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Taking Versus Confronting Visual Perspectives in Preschool Children

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Recent evidence suggests that 3-year-olds can take other people's visual perspectives not only when they perceive different things (Level 1) but even when they see the same thing differently (Level 2). One hypothesis is that 3-year-olds are good perspective takers but cannot confront different perspectives on the same object (Perner, Stummer, Sprung, & Doherty, 2002). In 2 studies using color filters, 3-year-olds were unable to judge in what color they and an adult saw the same picture. This was the case irrespective of whether children replied verbally (pilot study) or by pointing to color samples (main study). However, 3-year-olds readily took an adult's perspective by determining which of 2 objects an adult referred to as being a certain color, independently from how the children saw the objects (main study). Taken together, these results suggest that preschoolers' difficulty is not so much taking perspectives as it is directly confronting another's view with their own—an ability that seems to be acquired between 4 and 5 years of age.

Keywords: perspective taking, theory of mind, social-cognitive development

In their everyday interactions, humans rely heavily on the mutual ability to take and understand others' perspectives. In linguistic communication, for example, conversational partners tailor the content of their speech to the other's background knowledge (Clark & Murphy, 1982), and in cooperative activities participants pay attention to one another's roles and perspectives. There are certainly situations in which this ability to acknowledge others' perspectives falls short (e.g., Bernstein, Atance, Loftus, & Meltzoff, 2004; Keysar, Lin, & Barr, 2003), but this does not change the fact that adults generally do have the ability to appreciate others' viewpoints and that they often even do so without much or any effort (Samson, Apperly, Braithwaite, Andrews, & Bodley Scott, 2010).

Given the importance and ubiquity of perspective taking in adult human interaction, it is not surprising that one of the benchmarks of children's social-cognitive development is the emergence of this ability. Important questions are thus when and how young children first become aware that people's access to the world is perspectival, and that, as a consequence, people may have different views of things. Whereas most of the research has focused on the case of epistemic perspectives, with the standard false-belief task as the litmus test, the field's historic roots lie in the domain of vision, and there is reason to think that new advances are now possible within this domain.

According to Flavell's (1978, 1992) well-known developmental model, knowledge of visual perspectives unfolds in two distinct steps over ontogenetic time. Children first develop an understanding that another person may not see the same things they see—also known as *Level 1 perspective taking*. A child who has reached Level 1 should, for example, successfully hide an object from others ("percept deprivation"; see Flavell, Shipstead, & Croft, 1978; McGuigan & Doherty, 2002) or bring out an object from behind a screen that a person fails to see ("percept production"; Lempers, Flavell, & Flavell, 1977; Moll & Tomasello, 2006). Studies using action measures show that these abilities develop between around 2 and 3 years of age, and looking-time studies that capture perceptual reactions might suggest that even 12- to 15-month-olds are sensitive to what others can and cannot see (Luo & Baillargeon, 2007; Luo & Beck, 2010; Sodian, Thoermer, & Metz, 2007).

The second step in Flavell's (1978, 1992) developmental model is *Level 2 perspective taking* and has been characterized as the understanding that people may not only see different things, but see the same things *differently*. In this level, a child can determine, in philosophical terms, the specific "mode of presentation" (Frege, 1892) or "aspectual shape" (Searle, 1992) in which an object is given. A child at Level 2 can take another's perspective even when

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this differs not only with regard to *what* is visible, but *how* a specific object is seen.

Probably the most widely known Level 2 test is Piaget and Inhelder's (1967) three-mountain problem in which children are asked to specify how a doll sees a three-dimensional array from various positions by choosing from among a set of photographs. A test that might be more suitable for young children because it involves a much simpler visual array and binary response alternatives is the so-called turtle task (Masangkay et al., 1974). In this task, a child and an adult sit on opposite sides of a table with a picture of a turtle between them. The child, who sees the picture right-side up is asked to say how she herself sees the turtle ("right-side up") and how the adult sees it ("upside down"). The results showed that children at 4.5 years and older acknowledged that the adult saw the picture in a different orientation. The younger children, however, mostly said that the adult saw the turtle as they did, that is, right-side up. Whether young children are biased to report their own or, as Light and Nix (1983) suggest, the "good view" of an object cannot be distinguished on the basis of this finding, but it certainly indicates that children at this age do not properly attribute and fully understand different perspectives.

Numerous studies since then have replicated that children younger than about 4–5 years do not engage in Level 2 perspective taking. For example, 3-year-olds were no better than in the original turtle test when expressions with distinctive features were used (e.g., "standing on its head" instead of "upside down") or when the test was embedded in an ecologically valid event like book-reading—with the book orientated "the right way" or "the wrong way" (Flavell, Everett, Croft, & Flavell, 1981). Studies in which the effects of an observer's distance on the appearance of objects was varied also yielded negative results (Pillow & Flavell, 1986). Moreover, even training 3-year-olds by systematically presenting them with the perceptual changes following a change of spatial location was insufficient (Taylor & Hort, 1990). This has led researchers to conceive of Level 2 as a robust and uniform phenomenon (see Flavell, 1992, for a review).

However, this view has recently been challenged. Moll and Meltzoff (2011a) designed a Level 2 perspective-taking task with color filters (though color filters have been used before in other ways; Flavell, Flavell, & Green, 1983; Gopnik & Astington, 1988; Taylor & Flavell, 1984). In their first experiment, 36-month-old children were shown two identical-looking blue objects, one of which was seen through a yellow filter by an adult (but not by the child). One object was seen in the same color by both the child and the adult (blue), whereas the other looked different to them: blue for the child but green for the adult. The adult then requested either "the blue one" or "the green one" without indicating via gaze direction which object she was referring to. The 36-month-olds significantly selected the correct object in response to both requests: They chose the object that they and the adult both saw blue when blue was requested, but they chose the object that only the adult saw green when green was requested. The children thus identified another person's way of perceiving an object, whether this matched their own perception or not. In a subsequent study, children of the same age were also able to produce a certain perception in an adult: They knew on which side of a yellow filter they had to place a blue object for an adult to see it green—even though it still looked blue from their own perspective.

The pressing question, then, is how these data can be reconciled with the previous findings. As noted above, there was a strong confirmation, with many replications, of the original finding that children younger than approximately 4–5 years of age cannot apprehend that others may see the same thing differently. The new request-based color tests, in contrast, indicate that even 36-month-olds have such an understanding.

To resolve this apparent conflict, we argue that Moll and Meltzoff's (2011a) tests must be conceptually differentiated from the cognitive tasks that are typically solved between 4 and 5 years. Perner characterizes the cognitive step taken at this age as the nascence of the ability to confront perspectives on the selfsame object (see Perner, Stummer, Sprung, & Doherty, 2002). In the false-belief test, children have to acknowledge that the same object can be thought of as located in the drawer or the cupboard, depending on one's epistemic perspective. In the appearance-reality test, they have to apprehend that the same object can look to be one thing (e.g., a rock) but actually be another (a sponge). Likewise, in Doherty and Perner's (1998) "alternative naming game," children have to understand that one and the same object, for example, a rabbit, can come under two different sortals or conceptual perspectives ("bunny" and "rabbit"). Analogously, in the turtle task, the child has to confront two visual perspectives on the same object and understand that the same thing can be perceived in different ways.

We argue that 3-year-olds can take but not confront visual perspectives. The 36-month-olds in Moll and Meltzoff's (2011a) study succeeded because, although perspective taking at Flavell's (1992) Level 2 (with a difference in how a given object was presented) was involved, no confrontation of visual perspectives was necessary. They did not have to judge how an object looks from a certain point of view when an alternative view was simultaneously salient to them, but only had to fulfill another's request by taking or adopting the perspective expressed by the adult. In the first experiment, they achieved this by determining which of two potential referents the adult saw in the requested color. In the second experiment, they achieved it by producing a spatial arrangement that leads to a certain perception for the adult. In order to accomplish this, children did not need to realize that there are multiple ways of seeing the same thing. They just had to identify an object or a location that meets a specific criterion, but could ignore the fact that this implies different perspectives on the same thing.

On the basis of these considerations, we hypothesized that when the color filter test is modified such that children have to confront perspectives and judge how the adult sees the object that they see differently, 3-year-olds will not be successful—even if the material and basic procedure are kept the same. If this is true, then we will have differentiated two important abilities that have been uniformly subsumed under Level 2 perspective taking. To test this hypothesis, two studies were conducted. In a pilot study, 3-year-old children were administered a "confrontational" version of the color filter task, in which they were asked to explicitly judge in what color they and an adult see the same object. In the main study, 3- and 4.5-year-olds' performance on a nonverbal variant of the same test was compared with the performance by children of the same age who received the original request-based test.

Pilot Study

Initial support for the idea that 3-year-olds cannot confront visual perspectives was obtained in a pilot study conducted with the same children who participated in Moll and Meltzoff's (2011a) first experiment.

Method

Participants. Participants were 27 (12 females and 15 males) 36-month-old children (M = 36.13, range = 35.72–36.59). They were recruited by telephone calls from the university's subject pool. Previously established criteria for participation were that children be full term; had a normal birth weight; and had no known physical, sensory, or mental disabilities. According to parental report, 26 children were White, and one was Asian. All children had previously participated in Moll and Meltzoff's (2011a) Experiment 1.

Materials. A coil-shaped plastic toy served as a warm-up toy with which the experimenter (E) and the child played before the experiment began.

Pretest for color comprehension. In order to test for basic color comprehension vocabulary, four laminated, flower-shaped color samples (approximately 9 cm × 9 cm) in blue, green, white, and yellow were used.

Screens and color filters. A screen (46 cm high × 61 cm wide × 6 mm thick) was used to hold the yellow color filter. It consisted of two transparent sheets of acrylic plastic with a paper-thin slot into which color filter sheets could be slid. The screen contained a yellow color filter (46 cm high × 30.5 cm wide), which filled one half of the screen. A blue laminated picture showing a dog (17 × 16 cm) functioned as stimulus. A picture was used because it guarantees that the same surface is perceived from different perspectives, not distinct parts or sides of an object. During the demonstration phase, the picture was held up vertically against the screen (which resulted in an optimal effect of color mixing); for the test, it was placed flat on the table (for the reason stated above).

Design and procedure. For the color comprehension pretest, the four color samples were placed in front of each child in the same spatial arrangement (see below). The order in which E asked the child to show the colors was different for 24 of the children and randomized for the remaining three children. For the test, participants received two questions (Self Question and Other Question). Half the children received the Self Question first and half received the Other Question first. As part of the content of the question, the color terms *blue* and *green* were mentioned. Their order was counterbalanced.

After E's arrival at the research center, she introduced herself to the child, and they played together briefly. E and the child then went into the testing room. They sat down at a table with E positioned next to the child at a 90° angle to her left. E and the child then played with the warm-up toy for approximately 3 min until the child felt comfortable.

Color comprehension pretest. The warm-up toy was withdrawn, and the flower-shaped color samples were placed on the table in front of the child in a fixed order (white, blue, yellow, and green from the child's left to right). E then requested the child to show her the colors one by one ("Can you show me the [name of color] one?"). To avoid any gaze cues, E always looked at the child when asking the questions. The children responded by either pointing to or touching a color sample. If a child selected the wrong color, E repeated her request for the same color up to two times. They then moved on to the next color. All children successfully identified the four colors. E removed the color samples and brought out the screen containing the yellow color filter, which she placed on the table facing the child.

Demonstration phase. The yellow half of the screen was either to the child's left or to the child's right (counterbalanced). E then placed the picture of the blue dog between the child and the screen. She then asked the child to come around the table to see what the picture looked like from there. Children walked around the table and sat down in the chair to E's left—in Position B as shown in Figure 1. E first held the picture behind the clear part of the screen, then she moved it behind the yellow filter, saying "Look!" She then held up the green flower saying, "Now it looks like this!" to highlight that the picture now looked green. E moved the picture (e.g., the blue dog) back behind the clear half of the screen, this time holding up the blue flower, saying "Now it looks like this!" The picture was moved three times behind the filtered, and three times behind the unfiltered half of the screen. Every time a change in color perception took place, E highlighted this by holding up the corresponding color sample and saying "Now it looks like this!" Finally, E moved the picture very slowly behind the screen, saying "Look!" as the picture progressively turned green when moved behind the edge of the yellow filter and progressively turned blue again as it was moved back. Again, it was held behind each half of the screen three times. No color terms were used throughout the demonstration. After this demonstration, E asked the child to walk back around the table to sit in her initial position (A). Children then received Moll and Meltzoff's (2011a) Level 2 perspective-taking experiment. Immediately thereafter, the children engaged in the following test.

Test phase. E moved to Position B to sit down across from the child, with the yellow half of the screen centered between them. E placed the picture of the blue dog on the child's side of the table. The child saw the dog as blue, but to E, who saw it through the yellow filter, the dog appeared green. Analogous to the questions children are posed in the turtle task (see Flavell et al., 1981; Masangkay et al., 1974), E asked: "How do you see the dog from over there—do you see it blue or do you see it green?" (self-question) and "How do I see the dog from over here—do I see it blue or do I see it green?" (Other Question). The order in which children received these two questions was counterbalanced. The

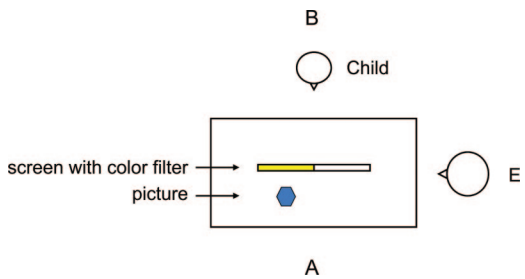

Figure 1. Aerial view of the setup during the demonstration phase in the pilot study.

order in which the color terms *blue* and *green* were mentioned was the same in the two questions for a given child, but was counterbalanced across children.

All children except one (who answered only the Self Question) gave a clear verbal response to both questions. An independent research assistant who was unaware of the content of the question coded whether children said "green" or "blue," or gave no response. No answers and wrong answers were scored as 0, and correct answers were scored as 1. To assess interrater agreement, an independent research assistant who was also unaware of the question scored a random sample of six children (> 20%). The two raters had one disagreement that could easily be resolved. Kappa was .84.

There was no effect of trial (first vs. second; $p = .43$) or order (Self Question first vs. Other Question first; $ps > .82$), so these factors were disregarded in the main analysis.

Results and Discussion

The results are shown in Table 1. Fourteen (52%) of the 27 children answered the question about how they saw the dog correctly (by responding "blue"), and 16 (59%) gave correct responses to the question about how the adult saw the dog (by responding "green"). Children's performance did not exceed chance (50%) for either question ($ps > .55$; binomial procedure), and Self Questions were solved equally often as Other Question ($p = .79$; Fisher's exact test). Only three of the children responded to both the Self and Other Questions correctly; the remaining 24 were correct on one question but not the other, because they gave the same answer to both questions.

These results show that when the color filter test is modified so that children can no longer just take a visual perspective (by determining which of two candidate objects an adult sees in a certain color or by determining where to place an object so that the adult sees it in a certain color) but have to simultaneously confront two perspectives, they do not succeed. The same 36-month-old children who had just previously solved Moll and Meltzoff's (2011a) Level 2 test were not able to judge explicitly how an object looked to the adult and to them (as in the turtle and structurally analogous tasks, which also involve a confrontation of perspectives).

Interestingly, the children in this study failed to reliably report their own perception: 48% claimed to see the dog as green, even though they saw it as blue. This is surprising given that it is widely held that one has immediate knowledge of one's own perceptions. The notion of "egocentrism" rests on the assumption that one has privileged access to what one perceives or knows but then erroneously takes for granted that others share these perceptual and epistemic states. In line with this idea, Flavell and colleagues (1981) consistently found that 3-year-olds reliably report their perspective (e.g., they correctly say that the turtle is right-side up) but then project it onto others. In the present study, however, nearly half the children misrepresented their own perspective but gave a correct description of the adult's. This might indicate that the children simply did not understand the question and therefore responded randomly. We think that children's prior participation in a related experiment influenced their answers: The same adult had just previously referred to the picture as "the green one" when it was positioned in the same place in front of the yellow screen. Hence, the picture was communicatively established as being green—obviously leading many children to adopt this view and "override" their own.

These data cannot lend themselves to strong conclusions. First, children's judgments were most likely colored by their prior participation in a similar experiment. Second, it is possible that the present task, just like the turtle task, is difficult for 3-year-olds not because they have to confront perspectives, but because they have to respond verbally. To address these concerns and to provide a direct developmental comparison of the abilities to take versus confront perspectives, we conducted another study with 3- and 4.5-year-old children.

Table 1
Number of Children in the Pilot Study Who Produced Correct Answers as a Function of Question Type (Self vs. Other)

	Performance		
	Self Question correct only	Other Question correct only	Both correct
Number of children	11	13	3

Main Study

In this study, a group of 3- and 4.5-year-olds were presented with a perspective-taking or a perspective-confronting task. As a perspective-taking task, Moll and Meltzoff's (2011a) request version of the color filter paradigm was used. As a perspective-confronting task, the same procedure as in the pilot study was applied; the only difference was that children responded by pointing to color samples. On the basis of the previous findings and our theoretical analysis, we predicted that (a) both age groups would succeed in perspective taking but that (b) only the 4.5-year-olds would successfully confront another's perspective with their own.

Method

Participants. Participants were 112 children, 56 of which were 3 years and 4.5 years of age, respectively. Half the children in each age group (14 females, 14 males) received the perspective-taking (3-year-olds: $M = 37.54$, range = 36.00–38.99; 4.5-year-olds: $M = 54.01$, range = 51.94–55.92), and the other half the perspective-confronting task (3-year-olds: $M = 37.18$, range = 36.06–40.30; 4.5-year-olds: $M = 54.50$, range = 52.20–56.41). Another six (five 3-year-olds and one 4.5-year-old) children in the perspective-taking group and nine (six 3- and three 4.5-year-old boys) in the perspective-confronting group were excluded because they failed the color comprehension test (10 males, three females), because of general developmental delay (one female) or experimenter error (one male). All children's parents had agreed that their child could participate in studies on child development at their child care institution. Children were tested there individually.

Materials. For the color comprehension test, the same material as in the pilot study was used for both tasks. For the perspective-taking task, the same acrylic screen with one yellow and one clear half was used. For the perspective-confronting task, a version of this screen with two separable halves was used

because only the yellow part was needed for the test phase. Four laminated blue animal pictures functioned as stimuli in both tasks: two exemplars of each in the perspective-taking and one in the perspective-confronting task. These were a dog (17 × 16 cm), a rabbit (15 × 17 cm), a horse (15 × 21 cm), and a bear (16 × 14 cm). Figure 2 shows two of the pictures.

Design and counterbalancing. For the color comprehension test, the counterbalancing was exactly the same as in the pilot study.

Children in the perspective-taking group received each of two request types, one in which E requested "blue" (Blue Request) and one in which she requested "green" (Green Request). There were two trials per request type, so four trials in total. Children received the requests in ABBA or BAAB order and were presented with the pictures in one of three previously determined orders. For 50% of the children, the screen was positioned with the yellow half to their left and vice versa for the other 50%.

Children in the perspective-confronting group received each of two question types, one in which E asked how the child herself saw a given picture (Self Question) and one in which E asked how she, E, saw the same picture (Other Question). There were thus four trials per question type, leading to a total of eight trials. The order in which E asked the questions and pointed at the two response alternatives in each question (the blue and the green color sample) was counterbalanced. Children were presented with the pictures in one of the same three orders as those in the perspective-taking group.

Procedure. After E's arrival at the day care center, she introduced herself to the child, and they briefly played together. E and the child then went into the testing room that the kindergarten provided. They sat down at a table with E positioned next to the child, in a 90° angle to her left. As a warm-up game, E and the child played with a Winnie-the-Pooh-puzzle for a few minutes. The same color comprehension task was used as in the pilot study. Children also received the same demonstration to experience color mixing.

Test phase. After the demonstration, E asked the child to walk back around the table to sit in her initial position. What happened next differed depending on the task.

Perspective-taking task. E rotated the screen 180° so that the yellow and the clear sides reversed. E then brought out the second exemplar of the same animal picture that was used during the demonstration and placed both pictures on the table: one on the child's side of the clear half of the screen and one on the child's side of the yellow half of the screen. From her position, the child thus saw both pictures in their true blue color.

E stood up and walked to the side of the table opposite from the child (see Figure 3a). Standing at a distance of approximately 2 m from the screen, she excitedly exclaimed "Look! Look at that, e.g., dog! That one looks blue/green from over here! Can you please put the blue/green one in the bag for me?" The bag was located next to the child. While making her request, E first fixated the middle of the screen (the edge where the yellow and clear halves met) and then looked up in the child's face. She thus did not indicate by gaze or pointing cues which picture she referred to in her request; there were no spatial cues to disambiguate the request. The child had to determine which of the two identical colored pictures (e.g., two blue dogs) in front of her the adult was referring to by taking the adult's visual perspective. E repeated her excited request if necessary. The trial was finished when a child placed a picture in the bag.

At the beginning of the second trial, E brought out the next pair of pictures and placed them in the same locations between the screen and the child where the first pair was located (one picture in front of the yellow half, and one in front of the clear half of the screen). The procedure was exactly the same, except that E ambiguously requested the other color. No pointing gestures were used. The procedure was repeated for the third and fourth trial.

Perspective-confronting task. E removed the clear half of the screen from the table so that only the part containing the yellow color filter remained. She placed the blue and the green color samples on the table to the child's left (see Figure 3b) and then put the picture that was used during the demonstration on the child's side of the screen. Thus, E saw the picture as green and the child saw it as blue.

Next, E posed the test questions. In the Other Question, E asked the child "How do I see the dog from my side over here? Do I see it like this [E points at first color sample, e.g., blue] or like this [E points at second color sample, e.g., green]?" In the Self Question, the child was asked "How do you see the dog from your side over there? Do you see it like this or like this?" pointing at the respective color sample while saying "like this." For 50% of the children, E pointed at the blue color sample first; for the other 50%, she

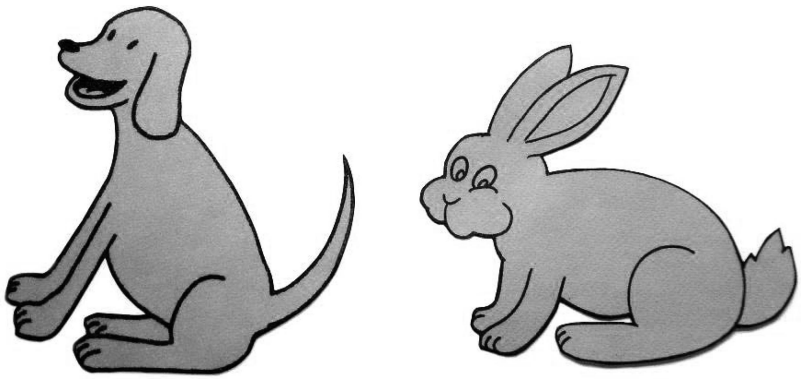

Figure 2. A sample of the stimuli used in the main study.

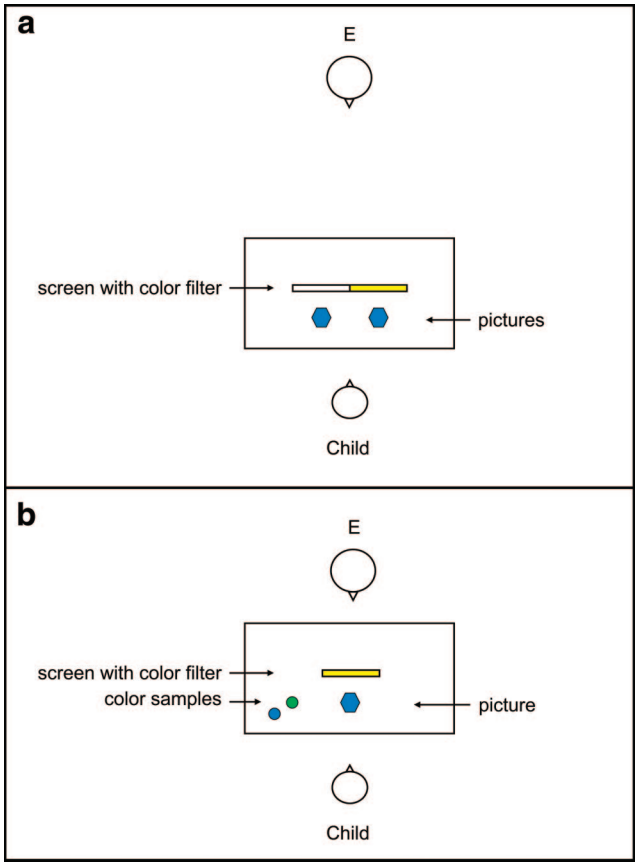

Figure 3. Aerial view of the setup during the test phase of the (a) perspective-taking and the (b) perspective-confronting task in the main study.

pointed at the green one first. E pointed to the corresponding person while saying "I" or "you" and stressed the pronouns.

Children gave their responses by pointing at or touching the color samples. After the child responded to the second question, E removed the picture from the table and brought out the next picture on the schedule. The procedure was identical for all four pictures. For each picture, a child received one Self Question and one Other Question.

Coding and reliability.

Perspective-taking task. E coded for all requests which of the two pictures the children chose and placed in the bag. "Green" was scored when the picture that looked green to E was chosen by children, and "blue" was scored when the picture that looked blue to E was chosen. An independent research assistant who was unaware of the content of the request (the sound was turned off) coded a randomly selected subsample of six childern per age group. The two raters agreed on 100% of the trials, leading to a Cohen's kappa of 1. Correct responses were scored 1, and incorrect responses were scored 0.

Perspective-confronting task. E coded for all questions to which of the two color samples (blue or green) the children pointed using the videotaped trials. "Green" was scored when the child either touched or pointed at the green color sample in response to a test question. "Blue" was scored when the blue color sample was touched or pointed at. If a child touched/pointed at both color samples (which occurred on six trials), the one that was chosen first was coded. An independent research assistant, who was unaware of what question had been posed, coded a randomly selected subsample of six children from each age group. The two raters agreed on all but one of the coded trials, leading to a Cohen's kappa of .98. For each correct response, a '1' was scored, and incorrect responses were scored '0'.

Mean percentages are reported because one child in the perspective-confronting group was inattentive on one trial. Preliminary analyses revealed no effects of order ($ps > .17$) or gender ($ps > .34$) for either task, so these factors were disregarded in the analyses reported below.

Results and Discussion

Figure 4 shows the number of children who achieved a particular mean percentage as a function of task and condition. In the perspective-taking task, 3-year-olds took the adult's perspective in 71% and 4.5-year-olds in 79% of the cases. One-sample t tests with Bonferroni-corrected error rates showed that for both the 3-year-olds, $t(27) = 4.6$, $p < .001$, and the 4.5-year-olds, $t(27) = 6.23$, $p < .001$, this was significantly above chance (50%). In the perspective-confronting task, 3-year-olds correctly judged how the adult saw the pictures in 44% and 4.5-year-olds in 74% of the cases. Only the 4.5-year-olds, $t(27) = 3.71$, $p < .01$, not the 3-year-olds, $t(27) = 1.00$, $p = 1$, confronted the adult's perspective with their own above-chance level. When it came to stating their own perception, 3-year-olds correctly judged that they saw the pictures as blue in 71% of the trials, and 4.5-year-olds in 86% of the trials.

We conducted a univariate analysis of variance (ANOVA), with task (taking the other's perspective vs. confronting it with one's own) and age (3 vs. 4.5 years) as between-subject factors. In terms

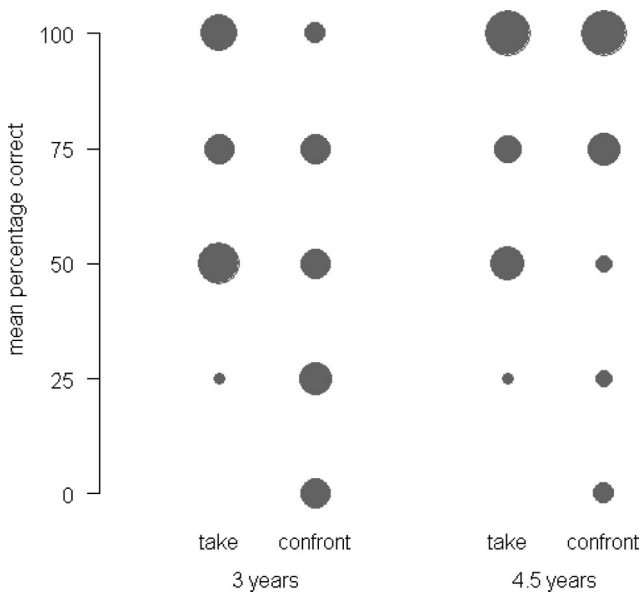

Figure 4. Mean percentage of correct responses in the main study as a function of task and age. Areas of the circles are proportionate to the number of children who received the corresponding score.

of main effects, taking the adult's perspective was easier than confronting it with one's own, $F(1, 108) = 8.00$, $p < .01$, $\eta = .07$, and 4-5-year-olds performed better than 3-year-olds, $F(1, 108) = 12.07$, $p = .001$, $\eta = .10$. The interaction between task and age revealed that the difference in confronting perspectives between the two ages was responsible for these effects, $F(1, 108) = 4.08$, $p < .05$, $\eta = .04$.

First, the results of this study confirm that preschoolers at age 3 can engage in perspective taking when the same object is seen differently. Second, they support the view that the ability to confront another's perspective with one's own emerges between 3 and 4.5 years. Many of the 3-year-olds judged correctly how they themselves perceived the pictures: 19 out of 28 achieved a success rate of 75% or higher. However, the same 3-year-olds were mostly unable to confront another's view of the same pictures with theirs: 19 of them achieved 50% or less. Unlike in the pilot study but as in previous experiments (e.g., Flavell et al., 1981), the modal response pattern was to judge egocentrically that the adult perceives the object in the same color they did (or else "euocentrically" that the adult perceives the object in its true color). Only the age group of 4.5-year-olds significantly produced correct answers by pointing to the green color sample when asked how the adult saw the picture.

General Discussion

The aim of the present studies was to establish that preschoolers at 3 years of age can solve certain Level 2 tests while failing others, even when aspects that have been regarded as critical (nonverbal response modes, etc.) are kept the same. Our hypothesis is that these tests tap different levels of perspectivity that are not captured by the Level 1–Level 2 distinction. Three-year-olds are competent perspective takers, even when the perspective to be taken differs with regard to not only what is seen (Level 1) but also how something looks (Level 2). This was shown by their success in the request-based test in the main study, replicating Moll and Meltzoff's (2011a) finding: 3-year-olds know which of two objects a person sees in a specific color when they see it in a different color.

However, we predicted that 3-year-olds would be unable to confront another's perspective with theirs—a further skill that is required for solving a classic Level 2 test but has failed to be noticed in previous research. To test this, we modified the color task in such a way that children had to explicitly judge how another person perceives an object when they themselves see it differently. The effect was as expected. Three-year-olds were not able to confront visual perspectives, whether they responded verbally (pilot study) or by pointing to a color sample (main study). Only the 4.5-year-olds (main study) successfully confronted another person's way of seeing an object with their own. Despite the strong similarities with the request-based color test, the results were much more comparable to those found in the—superficially dissimilar—classic tasks involving verbal responses and differences in an object's spatial orientation (e.g., the turtle task).

These findings suggest that the Level 1–Level 2 dichotomy is insufficient and needs refinement. Three-year-olds readily engage in some Level 2 tests, but not in others. We think that the distinction between taking and confronting perspectives is in better agreement with the data, and now elaborate on what we mean by those terms.

Children take another's perspective when they make sense of another person's action or utterance, even when it is contingent on a perspective that differs from the child's own. This may involve determining the goal or target of a person's action or the referent of her or his request, for example, by identifying which object (a) a person is searching for because she or he cannot see it (even though the child sees it), (b) someone refers to as being a certain color (even though the child sees it in a different color), or (c) is a real exemplar of a particular category (e.g., fruit vs. something that "only looks like" fruit). An analog in the epistemic domain is the ability to determine an agent's action goal when the child's knowledge differs from the agent's belief. In Buttelmann, Carpenter, and Tomasello's (2009) study, 18-month-olds saw an agent trying to open a box whose content had previously been removed either surreptitiously in the agent's absence (false belief) or while he was attentively watching (true belief). In the former case, they took the agent's goal to be the dislocated content of the box and showed him where it was; in the latter case, they realized that he must be aiming for something else and helped him open the box. In the area of appearance and reality, it has been shown that 36-month-olds can determine which of two objects is properly construed as "real," for example, chocolate and which one "only looks like" chocolate (Moll & Tomasello, 2011).

What is common to these various cases is that the perspective was expressed in the adult's utterance or behavior. The children did not need to spontaneously state how the other perceived or conceived of something (as being here or there, this or that color, this or that kind of object) while viewing or construing it differently. It was sufficient for them to determine the goal, target, or referent of another's performative act: What is she doing, trying to accomplish, or asking for? Even though the other's perspective is responsible for the particular way in which she acted, the perspective itself is not in the foreground—it constitutes the background condition that shaped the adult's behavior but is not the object of the child's judgment.

Confronting perspectives, however, requires exactly this: a judgment about how something is or can be seen or construed (by self or other) at the very same time that an alternative view is made salient for the child. The judgment can be nonverbal, for example, by pointing in the direction where someone will be led by her or his false belief, or pointing to a swatch that indicates in what color an object is perceived. Children who cannot yet confront perspectives will respond with whatever view springs to their mind first, which depends partly on the cognitive domain (see below) and on contextual factors.

It is helpful to distinguish between "mutually exclusive" and "not mutually exclusive" perspectives. Mutually exclusive ones cannot be occupied by a single person at a given time. Perceptual and epistemic perspectives are of this kind because an identical surface cannot look blue all over and green all over at the same time, and one cannot know something to be true and simultaneously have a false belief about it. Tasks are thus structured so that the child's perspective is contrasted either with that of another person (transfer of location, turtle task) or with the child's own perspective at a different time (change of content). Children in these situations will tend to give "egocentric" or "nunocentric" (focusing on the moment) responses, simply because their own/

present perception or belief is most obvious to them (which is why children need not necessarily make their own present view explicit, because the error predictably occurs when asked about the other's/their past view).

But sometimes the other's perspective can be more dominant than the child's, so that children might, counterintuitively, give "allocentric" responses. Unlike Flavell's (1992) model, which predicts that children err about the other's perspective, the taking–confronting distinction allows for misconstruals of one's own view. The results from the pilot study speak in favor of this and cannot be reconciled with the premise that children start out as egocentrists and only later learn about the view of others. *Egocentrism* is nothing but a response strategy embarked on by many children younger than 4 or 5 years when mutually exclusive perspectives are interpersonally distributed (my vs. your belief/perception). It is not to be interpreted as an assumption that everyone sees the world the way "I" do—there simply is no understanding yet that anyone, including oneself, perceives the world in any one particular way among others.

In the appearance-reality and the alternative-naming task, the two perspectives are not mutually exclusive: The same person can construe an object in alternative ways without the object undergoing some change (such as a displacement or color change) or the subject changing her or his visuospatial position in the meantime. Children who fail to confront perspectives usually settle on one of the ways to conceptualize the object. Which one this is again depends on how the situation is construed. In appearance-reality, most 3-year-olds go with reality when an object's identity is at stake and, for example, state that a glass of milk held behind a red color filter not only is but also looks like milk, not fruit punch. When an attribute such as the object's color is at stake, children mostly stick to phenomenology and say that the liquid behind the red color filter not only looks but really is red, not white (see Flavell, 1985; Flavell, Green, & Flavell, 1986). Tasks in which the same material is used can therefore yield opposing response patterns depending on how the situation is conceptualized.

Perner's distinction that we adopt preserves the idea that there is an important conceptual change between ages 4 and 5, and it provides a unitary explanation for a number of social-cognitive achievements during this age (see Perner, Brandl, & Garnham, 2003). Whether one deals with different beliefs, conflicting perceptions, a discrepancy between appearance and reality, or simply different names for an object, what allows children to understand all of this is their ability to confront perspectives on the selfsame object. Additional support for this view comes from functional magnetic resonance imaging studies in which it was found that false-belief understanding and confronting visual perspectives involve the same brain region, the temporo-parietal junction (see Aichorn, Perner, Kronbichler, Staffen, & Ladurner, 2006), and autistic children have similar difficulties with false-belief attribution and the confrontation of visual perspectives (Hamilton, Brindley, & Frith, 2009).

Some researchers may opposed the idea that confronting is harder than taking perspectives simply because children have to hold two representations in mind instead of one, which may exceed their information-processing limits (e.g., Rice, Koinis, Sullivan, Tager-Flusberg, & Winner, 1997). However, in a control condition of the alternative-naming task, 3-year-olds readily named an object's color when a puppet had just labeled the object, and vice versa (Doherty & Perner, 1998). Arguably, the executive demands are similar in the two cases. Combining nonexclusive predicates, such as being a rabbit and being brown, is unproblematic. Only terms that "compete" for capturing an object's color (blue vs. green in visual perspective tasks), location ("cupboard" vs. "drawer" in the transfer of location task), or kind ("rabbit" vs. "bunny" in alternative naming; "rock" vs. "sponge" in appearance-reality; "Smarties" vs. "candles" in the transfer of content task) pose a challenge. The difficulty is thus limited to providing an alternative way of viewing or construing the same aspect of an object. Explanatory attempts that focus exclusively on working memory and other executive functions are unsatisfactory because they cannot account for the specificity of young children's problems with these situations.

A major question that has remained open is how children proceed from one step to the other, and how they become able to take perspectives in the first place. We believe that taking and confronting perspectives both have their roots in infants' ability to engage in joint attention with others (Moll & Meltzoff, 2011b). Perspectives presuppose a shared, single object—a common ground with respect to which the views differ. Joint attention constitutes this common ground of different perspectives. In the months leading up to their first birthdays, infants share attention to things with others, but, arguably, do not consider at all that they and the other person perceive it differently. Through a developmental process—perhaps involving infants' comprehension of adults' communicative acts designed to draw the focus to various aspects and parts of the shared referent—their sharing of attention is enriched to include various perspectives on the shared focus. But this is still just taking perspectives, and confronting them requires something more. We speculate that a certain kind of discourse scenario is needed, in which children jointly attend to an object with a person who simultaneously sees it in a different way. In attempts to diagnose and repair miscommunication, they converse about and thematize the "clash" of perspectives, thereby coming to understand that different views of the same situation are possible.

In any case, the present results suggest that the classic theoretical distinction between Level 1 and Level 2 perspective taking is in need of revision. In particular, our proposal, following but elaborating on Perner et al. (2003), is that taking perspectives and confronting perspectives are usefully differentiated, which provides the theoretical tools necessary to account for not only our present results but those of previous studies as well.

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