and in similar clothes (green T-shirts) to counteract any salience effects arising from low-level visual features. Recordings were closely matched for the timing of the gestures, the overall position of the model and pointing hand, handedness, gaze patterns, emotional expression and any additional movements. In order for the adult models to occupy the same space as their peer counterparts, the camera was positioned slightly further away. By layering the respective adult and peer version of each video clip in a video editing software, the recordings were tested for the congruence of the pointing gestures and received final corrections to positioning. A special challenge was to keep angles, distances and the model's overall position matched across stimuli pairings despite the significant differences in body size between the adult and child models. Any compromise in matching stimuli resulted from balancing precision against the overall aim of creating a natural life-size presentation within the test-setup. Please note that despite our best efforts, the distance between pointing hand and target were minimally smaller in the adult condition for some stimulus pairings (cf. Video S3).

Coding and Data Preparation

Choice Data

The primary measure was children's choice behavior in the object-choice task. We coded which of the boxes the participants chose (Box 1, Box 2, Box 3). The first box that children lifted counted as their decision. Less than 3% of trials (n = 24) were dropped from the analysis. We excluded 14 trials in which children turned away from the presentation and, hence, did not see the pointing gesture (peer: n = 9; adult: n = 5). Four further trials were excluded from the analysis because children were too shy to make a choice and the experimenter lifted the baited box for them to finish the trial and move on (peer: n = 2; adult: n = 2). Six trials were omitted due to technical problems with the recording equipment (peer: n = 2; adult: n = 4). The final data set consisted of 840 trials from 96 participants. Agreement on children's choices was perfect (100%; κ = 1). For the analysis, participants' choices were re-coded as correct or incorrect depending on whether they were compliant with the pointing gesture. For an additional analysis of children's spontaneous imitation of the pointing behavior from peer and adult partners (see Supporting Information, Imitation of Peer and Adult Models).

Eye-Tracking Data

The Tobii system we used provided only a basic visualization of the calibration quality. This graph was checked by the experimenter and in case the calibration appeared to have a low quality, the calibration procedure was repeated. In order to complement this basic assessment, we added a recalibration procedure based on a previously established algorithm (Frank, Vul, & Saxe, 2012; for an implementation in R see also Hepach, Vaish, Grossmann, & Tomasello, 2016). The key idea was that a neutral stimulus is presented at the very beginning of the study. For this, we prompted participants to look to an additional set of calibration points on four specific locations on the cloth covering the screen. In the post-processing, an algorithm compares the actual location of the additional calibration points to the mapped gaze of the child. The discrepancy across all four positions was estimated by fitting a robust linear regression. The resulting beta-coefficient and intercept were used to re-calibrate the gaze position for each of the recalibration points. The automated procedure produced images for which the initial gaze position as well as the recalibrated gaze positions were plotted. Gaze plots for each participant were inspected individually. If the re-calibrated gaze positions showed a substantial improvement in correctly estimating the gaze position, we accepted the recalibration. This resulted in a recalculation of all gaze points of each participant's recording. All other subjects were dropped from the subsequent statistical analyses resulting in the exclusions of participants described earlier.

In order to prepare gaze data for the analyses, we read the raw data exported from the eye tracker into R. The gaze position based on the X- and Y-coordinates was re-calibrated following the procedure mentioned earlier. To check whether children were more attentive to the presentation of the stimulus material in either condition we calculated the overall proportion of time each child spent looking at the screen. In order to investigate the relation between children's looking to the correct box and their choice behavior, we averaged the data in the following way. First, we obtained the proportion of correct choices across all trials for each child in the subsample. Next, we created a measure indicating children's propensity to visually follow pointing gestures to the indicated target areas. We defined three areas of interest (AOI; left, middle, right) corresponding to the three possible hiding places in the object-choice task. In order to account for the fact that the task required tracking children's gaze to objects in front of the screen, target areas were extended downward over the physical rim of the screen by 1,200 px whereas the height on the actual screen was 120 px. The resulting target areas were identical for all video versions and covered an area of 500 × 1,320 px (cf. Figure 3).

Preliminary visual inspection of children's gaze behavior suggested that the AOI for the middle box was least diagnostic with regard to our research question. This is mainly due to registrations on the middle target area being recorded when children were just looking back and forth between all three target areas. In order to make the analysis more conservative, the middle target area was excluded from the analysis (see Figure 3B). As children often scanned all target areas throughout the trials, we decided to focus the analysis on a narrow time window in each video sequence—the period of time when the partner's point was fully extended (see Figure 3B). That period was defined as starting when the adult's or peer's gesture was fully established, with the pointing hand coming to a halt, and stopping as soon as the hand started to be withdrawn. The precise on and offset of this time window could vary across all three pointing video stimuli (pointing to target one, two, or three) for all 12 actors. As the respective video sequences where matched individually across conditions, the corresponding durations are highly correlated (Pearson's $r = .98$, $t(16) = 19.51$, $p < .001$), and differences are marginal (peer: mean duration = 1,773 ms, SD = 1,160 ms, range = 720–5,760 ms; adult: mean duration = 1,706 ms, SD = 1,121 ms, range = 480–5,360 ms). We then calculated the number of samples (both X- and Y-coordinates) found in each of the AOI (left cup vs. right cup) during the relevant time windows. For each trial, we calculated proportion scores of time children spent looking at the box highlighted by the pointing gesture as opposed to the irrelevant box on the other side. We calculated the mean proportion of looking at the correct box across all nine trials for each individual, such that all participants contributed one ratio indicating how exclusively they focused on the AOI cued by the pointing gestures.

Analysis

Choice Data

We used Generalized Linear Mixed Models (GLMM; Baayen, 2008; Bates, Maechler, Bolker, & Walker, 2015) with binomial error structure and logit link function to compare children's performance between conditions. Since we were primarily interested in the effect of the experimental manipulation, condition (peer, adult) was included as a fixed effect. Furthermore, we added age (2-year-olds, 3-year-olds) as a fixed effect and added an interaction of age and condition. Sex and trial number were entered as further fixed effects to be

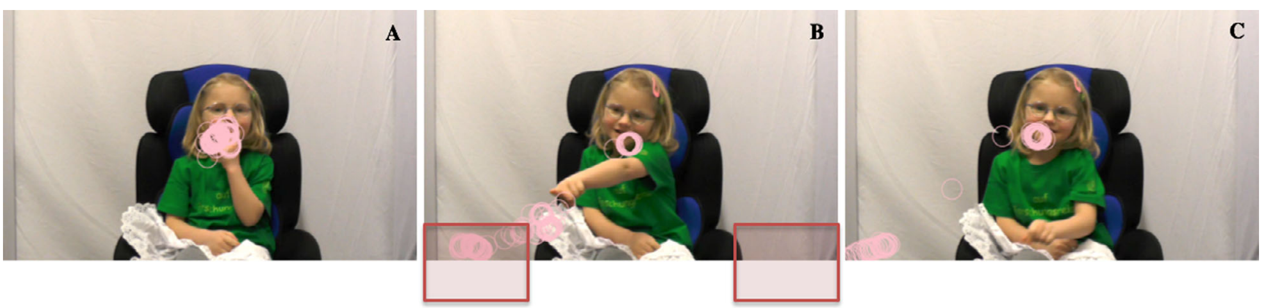

Figure 3. Illustration of areas of interest (AOIs) with gaze plot. Circles represent the locus of attention during the attention getter (A), the pointing gesture (B), and during the search phase (C) for two participants (n = 2) watching one of the pointing clips. Boxes represent AOIs during the pointing event. Note that the AOIs extent below the bottom of the presentation surface to capture gaze to objects in front of the screen.

controlled for. An interaction of condition and sex was added. Prior to the analysis, trial number was z-transformed to a mean of zero and a standard deviation of one to ensure model convergence. Dyad and participant were included as random effects. Furthermore, trial number was added as a random slope within dyad and participant as well as a correlation of the slopes and random intercepts. To establish the significance of the full model, we used a likelihood ratio test, comparing its deviance with that of a null model that comprised all factors of the full model described earlier except for condition, age and the interaction of condition and age. All GLMM analyses reported below share this full and null model structure. Model stability was evaluated by assessing the estimates of all fixed and random effects. In all of the models reported below, residuals were found to be normally distributed unless indicated otherwise. For additional support of the analysis, data were also submitted to standard analyses of variance and non-parametric tests (Mann–Whitney *U*). In order to test the performance of all experimental groups against chance, we used two-tailed one-sample t-tests with the chance level set to 1/3. For the analysis of variance (ANOVA), Mann–Whitney and t-tests, data were aggregated across trials for each individual. Missing data for individual trials were not imputed. The GLMM on children's choice behavior was adapted from Kachel et al. (2018) and provides a confirmatory effort to corroborate earlier findings. All other analyses on children's behavior were exploratory. All analyses were run in R (R core team, 2019). We used the packages *lme4* (Bates et al., 2015) and *exactRankTests* (Horton & Hornik, 2019) for analyses, as well as *png* (Urbanek, 2013) and *sciplot* (Morales, 2020) for visualizations.

In order to test for an influence of peer experience, we used a GLMM and adapted the model structure used earlier for this purpose. This analysis was exploratory. The proportion of correct responses was entered as the dependent measure and the hours spent with peers per week served as a fixed effect. Age (2-year-olds, 3-year-olds) was added as another fixed effect and we allowed for an interaction of peer time and age. Sex and trial number were entered as further fixed effects to be controlled for. Dyad and participant were included as random effects. Furthermore, trial number was added as a random slope within dyad and participant as well as a correlation of the slopes and random intercepts. For this analysis, we only used the data from the peer condition. Therefore, condition was not included as a factor.

Eye-Tracking Data

To test for differences in children's overall attention, we entered the proportion of time children spent looking at the screen as a dependent measure into 2 (age: 2-year-olds, 3-year-olds) × 2 (condition: peer, adult) ANOVA. In order to evaluate whether children's looking behavior during the pointing event could actually be used as a predictor for their decision in the object choice task, we ran an analysis of covariance (ANCOVA) entering the individuals' overall proportion of correct choices as the dependent measure and the averaged proportion of looking to the correct AOI as an independent measure. A Spearman's correlation was used to confirm the results. Having ensured that participants were equally attentive to the stimulus material in both conditions and that looking at the target AOIs had predictive value for participants' choice, we investigated whether participants were more prone to exclusively focus target areas highlighted by a pointing gesture in either of the two conditions by using an ANOVA. We plotted residuals against fitted values and used non-parametric tests in case assumptions were violated. All eye-tracking analyses were exploratory in nature, and intended to provide an additional perspective on the main analyses concerning children's choice behavior. For a repository containing the data and analyses (see https://github.com/GregorKachel/ET_PIP_supplements).

Results

Choice Data

The full model comprising age, condition and the interaction of age and condition was significantly better at explaining variation in the data than a null model comprising all factors except for condition, age and the interaction of condition and age ($\chi^2 = 24.86$, $df = 3$, $p < .001$). As the interaction of age and condition was not significant (Estimate = 0.3, $SE = .72$; $z = 0.41$; $p = .68$), it was dropped from the analysis. The final model contained age and condition as main effects and yielded a significant effect of condition (Estimate = −0.82, $SE = .38$; $z = -2.16$; $p = .03$) and of age (Estimate = 2.12, $SE = .38$; $z = 5.54$; $p < .001$). Analyzing the same data with an ANOVA, yielded a significant effect of condition ($F(1, 92) = 5.43$, $p = .02$) and age ($F(1, 92) = 34.93$, $p < .001$). Again, the interaction was not significant ($F(1, 92) = 1.43$, $p = .24$).

The data were explored further with Mann–Whitney U tests illustrating that the effect of condition appears to be mostly driven by the younger age group. Whereas a Mann–Whitney U test indicated a significant effect of condition in the 2-year-olds ($U = 385.5$, $p = .043$), we found no effect in the older age group ($U = 335.5$, $p = .3$). Additionally, 3-year-olds were significantly better than the 2-year-olds in both the adult condition ($U = 126$, $p < .001$) and the peer condition ($U = 92.5$, $p < .001$). An examination of the plots illustrates that the effect is more pronounced in the 2-year-olds (see Figure 4).

To test whether children's comprehension was above chance, we ran two-tailed one-sample t-tests for each condition separately with the chance level set to 1/3. When taking data from all nine trials, 2-year-olds were above chance in both conditions (peer: $M = 49.6\%$, $t(23) = 2.64$, $p = .01$; adult: $M = 66.9\%$, $t(23) = 6.08$, $p < .001$). The same was true for the 3-year-olds (peer: $M = 84.7\%$, $t(23) = 11.99$, $p < .001$; adult: $M = 89.9\%$, $t(23) = 16.69$, $p < .001$). To further explore the data, we formed a subset comprising only the first three experimental trials and found that only the 2-year-olds in the peer condition were not statistically better than chance ($M = 43.1\%$, $t(23) = 1.5$, $p = .15$). Two-year-olds in the adult condition performed above chance from the outset ($M = 67.4\%$, $t(23) = 6.14$, $p < .001$). For the 3-year-olds, subsetting the data did not influence the findings. In both the peer condition (peer: $M = 80.56\%$, $t(23) = 8.36$, $p < .001$) and the adult condition ($M = 91.67\%$, $t(23) = 16.13$, $p < .001$) performance was above chance even in the first three trials. This shows that children in all conditions were able to solve the task. Interestingly, only the 2-year-olds in the peer condition seemed to benefit from repeated exposure to the informative points.

In order to explore a possible influence of peer experience on children's choice behavior in the peer condition, we used a GLMM and entered the proportion of correct responses as the dependent measure and the hours spent with peers per week as a fixed effect. We found the full model was not significantly better at explaining the data than a null model containing all factors except for the amount of time spent with peers per week (likelihood-ratio-test; $\chi^2 = 2.91$, $df = 2$, $p = .23$).

Given the differences in size for the full sample ($N = 96$) and the sample contributing to the eye-tracking analyses ($N = 57$), we ran the same ANOVA on children's choice behavior on the participants contributing eye-tracking data and found the subsample to reproduce the effects of the full sample reported earlier. Two-year-olds made compliant choices in 77.6% of cases in the adult condition but only in 53% of cases in the peer condition (see Figure 4A). Three-year-olds chose the correct box in 90% of cases in the adult condition and in 85.2% of cases in the peer condition (see Figure 4B). The ANOVA indicated a significant effect of both condition ($F(1, 53) = 6.2$, $p = .02$) and age ($F(1, 53) = 12.02$, $p = .001$). Again, the interaction was not significant ($F(1, 53) = 2.12$, $p = .15$). A Mann–Whitney U test revealed a significant effect of condition ($W = 534$, $p = .03$) when testing both age groups. As before, the effect is driven by the younger age group as there is a significant effect of condition in the 2-year-olds ($W = 117.5$, $p = .049$) but not in the 3-year-olds ($W = 140$, $p = .4$).

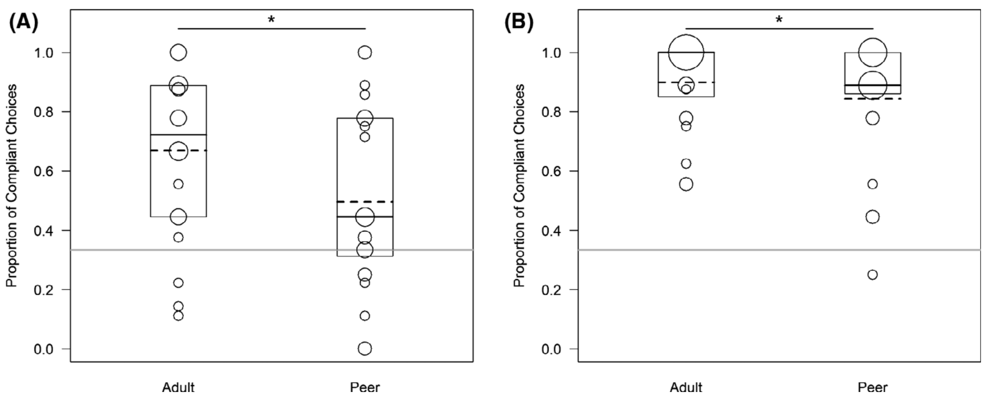

Figure 4. Proportion of compliant choices in 2- and 3-year-olds. Larger bubbles represent more participants with a given proportion. Boxes indicate 25th, 50th and 75th percentiles. Dashed lines indicate means. Asterisks highlight significant differences between conditions. The grey line demarcates chance level. The 2-year-olds are depicted on the left (A), 3-year-olds on the right side (B). The greatest amount of variation was observed for 2-year-olds tested in the younger age group with individuals contributing 0% and 100% of compliant choices.

Eye-Tracking Data

The overall proportions of time children spent looking at the screen were consistently high across conditions and age groups (2-year-olds: peer = 89.5%, adult = 90.9%; 3-year-olds: peer = 86%, adult = 89.9%; see Figure 5). An ANOVA revealed that the overall time children spent looking at the screen did not vary significantly as a function of age ($F(1, 52) = 1.19$, $p = .28$) or condition ($F(1, 52) = 1.37$, $p = .25$). Also, the interaction between condition and age ($F(1, 52) = 0.34$, $p = .56$) was not significant.

An ANCOVA combining the proportion of time participants spent looking at the target AOI and choice behavior, indicated that looking time was a significant predictor ($F(1, 39) = 4.97$, $p = .03$) for children's choice behavior. Again, there was a significant effect of age ($F(1, 39) = 6.56$, $p = .01$) but not of condition ($F(1, 39) = 1.8$, $p = .18$). The interaction between condition and age was not significant ($F(1, 39) = 0.02$, $p = .9$). The predictive value of looking time for the percentage of correct choices was confirmed by a Spearman's correlation (rs = .395, $p = .007$). Two-year-olds in the peer condition, spent an average of 68.1% looking at the correct cup, whereas the adult condition averaged around 93.7% (see Figure 6C). For the 3-year-olds, there was a similar but less pronounced tendency (peer: 89.6%, adult = 97.4%; see Figure 6D). Finally, testing the proportion of time children spent looking at the cued AOI across conditions, an ANOVA indicated a significant main effect of condition ($F(1, 40) = 4.77$, $p = .03$) and a trend for age ($F(1, 40) = 3.2$, $p = .08$). The interaction was not significant ($F(1, 40) = 1.44$, $p = .24$). However, plotting residuals against fitted values revealed that the residuals were not normally distributed which could make the ANOVA non-conservative. A Mann–Whitney U test comparing both conditions did not indicate a significant effect of condition ($U = 211$, $p = .4$).

General Discussion

In a between-subjects-design, 2- and 3-year-olds were tested in an object-choice-task with either peer or adult partners pointing out the location of a hidden toy. Partners were presented via a semi-interactive video playback enabling a close matching of adult and peer conditions and the combination of participants' choice behavior with looking time measures. A GLMM of children's choice behavior revealed a significant main effect of condition and of age but no interaction, indicating that children of both ages were more likely to use information provided by an adult partner, and that the 3-year-olds were generally more competent in the task. Plotting and additional analyses suggest that the effect of condition was mainly driven by the younger age-group. However, in the absence of a significant interaction of age and condition in the main analysis, the most conservative interpretation is that both 2- and 3-year-olds were more likely to follow pointing gestures by adults. As the gestures that children

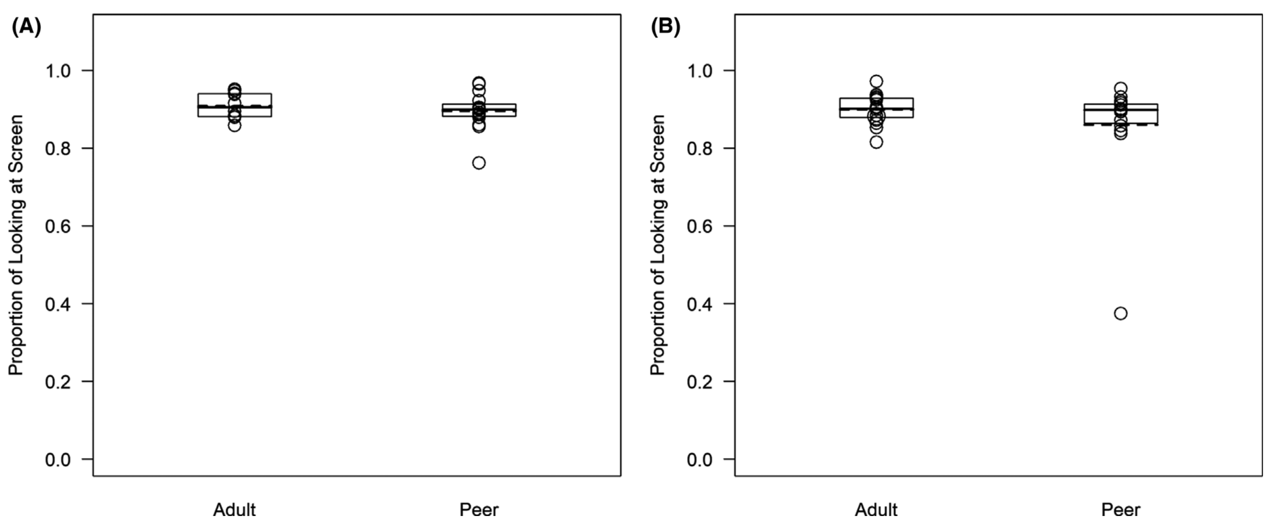

Figure 5. Proportion of time spent looking at screen. Larger bubbles represent more participants with a given proportion. Boxes indicate 25th, 50th, and 75th percentiles. Dashed lines indicate means. The 2-year-olds are depicted on the left (A), the 3-year-olds on the right side (B).

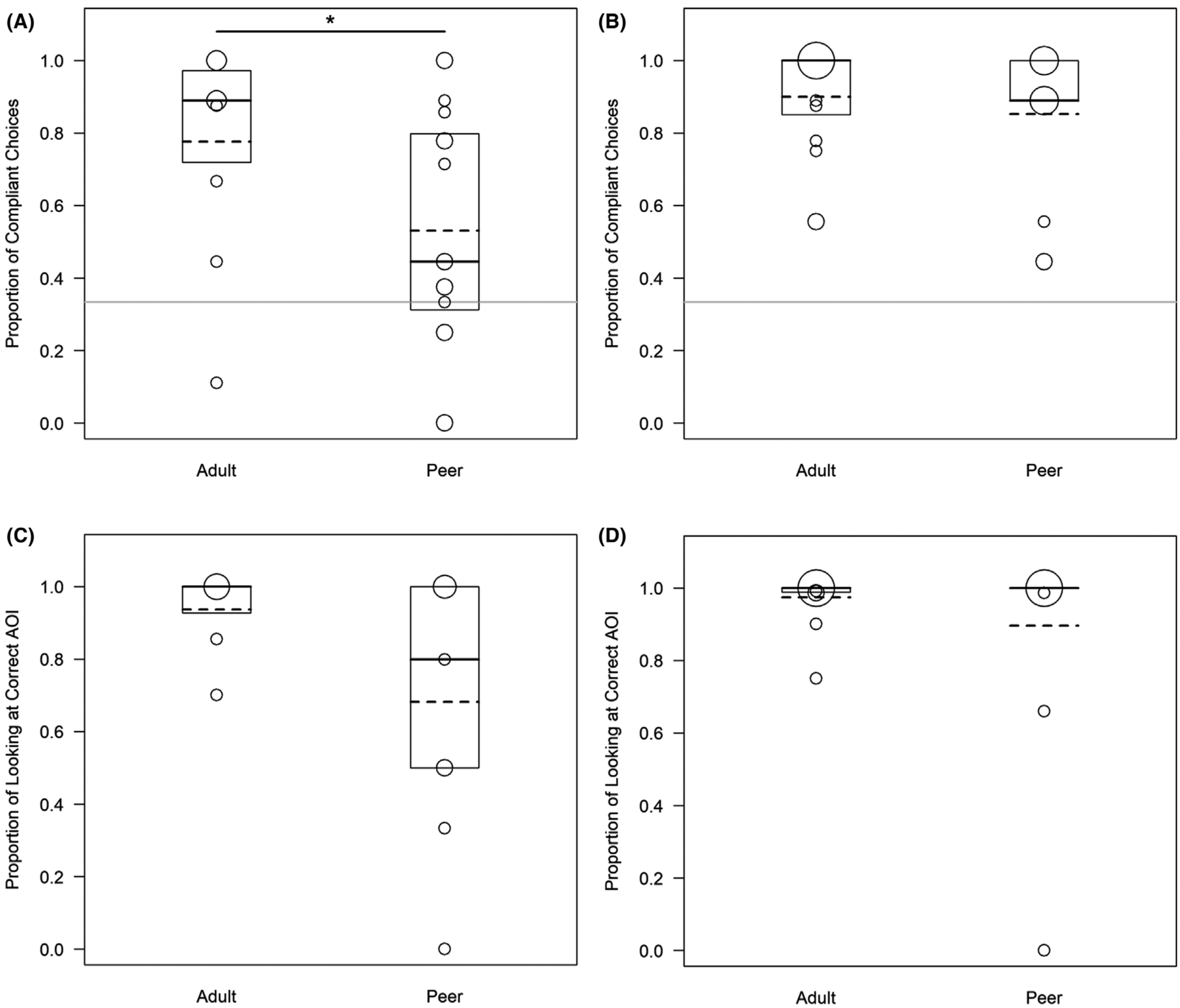

Figure 6. FProportion of compliant choices and looking at correct areas of interest (AOI). Larger bubbles represent more participants with a given proportion. Boxes indicate 25th, 50th, and 75th percentiles. Dashed lines indicate means. The grey line demarcates chance level. Plots illustrate the proportion of correct choice in the eye-tracking sub-sample (n = 57) for the 2-year-olds (A) and 3-year-olds (B), together with average proportion of time children spent looking at the correct AOI for the younger (C) and older age group (D), respectively.

were provided with in both conditions were matched with regard to their timing, accuracy, execution, angle and accompanying emotional and ostensive cues, the finding cannot be attributed to the younger pointing partners' being inferior interlocutors.

Looking time data indicated that participants were generally highly attentive and that differences in choice behavior might not result from a general lack of attention to the interaction partner. These results are in line with findings on children's attention tested with video stimuli of peer and adult partners in an imitation task (Zmyj, Daum, Prinz, Nielsen, et al., 2012). Further analyses revealed that participants who were more likely to exclusively focus on the target cued by the pointing gesture, were significantly more likely to make a correct choice. However, this effect was not mediated by the age of the pointer. Additionally, there was no effect of the age of the partner on the total amount of time participants spent looking at the cued target. While looking time emerges as a significant predictor for children's choice behavior, we do not find evidence for children distributing their attention differently across conditions. Given that we were working with recordings of young children and aimed at matching these recordings individually to models with considerably different body sizes, the pairings for pointing clips from the peer and adult were not perfectly identical. For example, the distances between pointing hand and target was slightly smaller in the moment when the pointing gesture was fully extended for some of the stimulus pairings (cf. Video S3). In the absence of differences in the looking time data, we consider such slight differences negligible. Especially the data from the older age-group illustrate that the participants were clearly able to unambiguously identify the target of the pointing hand (cf. Figure 6B) and that the clips were equally effective at drawing children's gaze to the respective target areas (cf. Figure 6D).

Additional questionnaire data on children's experience with peers aimed to enable comparisons with children tested in other contexts. Descriptive analyses indicate that participants in both age groups and conditions have considerable experience with same-age and older peers both within and outside of their family, and are very likely to encounter peers on a daily basis. The few exceptions to this general pattern were deliberately tested in interaction with adults as their performance might have distorted group performance in the peer condition. All parents indicated that their children felt comfortable around peers. In an exploratory analysis, the average amount of time children spent in the presence of peers did not emerge as a significant predictor for their choice behavior. However, it has to be highlighted that there was little variation in the amount of time children spent with peers and time spent with peers per se is a very coarse predictor as the quality of children's experience with peers will vary with the age, the presence of siblings and most crucially children's own social characteristics (Endedijk et al., 2015; Schuhmacher & Kärtner, 2015).

In the Supporting Information, we present further analyses of children's spontaneous imitation of the models (cf. Supporting Information, Imitation of Peer and Adult Models). While we found no significant difference in the amount of spontaneous imitation of the peer and adult models, imitation rates indicate that children were generally immersed in the task. Taken together, all additional measures indicate that the difference in children's choice behavior across conditions can neither be sufficiently explained by their motivation to attend, nor by a lack of engagement, or a general lack of experience with peers. Rather, our findings suggest that children use equivalent information differently when provided by peer and adult partners. That is, children are less likely to expect their peers to provide information, and so are more reluctant to make use of it to guide their behavior than when equivalent information is provided by adults.

The effect of condition was more pronounced in the younger age group. Several studies suggest that between the second and fourth birthday children become increasingly able to coordinate with and benefit from interactions with age-mates (Brownell & Carriger, 1990; Brownell et al., 2006; Grosse, Behne, Carpenter & Tomasello, 2010). If the result observed in the current study is due to children's particular sort of experience with peers (for example, if they have less often engaged in informative communicative interactions with peers than with adults), a greater number of rewarding interactions with peers should, over time, reduce the differences between conditions. Data visualization aimed at making the children's individual contributions salient highlights a high amount of intra-individual variation with 2-year-olds in both conditions (cf. Figure 4) and the role of the specific quality of peer experience.

The video presentation of peer and adult partners employed in the current work might raise concerns about the validity of the findings. While there is evidence that even 2-year-olds are generally able to handle and benefit from video interactions (Tarasuik, Galligan, & Kaufmann, 2011), children's learning and general performance has been shown to be negatively affected by video as opposed to real life presentation in imitation (Barr & Hayne, 1999; Hayne et al., 2003; McCall et al., 1977), self-recognition (Suddendorf, Simcock, & Nielsen, 2007) and most crucially object-retrieval tasks (Deocampo & Hudson, 2005; Troseth, 2003b; Troseth & DeLoache, 1998), which is also described as 'video deficit' effect (Anderson & Pempek, 2005; Barr, 2010). In the context of the current study, contingent interaction with the video partner as well as presenting the presentation surface as a window were introduced into the procedure to ameliorate such effects in line with previous findings (Barr, 2010; Nielsen et al., 2008; Roseberry, Hirsh-Pasek, & Golinkoff, 2014; Troseth, 2010; Troseth & DeLoache, 1998; Troseth, Saylor & Archer, 2006). While the interaction with televised models might still be considered an unnatural context limiting children's performance, this factor should weigh equally on both test conditions and, hence, not affect the findings of the study. Furthermore, children in all age groups and conditions performed above chance. For the 2-year-olds, the adult condition illustrates that even the younger age-group was generally able to respond correctly to the video set-up.

Finally, it needs to be addressed whether children's neglect of pointing gestures from peers is due to a lack of trust in the information provided, or a lack of trust in the helpful motivations underlying it. It is intuitively plausible that children in the first 2 years might encounter each other in predominantly competitive interactions, as they struggle over access to resources such as toys or caregiver attention. While antagonistic behavior is common in toddlers, affiliative behavior is generally more frequent (Eckerman & Peterman, 2003; Rabain-Jamin, Maynard, & Greenfield, 2003) and more rewarding for individuals (Endedijk et al., 2015). Children are sensitive to each other's needs and desires (Schuhmacher & Kärtner, 2015; Smiley, 2001) and engage in various types of prosocial behaviors with peers such as sharing (Brownell & Carriger, 1991; Hay et al., 1999; Smiley, 2001; Ulber, Hamann, & Tomasello, 2015), helping (Hepach, Kante, et al., 2016) and affiliative talk (Katz, 2004; O'Neill, Main, & Ziemski, 2009). Though conflicts will inevitably occur, the studies outlined here should at least provide a balanced view with regard to competitive and affiliative motives in peer interactions.

In this study, the context of the hide-and-seek game and the introductory sequence that clearly assigns roles to participant and partner were specifically designed to counteract participants' possible interpretation of pointing gestures as imperative or interrogative rather than genuinely informative. However, we cannot be sure whether some participants actually interpreted the pointing gestures as declarative or, for example, imperative in either condition. While it could still be argued that lower success rates in the peer condition could have resulted from participants falsely interpreting pointing as demanding objects or information due to their experience outside the laboratory (cf. Smiley, 2001; Viernickel, 2009), the argument from pragmatic misinterpretation does actually coincide with children not valuing the information provided by a peer's gesture, which is our preferred interpretation of the data. Moreover, if participants were misinterpreting pointing gestures from peers as expressing imperative rather than informative intentions, they should still be more likely to choose the box that their peer partner was pointing at as the pointing gesture would still make the indicated option more desirable and salient.

Interpreting the results of the current study in the light of selective trust or learning, provides an integration with several studies finding that young children value information from adult sources more than from peers. Three-year-olds have been shown to preferentially learn rules from adults as opposed to peers (Rakoczy, Hamann, Warneken, & Tomasello, 2010) and to conform to an adult majority more than to a majority of peers (McGuigan & Stevenson, 2016). Infants and preschoolers have also been shown to imitate novel actions more when demonstrated by adult as opposed to peer models (Zmyj, Daum, Prinz, Nielsen, et al., 2012; Zmyj & Seehagen, 2013). Furthermore, this study replicates the finding of Kachel et al. (2018) that 2-year-olds follow adults' pointing gestures over peers' in an object-choice task. While it has been shown that infants are already sensitive to the reliability of informants (Chow et al., 2008; Poulin-Dubois, Brooker, & Polonia, 2011), mastery of the concept of selective trust requires children to make stable ascriptions to groups of people and act accordingly (Lucas & Lewis, 2010). In light of this argument, the current data provide a valuable contribution to this literature. Even where informants are equally reliable, 2-year-olds appeared to have entered this study with a general assumption about the relative value of information provided by peers and adults. However, our findings also suggest that a preference for using information provided by adults would decrease at the end of the third year when peers become more competent interlocutors. Preschoolers are able to intelligently overcome a bias for information from adults for example when requiring information about toys (Vanderborght & Jaswal, 2009) or when adults prove unreliable (Jaswal & Neely, 2006).

Peers form a social group with which infants and toddlers generally have ample experience and that provides unique opportunities for interaction and social learning. But prior to their second birthday, age-mates are unlikely to provide young children with the same amount of tailored care, targeted information and pedagogical intervention that they can receive from adults and older siblings (Bakeman & Adamson, 1984; Brownell, 1990; Brownell & Carriger, 1990). This makes age a highly salient and reliable cue for the knowledgeability of an informant consistent across a wide range of individuals. While much emphasis has been put on understanding the special ways in which adults scaffold children's learning behavior, a more comprehensive understanding of ontogeny requires further study of how children guide their own learning experiences and actively seek out relevant and reliable information (Begus et al., 2014; Stahl & Feigenson, 2015). This study adds to the growing literature on selective learning by providing solid evidence that young children can take an interlocutors' age into account when judging and interpreting testimony.

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Supporting Information

Additional supporting information may be found in the online version of this article at the publisher's website:

Appendix S1. Imitation of Peer and Adult Models

Video S1. Subject's Perspective in Test

Video S2. Introductory Sequence and First Trial

Video S3. Stimulus Material