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Four- to Six-Year-Old Children's Sensitivity to Reliability Versus Consensus in the Endorsement of Object Labels

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Recent studies have demonstrated that young children use past reliability and consensus to endorse object labels. Until now, no study has investigated how children weigh these two cues when they are in conflict. The two experiments reported here were designed to explore whether any initial preference for information provided by a consensual group would be influenced by the group's subsequent unreliability. The results show that 4- and 5-year-old children were more likely to endorse labels provided by an unreliable but consensual group than the labels provided by a reliable dissenter. Six-year-olds displayed the reverse pattern. The article concludes by discussing the methodological implications of the two experiments and the developmental trajectory regarding the way children weigh consensuality versus reliability.

A growing number of studies in developmental psychology have underlined the importance of testimony in knowledge acquisition (e.g., Clément, 2010; Gelman, 2009; Harris, 2012; Mills, 2013). One of the main issues of this line of research is to identify the cues used by young children when they select one kind of testimony over another. In particular, some studies have investigated the influence of informants' prior reliability on the endorsement of testimony, while others have focused on the influence of consensus. Until now, no study has tested how these cues interact when they conflict. The two experiments reported in this article have been designed to explore how children weigh reliability versus consensuality in the endorsement of object labels.

Testimony Selection and Reliability

The influence of reliability on children's testimony selection has received more attention than consensuality, mostly in studies using the following setup: The first phase, the reliability familiarization phase, involves introducing children to two unfamiliar informants who consistently name familiar objects either accurately (one informant) or inaccurately (the other informant). In the second phase, the test phase, the two informants give contradictory information about unknown objects. For instance, each informant gives a different name for an unknown object and children are then asked to indicate what they think the object is called. With this kind of procedure, several experiments have shown that 4-year-olds, and under certain conditions 3-year-olds, prefer to learn labels from a reliable speaker rather than from an unreliable speaker (e.g., Birch, Vauthier, & Bloom, 2008; Clément, Koenig, & Harris, 2004; Corriveau & Harris, 2009a; Jaswal & Malone, 2007; Koenig & Harris, 2005; Pasquini, Corriveau, Koenig, & Harris, 2007; Scofield & Behrend, 2008). Birch et al. (2008) showed that this selection for reliability is not limited to the domain of language: Three- and 4-years-olds also favored a previously reliable informant when learning new object functions (see also DiYanni & Kelemen, 2008).

Recent research has also investigated what happens when reliability conflicts with another cue. Some of these studies show that the influence of reliability can be disrupted by several cues such as

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similarity (Reyes-Jaquez & Echols, 2013), perceptual access (Brosseau-Liard & Birch, 2011), or minimal group membership (MacDonald, Schug, Chase, & Barth, 2013). In contrast, other studies have demonstrated that reliability can trump other cues—even cues that are used by children in the absence of information about reliability, such as familiarity (Corriveau & Harris, 2009b), age (Jaswal & Neely, 2006), or accent (Corriveau, Kinzler, & Harris, 2013).

For instance, Corriveau, Kinzler, et al. (2013) tested whether children more readily accept the testimony of a native-accented speaker than that of a foreign-accented one, and the extent to which the reliability or unreliability of each informant modulates this effect. In a pre-reliability phase, 3-, 4-, and 5-year-olds endorsed more readily the testimony of a native-accented speaker than the testimony of a foreign-accented speaker (Study 1). After the reliability familiarization phase, 4- and 5-year-olds endorsed the testimony of the reliable informant, irrespective of whether she was a native-accented speaker or a foreign-accented speaker. In a second experiment, Corriveau, Kinzler, et al. tested whether 4-year-olds showed the same pattern of results when the children were presented with two types of reliability familiarization trials: 100% versus 0% accurate, and 75% versus 25% accurate. Again, 4-year-olds chose the testimony of the more reliable informant, irrespective of whether she spoke with a native or a foreign accent.

Consensus is another important cue in knowledge acquisition. The fact that several people agree is good evidence that they are right (at least to the extent that they rely on independently acquired information). The more people agree, the stronger the evidence that they are right. However, classical studies have shown that people can also follow a consensual group when it is clearly unwarranted—for instance, when the consensus conflicts with unambiguous perceptual evidence (e.g., Asch, 1956). Whether it is for informative reasons—thinking that a consensual opinion is likely to be correct—or for social reasons—following the consensus could increase social benefits—accepting consensual information is a powerful psychological heuristic in humans (for a review, see Cialdini & Goldstein, 2004). Studies investigating the development of this powerful factor in testimony selection will now be described.

Testimony Selection and Consensus

The first study related to the influence of consensus on testimony selection focused on the role of informant agreement and disagreement (Fusaro & Harris, 2008). In this study, 4-year-olds were shown a video with an interviewer, two informants, and two bystanders. In each trial, the interviewer placed an unknown object on a table and asked each of the two informants to name the object. The two informants offered conflicting names for each unknown object. After each statement, both bystanders consistently nodded their head in agreement with one of the informants, and consistently shook their head in disagreement with the other informant. The experimenter then asked the child to choose between the two names. The results showed that children endorsed the name provided by the informant who had received the bystanders' approval rather than disapproval. In another study (Corriveau, Fusaro, & Harris, 2009), three unknown objects were set out in front of four informants (Study 1). Three- to 4-year-old children heard a recorded voice-over saying, for instance, "Show me the *modi*." Then three informants simultaneously pointed to the same object, while the fourth informant pointed to a different object. The experimenter then asked the child, for instance, "Which one is the *modi*?" The results showed that children were more likely to endorse the information provided by the consensual group than the information provided by the dissenter. In the rest of this article, we will call this effect the consensus effect. In a second phase of Corriveau et al.'s (2009) study, children were presented with only two informants: one member of the previous consensual group and the dissenter. These two informants provided conflicting information about the names of unknown objects. In this second phase, children still preferred to endorse information from the informant who had been part of the consensual group.

Moreover, Haun, Rekers, and Tomasello (2012) have recently shown that 2-year-olds also display sensitivity to consensus. When they did not know how to use an unfamiliar box to deliver a reward, 2-year-olds were more likely to copy an action demonstrated by three informants (consensual group) rather than an action demonstrated 3 times by the same informant.

Some studies have also explored what happens when consensus conflicts with another cue. For instance, a recent study has investigated, with the same kind of procedure as that used by Corriveau et al. (2009), the conflict between consensus and in-group/out-group membership (Chen, Corriveau, & Harris, 2013). In the "all in-group" condition in which the consensus consisted of same-race informants, results with 4- to 6-year-old European

American and Taiwanese children replicated the results of Corriveau et al. However, results were slightly different when the consensus was composed of out-group informants. Children preferentially chose the objects indicated by the majority of out-group informants in the first phase, but the preference linked to the consensus disappeared in the second phase when the testimony of only one member of the previous consensus was placed in conflict with the testimony of the lone dissenter. This study showed therefore that the effect of consensus on testimony selection can be modulated, in particular, according to the in-group/out-group composition of the consensual group. Another recent study has investigated the conflict between consensus and expertise (Seston & Kelemen, 2014). Results indicated that the tendency to follow a consensual group was modulated by the plausibility of the opinions expressed by this group regarding the object functions, and that this effect was stronger for the 4-year-olds than for the 3-year-olds. This study thus seems to suggest that greater expertise in a domain could reduce the tendency to follow the consensus.

Finally, consistent with the cornerstone Asch (1956) study with adults, another set of studies tested children for what is called the conformity effect, that is, subjects' tendency to favor an erroneous consensual response over their own accurate perception. For instance, Corriveau and Harris (2010) showed that 3- and 4-year-olds tend to favor their own perceptual judgment (regarding which line was the longest) rather than the claims made by a consensual group of three adults. Nevertheless, they sometimes deferred to the consensual group (see also Corriveau, Kim, Song, & Harris, 2013). Similarly, Haun and Tomasello (2011) have shown that 4-year-olds also sometimes deferred to claims made by a consensual group. In this study, each child was asked to label a familiar animal according to its typical size (daddy, mommy, or baby). Three peers gave an erroneous answer before the target child. Results showed that children followed their peers in 37% of the cases, almost as often as the adults in the classic Asch paradigm.

The Present Study

All the studies presented above show that both the past reliability of informants and the consensus expressed by several informants influence children's selection of testimony. So far, no studies have investigated how children weigh these two cues when they conflict. The most closely related studies are those about the conformity effect (Corriveau & Harris, 2010; Corriveau, Kim, et al., 2013; Haun & Tomasello, 2011). However, these studies did not address the issue of how past reliability and consensus interact, but instead tested the conflict between children's perceptual judgments and unreliable consensual responses (as defined in relation to perceptual judgment). Moreover, these studies involved unanimous consensual responses and did not deal with the domain of labels.

The present study aims to determine how 4- to 6-year-old children weigh consensus versus past reliability in the endorsement of object labels. Participants could not rely on their own perceptual judgment to solve the task but received information provided by a consensual group or by a dissenter. The two experiments reported below were designed to explore whether any initial preference for the information provided by a consensual group would be influenced by the group's subsequent unreliability.

Experiment 1

Method

Participants

This experiment involved 63 children from three public preschools in Lyon, France. Children were divided into three age groups: twenty 4-year-olds (10 girls, M_{age} = 54 months, SD = 3.24, range = 48–59 months) in the 1st year of preschool, twenty-one 5-year-olds (10 girls, M_{age} = 65.81 months, SD = 3.63, range = 60–71 months) in the 2nd year of preschool, and twenty-two 6-year-olds (10 girls, M_{age} = 78.41 months, SD = 4.75, range = 72–87 months) in the last year of preschool. The children were predominantly Caucasian (92.1%), and the remainder had at least one parent of East Asian (3.2%) or African (4.7%) heritage. Most of the children came from middle- and upper-middle-class families. All children spoke French as their first language, and all the experiments were conducted in French. Only children whose parents had given their consent were included in the study. Each child was tested individually in a quiet room by a single experimenter for about 15 min.

Materials and Procedure

The experiment was partly adapted from Chen et al. (2013) and Corriveau, Kinzler, et al. (2013). All children were presented with a three-phase testing sequence involving a pre-reliability phase, a

reliability familiarization phase, and a postreliability phase.

Pre-reliability phase. In the pre-reliability phase, children watched four short videos displayed on a laptop. In each of these movies, four female informants and three unknown objects were presented to the children (Figure 1). Each informant wore a shirt of a different color (green, blue, yellow, and red). First, the children were asked to give the color of each shirt as the experimenter pointed to each informant in random order. After the children had given all the answers, the experimenter said, "These girls are going to show you some objects, and then teach you their names." For each trial, the experimenter introduced the presence of the unknown objects by saying, for instance, "There are three objects here, and one of them is called a *ridu*. Do you know which one is a *ridu*? I don't know which one is a *ridu*, but these girls can help us. Let's watch!" If the child claimed to know the name of an object, the experimenter said, "Actually, I don't think that's what it is called. But I bet these people can help us." Next, children saw a video clip in which a voice-over said, for instance, "Show me the *ridu*." At that point, three informants pointed simultaneously to the same object while the fourth informant pointed to a different object. It is worth noting that the total number of pointing gestures did not influence the consensus effect. In their Study 2, Corriveau et al. (2009) showed that children followed the consensual group (two of the three informants) even if the consensual group indicated one object with two pointing gestures (one hand per informant) while the dissenter indicated another object with the same number of pointing gestures (the dissenter pointed with both hands).

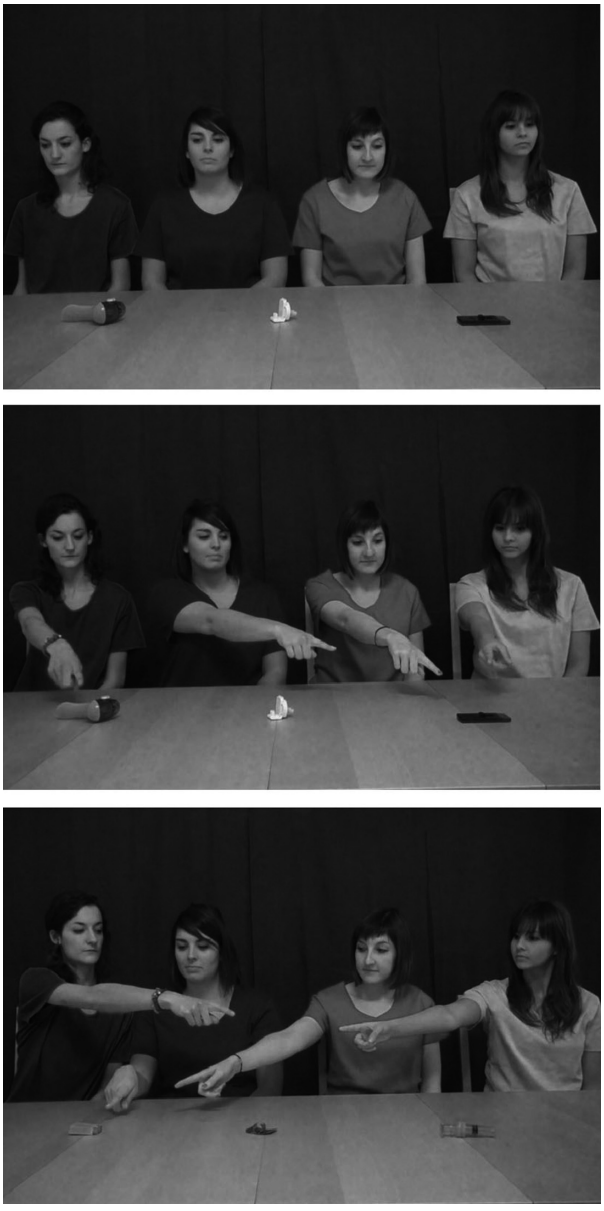

Figure 1. Sample screenshots for presentation, not crossed, and crossed pointing gestures.

In two trials, the three informants' pointing gestures did not cross the dissenter's pointing gesture. In the two other trials the three informants' pointing gestures did cross the dissenter's (Figure 1). The order of the type of pointing gesture (i.e., crossed, not crossed) was counterbalanced. The experimenter stopped the video when the pointing gestures could be clearly identified (Figure 1) and asked the child, "Did you see it well?" After a positive response, the video displayed the informants moving back to their initial position. The experimenter then asked, "According to you, where is the *ridu*?" This procedure was repeated for all four trials, with different objects and labels. The location of the dissenter (right or left) and the color of the dissenter's shirt (green or blue) varied systematically across participants (four conditions: dissenter in green shirt at right, dissenter in blue shirt at left, dissenter in green shirt at left, dissenter in blue shirt at right).

Reliability familiarization phase. On each of four trials, the same four female informants were in front of a familiar object (e.g., a cup) and gave different names for it. First, the experimenter said, "Now these four girls are going to tell you the names of some objects. They're each going to say a name and then I'm going to ask you what you think it's called." The three informants who formed a consensus in the pre-reliability phase labeled all four objects inaccurately and the dissenter labeled all four objects accurately (order of labeling was

counterbalanced across the four trials). For instance, when a cup was presented, the three girls said,: "That's a sponge," and the dissenter said, "That's a cup." Objects were presented in a fixed order (cup, apple, doll, and ball). After viewing each trial, the experimenter pointed to a still frame of the four informants and the object and asked children, "According to you, what's the name of this object?"

Postreliability phase. After the reliability familiarization trials, four postreliability trials were presented to children. The procedure was exactly the same as that of the pre-reliability trials, with different unknown objects and different novel pseudowords presented to the children.

Results

Although only two of the three objects were pointed to in each trial, children's choices for the nonpointed objects (distractors) were at 6.7% in the pre-reliability phase and at 13% in the postreliability phase. Because there were three objects from which to choose, chance level for each trial was at 0.33. Given that there were four trials in the pre- and postreliability phases, chance level was at 1.33.

Regarding the four reliability familiarization trials, all 4-, 5-, and 6-year-olds accurately chose the name of the familiar objects after having heard the two testimonies. Preliminary analyses revealed no significant effects involving gender, conditions (dissenter in green shirt at right, etc.), and type of pointing gestures (crossed or not crossed pointing gestures) on the pre- and postreliability phases. These three factors have therefore not been included in the following analyses.

Data analysis proceeded as follows: We first examined the pre-reliability trials to see whether children preferred to endorse information provided by the consensual group rather than information provided by the lone dissenter without having any information about the reliability of these two sources. We then analyzed how often children followed the consensual group in the postreliability trials, a group that was unreliable in the reliability familiarization phase. Moreover, for the pre- and the postreliability phases, we tested the mean for each possible choice (consensus, dissenter, or distractor) against the chance level (1.33). Finally we compared the results between pre-reliability and postreliability trials to assess the impact of reliability familiarization trials on children's selection of the object linked to the consensus.

Figure 2 shows the percentage of each possible choice as a function of age group and phase.

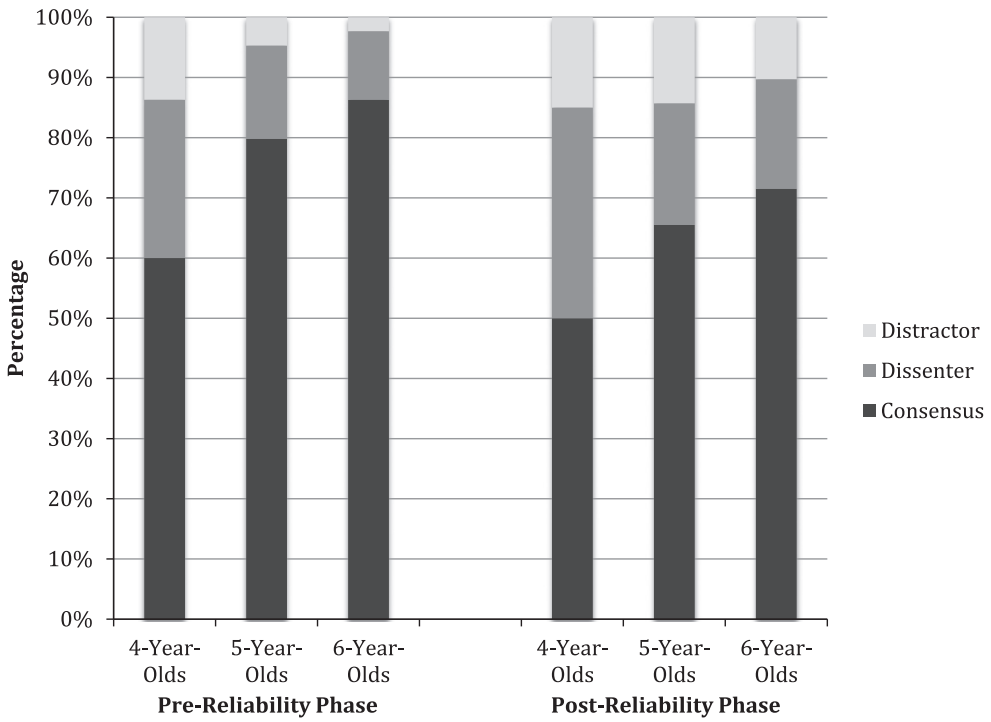

Figure 2. Percentage of choices linked to consensus, dissenter, and distractor object for each phase and each age group.

Pre-reliability Phase

With respect to the number of choices linked to the consensus, a one-way analysis of variance (ANOVA) revealed a significant main effect of age group, $F(2, 60) = 4.37$, $p = .017$, $\eta^2 = .13$. The 6-year-olds chose the object linked to the consensus significantly more often (86.3%, $M = 3.45$, $SD = 0.91$) than the 4-year-olds did (60%, $M = 2.40$, $SD = 1.46$, $p = .022$). The 5-year-olds' performance (79.8%, $M = 3.19$, $SD = 1.17$) was not significantly different from either the 4-year-olds' or the 6-year-olds' performance. Four-, 5-, and 6-year-old children answered above chance in their choices of the object pointed to by the consensual group: 4-year-olds, $t(19) = 3.26$, $p = .004$, $d = 1.49$; 5-year-olds, $t(20) = 7.31$, $p < .001$, $d = 3.27$; and 6-year-olds, $t(21) = 10.93$, $p < .001$, $d = 4.77$.

Regarding the choices linked to the dissenter, 4-year-olds responded at chance, 26.3%, $M = 1.05$, $SD = 1.14$, $t(19) = -1.09$, $p = .288$, $d = -0.50$, while 5- and 6-year-olds performed below chance: 5-year-olds, 15.5%, $M = 0.62$, $SD = 0.92$, $t(20) = -3.54$, $p = .002$, $d = -1.58$, and 6-year-olds, 11.4%, $M = 0.45$, $SD = 0.86$, $t(21) = -4.79$, $p < .001$, $d = -2.09$.

Regarding the choices for the distractor object, all three age groups performed below chance: 4-year-olds, 13.7%, $M = 0.55$, $SD = 0.76$, $t(19) = -4.59$, $p < .001$, $d = -2.11$; 5-year-olds, 4.7%, $M = 0.19$, $SD = 0.87$, $t(20) = 5.98$, $p < .001$, $d = 2.67$; and 6-year-olds, 2.3%, $M = 0.09$, $SD = 0.29$, $t(21) = -19.75$, $p < .001$, $d = -8.62$.

Postreliability Phase

Another one-way ANOVA yielded no significant main effect of age group, $F(2, 60) = 1.96$, $p = .15$, $\eta^2 = .06$. The choices linked to the consensual group were significantly above chance, both for all children, 62.7%, $M = 2.51$, $SD = 1.47$), $t(62) = 6.36$, $p < .001$, $d = 1.62$, and for each age group: 4-year-olds: 50%, $M = 2$, $SD = 1.25$, $t(19) = 2.38$, $p = .028$, $d = 1.09$; 5-year-olds, 65.6%, $M = 2.62$, $SD = 1.62$, $t(20) = 3.63$, $p = .002$, $d = 1.62$; and 6-year-olds, 71.5%, $M = 2.86$, $SD = 1.42$, $t(21) = 5.05$, $p < .001$, $d = 2.21$.

Regarding the choices linked to the dissenter, 4-year-olds responded at chance, 35%, $M = 1.40$, $SD = 1.09$, $t(19) = 0.28$, $p = .78$, $d = 0.13$, while 5- and 6-year-olds performed below chance, 5-year-olds, 20.2%, $M = 0.81$, $SD = 1.12$, $t(20) = -2.12$, $p = .046$, $d = -0.95$, and 6-year-olds, 18.2%, $M = 0.72$, $SD = 1.20$, $t(21) = -2.35$, $p = .029$, $d = -1.02$.

Regarding the choices for the distractor object, all three age groups performed below chance: 4-year-olds, 15%, $M = 0.60$, $SD = 0.99$, $t(19) = -3.28$, $p = .004$, $d = -1.50$; 5-year-olds, 14.3%, $M = 0.57$, $SD = 1.16$, $t(20) = -2.98$, $p = .007$, $d = -1.33$; and 6-year-olds, 10.3%, $M = 0.49$, $SD = 0.91$, $t(21) = -4.75$, $p < .001$, $d = -2.07$.

Comparison Between Pre- and Postreliability Phases

A two-way ANOVA with age group (4-, 5-, and 6-year-olds) as the between-subjects variable and phase (pre-reliability and postreliability) as the within-subjects variable was calculated for the number of choices linked to the consensus. This revealed a main effect of phase, $F(1, 60) = 12.01$, $p = .001$, $\eta^2 = .17$, and a main effect of age group, $F(2, 60) = 3.64$, $p = .032$, $\eta^2 = .11$. The Age Group × Phase interaction was not significant, $F(2, 60) = 0.16$, $p = .853$, $\eta^2 = .005$. As a whole, the children chose the object pointed to by the consensual group in the pre-reliability phase significantly more often (75.7%, $M = 3.03$, $SD = 0.15$) than in the postreliability phase (62.7%, $M = 2.51$, $SD = 0.18$, $p = .001$). Irrespective of phase, the 6-year-olds chose the object pointed to by the consensus significantly more often (79%, $M = 3.16$, $SD = 0.25$) than the 4-year-olds did (55%, $M = 2.2$, $SD = 0.27$, $p = .039$). The 5-year-olds' performance (72.5%, $M = 2.9$, $SD = 0.26$) was not significantly different from either the 4-year-olds' or the 6-year-olds' performance.

Discussion

The aim of this experiment was to investigate whether any initial preference for the information provided by a consensual group, that is, the consensus effect, would be influenced by the subsequent unreliability of the group.

In the pre-reliability phase, 4- to 6-year-old children selectively endorsed the label provided by the consensual group rather that the label provided by the dissenter. Moreover, the results indicate that older children favored the consensus significantly more often than the younger children did in the pre-reliability phase. This developmental pattern seems to be in line with previous studies showing an increase of the consensus effect between the ages of 4 and 6. With the same kind of procedure, Corriveau et al. (2009) found, for instance, that 4-year-olds followed the consensus at 70.2%, while Chen et al. (2013) found that older children (M_{age} = 5;3 years, range = 4;4–6;2 years, in their "all in-group" condition) followed the consensus at 78.5%. Nevertheless, the former study investigated 4- to 6-year-olds' per-

formance without distinguishing age groups in their analyses. Thus, further research seems necessary to investigate this effect with older children.

Results from the postreliability phase and from the comparison between pre- and postreliability phases showed that the choice of the consensual group as a source of information was modulated by the reliability familiarization phase. All age groups chose the objects pointed to by the consensual group significantly less often in the post- than in the pre-reliability phase. Nevertheless, it is important to keep in mind that the choice of the objects pointed to by the consensus in the postreliability phase remained the most likely choice made by children as a whole (62.7%), even after the group had been shown to be unreliable.

However, the methodology of this first experiment raises a potential concern. In past research, when children were asked how good the source they had preferred was at answering the question, a majority of the children responded that the consensual group was very good at answering it, while they responded that the dissenter was not very good (Corriveau et al., 2009; Fusaro & Harris, 2008). As a result, the pre-reliability phase could lead children to consider that the consensual group —which they most often followed—was very reliable, while the lone dissenter was very unreliable. These assignments of reliability from the pre-reliability phase would then mitigate the effects of the reliability familiarization phase (where the consensual group demonstrated unreliability and the lone dissenter reliability). Experiment 2 was conducted to avoid this possible confound. Given that Experiment 1 demonstrated a consensus effect as a baseline on children's testimony selection, Experiment 2 was conducted in the exact same way but without the pre-reliability phase. Moreover, to better understand how children weigh reliability and consensuality, a control condition—the reliable consensus condition—has been added in Experiment 2. In this condition, during the reliability familiarization phase the three informants who formed a consensus provided accurate information while the dissenter provided inaccurate information.

Experiment 2

Method

Participants

This experiment involved 132 children from three public preschools in Lyon, France. They were divided into three age groups: forty-six 4-year-olds (24 girls, M_{age} = 54.26 months, SD = 3.24, range = 49–59 months) in the 1st year of preschool, forty-four 5-year-olds (20 girls, M_{age} = 65.27 months, SD = 3.57, range = 60–71 months) in the 2nd year of preschool, and forty-two 6-year-olds (19 girls, M_{age} = 76.90 months, SD = 3.58, range = 72–85 months) in the last year of preschool. The demographics were similar to those of Experiment 1. Children were predominantly Caucasian (90.1%), with a few having at least one parent of East Asian (0.8%), Indian (2.3%), or African (6.8%) heritage. Only children whose parents had given their consent were included in the study. Each child was tested individually in a quiet room by a single experimenter for about 10 min.

Materials and Procedure

Approximately half the children in each age group were assigned to one of the two conditions. In the unreliable consensus condition, the same materials and procedure as those used in Experiment 1 were involved, but without the pre-reliability phase. The reliable consensus condition only differed from the unreliable consensus condition by the fact that in the reliability familiarization phase the consensual group labeled all four objects accurately and the dissenter labeled all four objects inaccurately.

Results

All the 4-, 5-, and 6-year-olds again accurately chose the name for the familiar objects in the four reliability familiarization trials. As in Experiment 1, preliminary analyses revealed no significant effects involving gender, condition, and type of pointing gestures on the postreliability trials. These three factors have thus not been included in the following analyses.

Our data analysis strategy was as follows: We first examined postreliability trials to see whether (a) children preferred to endorse information provided by the unreliable consensus rather than information provided by the reliable dissenter (unreliable consensus condition), (b) children preferred to endorse information provided by the reliable consensus rather than information provided by the unreliable dissenter (reliable consensus condition). Moreover, for each postreliability phase, we tested the mean for each possible choice (consensus, dissenter, or distractor) against the chance level (1.33).

Finally, we compared the results between the postreliability phase of Experiment 1 and the postreliability phase in the unreliable consensus condition of Experiment 2 to test whether the presence or the absence of a pre-reliability phase influenced the children's performance in the postreliability phase.

Figure 3 shows the percentage of each possible choice as a function of age group and postreliability phase.

Postreliability Phases

A two-way ANOVA, with age group (4-, 5-, and 6-year-olds) and condition (unreliable consensus, and reliable consensus) as the between-subject variables, was calculated for the number of choices linked to the consensus. This revealed a significant main effect of condition, $F(1, 126) = 28.05$, $p < .001$, $\eta^2 = .18$, and a significant interaction between the two factors, $F(2, 126) = 8.63$, $p < .001$, $\eta^2 = .12$. The main effect of age group was not significant, $F(2, 126) = .55$, $p = .578$, $\eta^2 = .009$. As a whole, the children chose the object pointed to by the consensus in the reliable consensus condition significantly more often (75%, $M = 3$, $SD = 1.13$) than in the unreliable consensus condition (47.3%, $M = 1.89$, $SD = 1.46$, $p < .001$). Further analysis of the Age Group × Condition interaction using tests of simple effects showed that the 4-year-olds' performance did not differ significantly between the two conditions (unreliable consensus: 57.9%, $M = 2.32$, $SD = 1.29$; reliable consensus: 60.4%, $M = 2.42$, $SD = 1.10$), $F(1, 44) = .08$, $p = .781$, $\eta^2 = .002$, while the 5-year-olds' and the 6-year-olds' performance did significantly differ, $F(1, 42) = 7.44$, $p = .009$, $\eta^2 = .15$, and $F(1, 40) = 34.81$, $p < .001$, $\eta^2 = .46$, respectively. The 5- and 6-year-olds chose the object pointed to by the consensual group significantly more often in the reliable consensus condition (5-year-olds: 78.3%, $M = 3.13$, $SD = 1.18$; 6-year-olds: 88.1%, $M = 3.52$, $SD = 0.81$) than in the unreliable consensus condition (5-year-olds: 52.4%, $M = 2.09$, $SD = 1.34$; 6-year-olds: 30.9%, $M = 1.24$, $SD = 1.58$).

Regarding the choices for the object pointed to by the consensual group in the unreliable consensus condition, 6-year-olds responded at chance, $t(20) = -0.27$, $p = .792$, $d = -0.12$, while 4- and 5-year-olds answered above chance: 4-year-olds, $t(21) = 3.60$, $p = .002$, $d = 1.57$, and 5-year-olds, $t(20) = 2.62$, $p = .016$, $d = 1.17$. In the reliable consensus condition, all three age groups performed above chance: 4-year-olds, $t(23) = 4.84$, $p < .001$, $d = 2.02$; 5-year-olds, $t(22) = 7.32$, $p < .001$, $d = 3.12$; and 6-year-olds, $t(20) = 12.36$, $p < .001$, $d = 5.53$.

Interestingly, regarding the choices linked to the dissenter in the unreliable consensus condition,

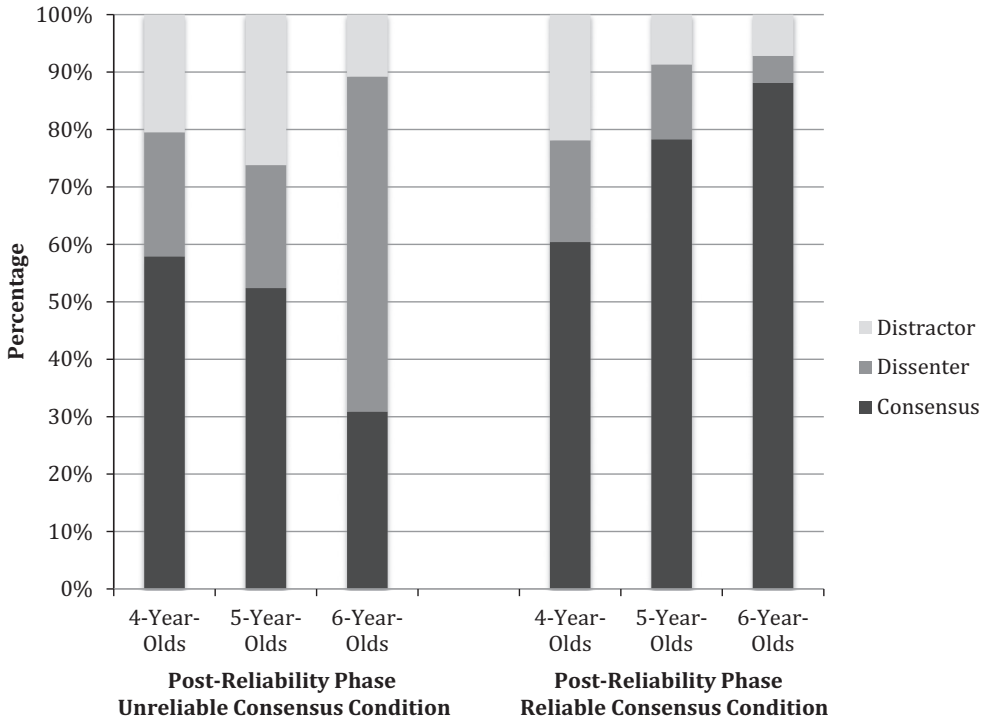

Figure 3. Percentage of choices linked to consensus, dissenter, and distractor object for each postreliability phase and each age group.

6-year-olds were significantly more likely than chance to choose the dissenter, 58.3%, $M = 2.33$, $SD = 1.71$, $t(20) = 2.68$, $p = .014$, $d = 1.19$, while 4- and 5-year-olds were significantly less likely than chance to do so: 4-year-olds, 21.6%, $M = 0.86$, $SD = 0.99$, $t(21) = -2.21$, $p = .038$, $d = -0.96$, and 5-year-olds, 21.4%, $M = 0.85$, $SD = 0.96$, $t(20) = 2.25$, $p = .036$, $d = 1.01$. In the reliable consensus condition, all three age groups performed below chance in their choices linked to the dissenter: 4-year-olds, 17.7%, $M = 0.71$, $SD = 0.69$, $t(23) = -4.41$, $p < .001$, $d = -1.84$; 5-year-olds, 13%, $M = 0.52$, $SD = 0.73$, $t(22) = -5.31$, $p < .001$, $d = -2.26$; and 6-year-olds, 4.7%, $M = 0.19$, $SD = 0.40$, $t(20) = -12.97$, $p < .001$, $d = -5.80$.

Regarding the choices for the distractor object in the unreliable consensus condition, 5-year-olds responded at chance, 26.2%, $M = 1.05$, $SD = 0.97$, $t(20) = -1.33$, $p = .199$, $d = -0.59$, while 4- and 6-year-olds performed below chance: 4-year-olds, 20.5%, $M = 0.82$, $SD = 0.85$, $t(21) = -2.81$, $p = .010$, $d = -1.23$, and 6-year-olds, 10.8%, $M = 0.43$, $SD = 0.67$, $t(20) = -6.11$, $p < .001$, $d = -2.73$. In the reliable consensus condition, all three age groups performed below chance in their choices for the distractor object, 4-year-olds, 21.9%, $M = 0.87$, $SD = 0.99$, $t(23) = -2.25$, $p = .035$, $d = -0.94$; 5-year-olds, 8.7%, $M = 0.35$, $SD = 0.77$, $t(22) = -6.07$, $p < .001$, $d = -2.58$; and 6-year-olds, 7.2%, $M = 0.28$, $SD = 0.56$, $t(20) = -8.54$, $p < .001$, $d = -3.82$.

Comparison Between Postreliability Phase in Experiment 1 and Postreliability Phase in Experiment 2 (Unreliable Consensus Condition)

A two-way ANOVA, with age group (4-, 5-, and 6-year-olds) and phase/experiment (postreliability Experiment 1 and postreliability Experiment 2 in the unreliable consensus condition) as the between-subject variables, was calculated for the number of choices linked to the consensus. This revealed a significant main effect of phase/experiment, $F(1, 121) = 5.81$, $p = .017$, $\eta^2 = .05$, and a significant interaction between the two factors, $F(2, 121) = 4.96$, $p = .008$, $\eta^2 = .08$. The main effect of age group was not significant, $F(2, 121) = 0.50$, $p = .606$, $\eta^2 = .008$. As a whole, the children chose the object pointed to by the unreliable consensus in the postreliability trials of Experiment 1 significantly more often (62.7%, $M = 2.51$, $SD = 1.47$) than in the postreliability trials of Experiment 2 in the unreliable consensus condition (47.3%, $M = 1.89$, $SD = 1.46$, $p = .017$). Further analysis of the Age Group × Phase/Experiment interaction using tests of simple effects showed that the 4-year-olds' and the 5-year-olds' performance in the two postreliability phases did not significantly differ, $F(1, 40) = 0.65$, $p = .423$, $\eta^2 = .02$, and $F(1, 40) = 1.29$, $p = .261$, $\eta^2 = .03$, respectively, while the 6-year-olds' performance was significantly different in these two phases, $F(1, 41) = 12.59$, $p = .001$, $\eta^2 = .24$. The 6-year-olds chose the object pointed to by the consensus in the postreliability trials of Experiment 1 significantly more often (71.5%, $M = 2.86$, $SD = 1.42$) than in the postreliability trials of Experiment 2 in the unreliable consensus condition (30.9%, $M = 1.24$, $SD = 1.58$).

Discussion

We hypothesized that in Experiment 1 the effects of the reliability familiarization phase could have been mitigated by an assignment of reliability to the consensual group, and of unreliability to the dissenter, taking place in the pre-reliability phase. Experiment 2 was introduced to avoid the possible effect of the pre-reliability phase (by removing this phase) and to offer a clearer comparison of past reliability and consensuality in postreliability trials.

Many authors have suggested that children can follow the consensus for two different reasons: increasing social benefits (affiliate with the consensus) and increasing accurate learning (because a consensus is considered as a reliable source of information about a shared world; e.g., Claidière & Whiten, 2012; Haun, van Leeuwen, & Edelson, 2013; Over & Carpenter, 2012). The results from our two experiments could suggest that these reasons indeed differ across each age group.

A comparison of the 6-year-olds' results in Experiments 1 and 2 seems to confirm our hypothesis for this age group. In the unreliable consensus condition of Experiment 2, without the possibility of assigning reliability to the consensual group before the familiarization phase, the 6-year-olds were more likely than chance to endorse the testimony provided by the dissenter. Thus, we may consider that the 6-year-olds are sensitive to reliability on at least two levels. First, we can hypothesize that without having any information about the consensual group, they follow the consensual group because they consider that a consensual group is more likely to be reliable than a single dissenter (pre-reliability phase of Experiment 1). Second, we can also hypothesize that they are sensitive to reliability because when the only information they have about the consensual group is that it provides unreliable labels, they prefer to follow a reliable

dissenter (unreliable consensus condition of Experiment 2). Moreover, they preferentially endorsed the labels provided by the reliable consensual group (reliable consensus condition of Experiment 2) compared to the labels provided by the unreliable consensual group (unreliable consensus condition of Experiment 2).

Regarding the 4-year-old children, the unreliable consensus condition of Experiment 2 replicated the results of the postreliability phase of Experiment 1, in which 4-year-olds endorsed a label provided by an unreliable consensual group over a label provided by a reliable dissenter. In Experiment 2, which had no pre-reliability phase that could be interpreted as providing evidence of the consensual group's reliability, the 4-year-olds still favored consensuality over reliability in the unreliable consensus condition. One way to explain these results could be that most 4-year-olds did not assign reliability to the consensual group in the pre-reliability phase of Experiment 1 but instead followed the consensual responses expressed by a group in order to affiliate with that group. The fact that 4-year-olds' performance did not differ significantly between the two conditions of Experiment 2, namely, between a condition in which the consensual group demonstrated unreliability and a condition in which the consensual group demonstrated reliability, could support this interpretation. If the 4-year-olds affiliate with the consensual group, they might not take into account the unreliability or the reliability of the consensus during the reliability familiarization phase. This explanation fits with studies about the conformity effect where 4-year-olds follow the consensus more for social benefits rather than because they consider the consensus as reliable. In fact, Corriveau and Harris (2010) found, for instance, that although children followed a consensual claim concerning the longest strip, they subsequently reverted to their own perception when asked to solve a pragmatic task that involved choosing a strip long enough to ford a river—suggesting that they did not consider the consensual group as reliable. The fact that 6-year-olds seem to favor the testimony of the consensual group because they deem it reliable rather than for social reasons is also in line with other data showing that the importance accorded to conformity decreases with age (for a review, see Haun et al., 2013).

The 5-year-old children seem to be in a transitional situation. The comparison between the two conditions of Experiment 2 seems to show that some of them were sensitive to the reliability of the consensual group. Nevertheless, after the consensual group has been shown to be unreliable (reliability familiarization phase of unreliable consensus condition), most of the 5-year-olds continue to follow the unreliable consensus in the postreliability phase. We could thus hypothesize that a majority of 5-year-olds also followed the consensual group in order to affiliate with this group even if a minority of them seems to be, like the 6-year-olds, sensitive to the past reliability of the consensus and likely to follow the consensus because it was deemed more reliable. Indeed it seems that some of the 5-year-olds grant reliability to the consensus in the pre-reliability phase. A comparison between the descriptive results of the postreliability phase of Experiment 1 and the postreliability phase in the unreliable consensus condition of Experiment 2 shows that there were more choices linked to the consensus in the postreliability phase of Experiment 1 than in the postreliability phase of Experiment 2, even if this difference did not reach statistical significance. This could suggest that a subset of the 5-year-olds could have granted reliability to the consensus at the end of the pre-reliability phase, although this portion does not seem to involve enough children to reach the level of the 6-year-olds' assignments. Nonetheless, further research is necessary to deepen our understanding of the mechanisms underlying the answers given by the children in each of the age groups of our experiments.

General Discussion

Young children learn most of their factual knowledge through testimony. Many studies have shown that reliability and consensuality play an important role in children's evaluation of what others tell them (e.g., Chen et al., 2013; Corriveau et al., 2009; Koenig & Harris, 2005; Scofield & Behrend, 2008). As no study has tested the respective influence of these two cues when they are placed in conflict, the aim of the present article was to explore how children weigh past reliability versus consensuality in the endorsement of object labels.

The results of Experiment 1 suggest that with no information about the reliability of a consensual group and a dissenter (pre-reliability phase), 4- to 6-year-old children use the existence of a consensus to evaluate information: All age groups preferentially endorsed the labels provided by the consensual group compared to the labels provided by the dissenter. Moreover, older children favored the consensual opinion significantly more than younger

children did. These results replicate previous findings on the influence of consensus in testimony selection (Chen et al., 2013; Corriveau et al., 2009).

After the reliability familiarization trials of Experiment 1, in which the consensual group proved to be unreliable, children continued to follow the consensual group in the postreliability trials, even if this consensus effect was significantly attenuated in relation to the pre-reliability trials. This result indicates that children were sensitive to the low level of reliability demonstrated by the consensual group during the reliability familiarization phase, but not enough to invert their preference for the consensual group.

Experiment 2 indicated that this tendency was still present in the 4- and 5-year-olds but not in the 6-year-olds. In fact, the unreliable consensus condition of Experiment 2, in which there was no pre-reliability phase, replicated the results of Experiment 1 for the 4- and 5-year-olds, but not for the 6-year-olds. The younger children favored the unreliable consensual group over the reliable dissenter. In contrast, 6-year-olds presented the reverse pattern, following the reliable dissenter more often than the unreliable consensus. Our data seem to suggest that this difference between 6-year-olds and younger children could be explained by the fact that the children did not follow the consensus for the same reasons. Nevertheless, further research is needed to better understand how and under which circumstances children take into account the reliability of a consensual group to endorse information. In any case, the presentation of a pre-reliability phase seems to introduce a bias for the 6-year-olds. This highlights an important methodological issue, and it seems that researchers have to be cautious about the use of the pre- and postreliability phases with older children. Further research needs to be conducted to replicate our results and to confirm the existence of this potential methodological bias. Moreover, it will be important in future research to ask whether the developmental change in 6-year-olds that the present research seems to indicate could be replicated with a longitudinal methodology. Such a result would reinforce the consistency of our results and help to better understand, with intraindividual analyses, the conditions under which this developmental change appears.

Another interpretation of our data needs to be addressed: One could argue that the tendency displayed by children to follow the unreliable consensual group was influenced by the fact that the consensual group provided information via pointing gestures. Indeed, research has shown that the pointing gesture is an important indicator of another person's knowledge state for younger children, regardless of the person's verbal indication (Grassmann & Tomasello, 2010) or visual access (Palmquist, Burns, & Jaswal, 2012; Palmquist & Jaswal, 2012). Nevertheless, as mentioned previously, past research seems to indicate that the total number of pointing gestures did not influence the consensus effect. Indeed, Corriveau et al. (2009) showed that children followed the consensual group (two informants in their Study 2) even if the consensual group indicated one object with two pointing gestures (one hand per informant) while the dissenter indicated another object with the same number of pointing gestures (the dissenter pointed with both hands). Moreover in the studies mentioned above (Grassmann & Tomasello, 2010; Palmquist & Jaswal, 2012; Palmquist et al., 2012), children made their choices when informants continued to point to one of the two objects. In contrast, children made their choices once informants' arms were back at their sides in our study. Nevertheless, given that no study has investigated the potential effect of three pointing gestures over one pointing gesture, the importance of pointing gestures needs further investigation in research dedicated to the consensus effect.

Besides, the pointing gestures raise an interesting question: Would the consensus effect demonstrated in our study be different if the consensual responses were presented successively? As in the present research, previous studies have tested the consensus effect by a simultaneous presentation of the consensual responses, that is, by simultaneous pointing gestures (Chen et al., 2013; Corriveau et al., 2009). In contrast, other studies have used a successive presentation of the consensual responses to test the conformity effect (Corriveau & Harris, 2010; Haun & Tomasello, 2011) or the effect of consensus on imitation (Haun et al., 2012; Herrmann, Legare, Harris, & Whitehouse, 2013; Seston & Kelemen, 2014; Turner, Nielsen, & Collier-Baker, 2014). The only study that has compared these two ways of presentation showed that children imitated more a consensus expressed by a simultaneous presentation than one expressed by a successive one (Herrmann et al., 2013). It could be thus hypothesized that the consensus effect demonstrated in our study might be less strong with a successive presentation. Nonetheless, further research should be undertaken to disentangle the effect of these two kinds of consensus, distinguishing also, for instance, whether the consensus is unanimous (Corriveau & Harris, 2010; Corriveau, Kim, et al., 2013; Haun &

Tomasello, 2011; Herrmann et al., 2013; Seston & Kelemen, 2014) or not (Chen et al., 2013; Corriveau et al., 2009; Turner et al., 2014).

In a broader perspective, this study highlights the potential importance of consensus in the formation of beliefs during development. The fact that younger children were almost insensitive to past reliability when confronted to a consensus could shed light on the process of children's "resistance to science" (Bloom & Weisberg, 2007, p. 996). Indeed, it has been noticed that it is difficult for children growing in relatively homogeneous communities *not to believe* in the hidden properties of the world that are held as true by adults (Harris & Koenig, 2006), especially when those publicly held beliefs are in line with some of the children's intuitions (Evans, 2001; Kelemen, 2004). Our results show that even when confronted with a dissenter, younger children continue to follow the consensus. However, the 6-year-olds results seem to indicate the emergence of a more critical mind: Older children favored the reliable dissenter over the unreliable consensual group. More research is necessary to understand the developmental changes occurring at that age—an age incidentally known since the Roman times as *the age of reason*.

In summary, the present study makes three important contributions to the understanding of how children learn from others. First, we replicate the few experiments indicating that children, in the absence of other information, prefer to learn from a consensual group rather than from a dissenter, that is, the consensus effect. Second, this is the first study to provide evidence that 4- and 5-year-olds favor consensuality over reliability in testimony selection. Even if the consensus has been demonstrated to be unreliable in the recent past, 4- and 5-year-old children prefer to follow the information provided by this unreliable consensus. Finally, this study shows a developmental change concerning this preference: Reliability trumps consensuality at 6 years of age. We have hypothesized that this developmental change can be linked to the fact that children could follow the consensual group for two different reasons: either by affiliation (younger children) or because they deem a consensual group to be more reliable (older children).

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