Are Children Conservative or Liberal? Involvement of the Distinctiveness Heuristic in Decision Making

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Abstract

The present experiment investigates whether young children are able to reduce their false recognition rate after distinctive encoding by implementing a strategic metacognitive rule. Seventy-two children, aged 4, 6, and 9 years, studied two lists of unrelated items. One of these lists was visually displayed (picture condition) while the other was presented auditorily (word condition). After each study phase, participants completed recognition tests. Finally, they answered questions about their explicit knowledge of the distinctive-encoding effect. The results revealed that even the youngest children in our sample showed a smaller proportion of intrusions in the picture condition than in the word condition. Furthermore, the results of the signal detection analyses were consistent with the hypothesis that the lower rate of false recognitions after picture encoding results from the implementation of a conservative response criterion based on metacognitive expectations (distinctiveness heuristic). Moreover, the absence of correlation between children's explicit knowledge of the distinctiveness rule and their effective use of this metacognitive heuristic seems to indicate that its involvement in memory decisions could be mediated by implicit mechanisms.

Keywords: Distinctiveness heuristic, Metamemory, False memory, Children

Introduction

Over the past decades, researchers studying adult metacognition have placed a heavy emphasis on how expectations and naïve theories about memory functioning can influence memory decisions by leading to the implementation of metacognitive rules (e.g., Schwarz, 2004; Tversky & Kahneman, 1973). Many of these studies have demonstrated the power of the heuristic hypothesis—which postulates that cognitive judgments are based on people's metacognitive expectations—to explain memory decisions in adulthood (Hege & Dodson, 2004; McDonough & Gallo, 2012). By contrast, research on metacognition in children has only recently started to pay attention to the influence of these heuristics on decision making. In general, these sparse studies indicate that memory judgments seem already to be based on heuristics by the ages of 7-8 years (e.g., Koriat, Ackerman, Lockl, & Schneider, 2009). Thus far, the question of whether younger children can do the same has gone largely unexamined, apart from Ghetti, Qin, and Goodman's (2002) investigation of the distinctiveness heuristic in 5- and 7-year-old children.

As stated by Schacter, Israel, and Racine (1999), the distinctiveness heuristic is a retrieval strategy that explains why the encoding of distinctive information (e.g., pictures) leads to a reduction in false recognition compared with the encoding of less distinctive information (e.g., words). People usually expect to be able to recollect more vivid details for pictures than for words. When these expectations are not fulfilled, participants tend to conservatively decide that the stimulus has never been presented. Conversely, when participants do not have such recollective expectations—e.g., after encoding a word—they are inclined to apply a more liberal response criterion (Dodson & Schacter, 2002; Gallo, Bell, Beier, & Schacter, 2006; Johnson, Hashtroudi, & Lindsay, 1993).

Using a procedure inspired by the Deese–Roediger–McDermott (DRM) paradigm (Roediger & McDermott, 1995), Ghetti et al. (2002) asked young children to study lists of associated words presented either visually (pictures) or orally (spoken words), and then perform a recognition test. Consistent with distinctiveness heuristic account, their results highlighted a decrease in false recognitions following distinctive compared with non-distinctive encoding in the two age groups. However, Ghetti et al. (2002) did not interpret these findings as the product of a heuristic. Instead, they hypothesized that the distinctiveness heuristic is a conscious decision rule based on explicit metamemorial knowledge. Consequently, they argued, young children's limited metacognitive skills make it unlikely that they would implement it.

Ghetti et al. (2002) offered two alternative explanations for the distinctiveness effect on children's false recognition. Following Smith and Hunt (1998), they first supposed that distinctive encoding spontaneously impoverishes relational encoding by improving the processing of the differences between items. If the relation between items is not detected during study, then there should be less activation of conceptually related lures during the study, and these should consequently be less subject to false recognition at test. Second, Ghetti et al. (2002) suggested that a "recall-to-reject" strategy could have supported the rejection of lures in the distinctive encoding condition. Specifically, they hypothesized that distinctive encoding increases the likelihood that people will recall information about studied items that will enable them to disqualify similar distractors (Gallo et al., 2006; Rotello, Macmillan, & Van Tassel, 2000).

Nevertheless, the rejection of the distinctiveness heuristic hypothesis on the basis of the assumption that young children do not have sufficient metacognitive abilities seems quite premature. Some recent studies have shown that, through a judgment-of-learning task, even four-year-old children are able to judge their own learning and develop accurate expectations about their future performance (Lipowski, Merriman, & Dunlosky, 2013). According to Dodson and Schacter (2002), these two metacognitive components (i.e., expectations about memory and the ability to judge learning) are the main prerequisites for the use of the distinctiveness heuristic. If children master them both, nothing should prevent them from employing this metacognitive rule. Moreover, the fact that young children do not have enough explicit metamemorial knowledge to implement strategic decision rules also does not appear to be a barrier. For example, Koriat et al. (2009; see also Geurten, Willems, & Meulemans, 2015) established that children are perfectly able to rely on the memorizing-effort heuristic—a metacognitive strategy which associates greater ease of encoding with greater probability of future recall—to guide their memory decisions without demonstrating any explicit knowledge of the rule. In other words, Koriat et al.'s findings (2009) suggest that the use of metacognitive heuristics could rest on automatic rules based on unconscious inferences.

For these reasons, the present study was designed to achieve two main goals. Our first aim was to examine whether young children under the age of 7 years old demonstrate a reduction in false recognitions when learning more distinctive material, and whether this reduction could be due not only to enhanced discrimination between old and new information (recall-to-reject), but also to the strategic implementation of a conservative response criterion (distinctiveness heuristic). Moreover, to limit the potential influence of item-specific processing in the picture condition, the effect of distinctiveness was studied through an experimental procedure that does not involve the encoding of relations between items.

According to Koriat et al. (2009), metacognitive heuristics rest on unconscious inferences that could potentially be implemented by young children despite their limited explicit metamemorial knowledge. On the other hand, Ghetti et al. (2002) hold that the distinctiveness heuristic is a conscious decision rule and is thus unlikely to be successfully used until later in development. Our second aim was to contribute new evidence revealing whether children's explicit knowledge of the heuristic is correlated to their use of the metacognitive rule. Additionally, as previous studies have generally found effects of high-level cognitive functions and demographic variables on measures of children's explicit metacognitive knowledge, we expected to find an influence of some executive functions—i.e., inhibition, flexibility, and executive monitoring—and demographic characteristics on children's score on the explicit distinctiveness questionnaire (Grammer, Purtell, Coffman, & Ornstein, 2011).

Method

Participants

The participants were 72 typically developing children aged 4 (Mean = 54.29 months; SD = 3.37), 6 (Mean = 78.08 months; SD = 3.31), and 9 years (Mean = 113.04 months; SD = 3.16). There were 24 participants per group (12 girls).

Materials

The stimuli consisted of two lists of 60 two-dimensional colored line drawings (objects and animals) and their corresponding names (in French). Each list contained 20 randomly assigned study items and 40 lures. Lures were divided into four categories: (1) 10 items that each looked like one specific studied picture, but were totally unrelated to any of the studied words (visual lures/unrelated when presented in the word condition; Fork – Rake), (2) 10 items that each sounded like one specific studied word but were totally unrelated to any of the studied pictures (auditory lures/unrelated when presented in the picture condition: e.g., Fork – Fox), (3) 10 items that each had weak semantic links with one specific studied item (weak semantic lures: e.g., Fork – Plate), and (4) 10 items that each had strong semantic links with one specific studied item (strong semantic lures: e.g., Fork – Knife). All stimuli were selected to be included in the vocabulary of 4-year-old children.

Eighty-four pictures were drawn from the standardized data sets developed by Rossion and Pourtois (2004). The 36 remaining pictures were retrieved from a free internet database; half were assigned to each list either as studied items or as lures. On average, word stimuli were equal in terms of frequency and number of syllables, while the pictures contained similar amounts of detail.

Procedure

Children were tested individually in a quiet room in their school. Each child underwent two 45-minute sessions approximately three days apart. One of the two lists of stimuli was randomly assigned to each of the two experimental conditions (picture or word), counterbalanced between subjects. The order of the two conditions between sessions was also counterbalanced. The study and recognition phases were separated by a 10-minute delay that was filled with two non-verbal cognitive tasks: the Dragons' House test of flexibility from Zimmermann, Gondan, and Fimm's (2005) attentional test battery for children KiTAP, and the Matrix subtest of the Wechsler Preschool and Primary Scale of Intelligence (Wechsler, 2004,

2005) for one session; the self-ordered pointing test (SOPT), which assesses the executive ability to generate and monitor a sequence of responses (Cragg & Nation, 2007) and a go/no-go test of response inhibition (Drewe, 1975) for the other session.

Study phases. A list of 20 items (either pictures or words) was presented in a random order to each child. Participants were asked to try to remember the material in order to be able to recall it later. In the word condition, participants were asked to fixate on a stimulus in the center of the screen ("+"), while the study items were named by a recorded female voice at a rate of one every 3.5 s. In the picture condition, each stimulus appeared at the center of the screen for 3 s before being followed by a blank screen for 500 ms.

Recognition phases. Children were told that they would be presented with both studied and non-studied items, and that they had to respond "yes" if they remembered seeing the stimulus in the first phase, and "no" if they did not. When items were presented in word condition, a cross-hair appeared in the center of the screen while the items in the list were successively named in a random order. In the picture condition, the stimuli were displayed at the center of the screen, again in random order. After each response, or after 5 s, a blank screen was presented for 500 ms, followed by the presentation of the next item. In both experimental conditions, 20 study items and 40 lures from 4 different categories were presented.

At the end of the experiment, the children were asked five questions related to the distinctiveness heuristic (the Appendix). In each case, they were required to select one of two alternative responses (forced choice) and then justify their answer. These questions were constructed so as to require the children to consciously call upon their knowledge of the distinctiveness rule in order to answer. Afterward, participants were given the PPVT-R to assess their receptive vocabulary level.

Measures

The main measures were (1) a corrected hit and false recognition rate for both conditions, which was computed by dividing the number of correctly/falsely recognized targets/lures by the number of targets/lures for which an answer was given within the allotted time (5 s), (2) the number of questions correctly answered on the explicit distinctiveness questionnaire, and (3) two executive scores combining the participants' results on the three executive tasks. Specifically, reaction times on the Dragons' House and go/no-go tasks, on the one hand, and the number of errors on the SOPT, Dragons' House, and go/no-go tasks, on the other hand, were standardized and averaged to form two separate composite scores: EF (RT) and EF (Errors).

Results

Data analyses

The primary goal of this study was to determine whether children demonstrate a lower false recognition rate and a more conservative response bias after picture encoding than after word encoding. We thus compared participants' results using a 3 (Age Group: 4-, 6-, or 9-year-old) × 2 (Condition: picture or word) mixed-factor design. The second aim of the study was to explore the relation between children's explicit knowledge of the distinctiveness rule and their use of this metacognitive heuristic. For this purpose, a partial correlation analysis was carried out to determine whether the tendency to implement a more conservative response criterion in the picture condition than in the word condition was related to score on the explicit distinctiveness questionnaire.

Preliminary analyses indicated homogeneity of variance between the age groups and revealed no gender, order, or list effect on any of the dependent variables. No group difference was found in terms of parental education level ($F(2,69) = 0.64$, $p = .53$), verbal ability ($F(2,69) = 2.09$, $p = .13$), and non-verbal intelligence ($F(2,69) = 2.17$, $p = .12$), respectively assessed using both parents' years of education, age-standardized scores on the Peabody Picture Vocabulary Test (PPVT-R; Dunn, Thériault-Whalen, & Dunn, 1993) and age-standardized scores on the Matrix test (Wechsler, 2004, 2005).

Hit and False recognition rates

Hit rate. The results of the mixed ANOVAs indicated no effect of age on hit rate, $F(1,70) = 1.19$, $p = .31$. However, a main effect of condition was found, $F(1,70) = 20.25$, $p < .001$, $\eta^2_p = .23$, indicating that, regardless of age, children's hit rate was higher in the picture condition than in the word condition (Table 1). No significant interaction was found between the two variables, $F(2,69) = 1.98$, $p = .15$.

False recognition rate. The rate of false recognitions after picture or word encoding was compared using a 3 (Age Group) × 2 (Condition) x 4 (Lure Type) mixed-design ANOVA. No effect of age, $F(2,69) = 1.32$, $p = .27$, or lure type, $F(3,207) = 1.56$, $p = .20$, was found on the participants' corrected rate of false recognitions. Similarly, no significant Age x Condition or Age x Lure Type interaction was highlighted, *Fs* < 1. However, the results revealed a significant main effect of condition, $F(1,69) = 28.59$, $p < .001$, $\eta^2_p = .29$, and a significant Condition x Lure Type interaction, $F(3,207) = 7.51$, $p < .001$, $\eta^2_p = .10$, with a significant effect of condition for strong semantic lures, $F(1,69) = 24.49$, $p < .001$, $\eta^2_{p} = .26$, weak semantic lures, $F(1,69) = 27.30$, $p < .001$, $\eta^2_p = .28$, and unrelated lures, $F(1,69) = 22.60$, $p < .001$, $\eta^2_{p} = .24$, but not for visual/auditory lures, $F(1,69) = 3.01$, $p = .09$. The children's false recognition rate was thus significantly lower in the picture condition than in the word condition for all groups of children and all categories of lures other than visual/auditory (Table 1). The latter finding is particularly interesting because it indicates that the encoding condition affects the way children reject lures that share physical features with studied items.

Table 1. *Corrected Proportion of Correctly Recognized Studied Items and Falsely Recognized Lures, Rate of Non-Responses by Age Group for the Two Experimental Conditions*

	All (*n* = 72)		4 years (*n* = 24)		6 years (*n* = 24)		9 years (*n* = 24)	
	Picture	Word	Picture	Word	Picture	Word	Picture	Word
Hits	0.84 (0.12)	0.75 (0.16)	0.81 (0.15)	0.76 (0.21)	0.88 (0.08)	0.78 (0.14)	0.86 (0.11)	0.70 (0.14)
False Recognitions								
Total	0.04 (0.05)	0.13 (0.14)	0.06 (0.05)	0.15 (0.18)	0.03 (0.06)	0.12 (0.13)	0.03 (0.03)	0.11 (0.12)
Strong semantic	0.01 (0.02)	0.04 (0.04)	0.02 (0.02)	0.05 (0.05)	0.01 (0.02)	0.04 (0.04)	0.01 (0.01)	0.03 (0.03)
Weak semantic	0.01 (0.02)	0.04 (0.05)	0.01 (0.02)	0.05 (0.06)	0.01 (0.02)	0.03 (0.03)	0.01 (0.01)	0.03 (0.04)
Visual/auditory	0.02 (0.03)	0.03 (0.04)	0.02 (0.03)	0.03 (0.05)	0.01 (0.03)	0.02 (0.03)	0.01 (0.02)	0.02 (0.03)
Unrelated	0.01 (0.01)	0.02 (0.04)	0.01 (0.01)	0.02 (0.05)	0.00 (0.01)	0.02 (0.05)	0.00 (0.01)	0.02 (0.03)
Non-responses	0.03 (0.03)	0.05 (0.04)	0.05 (0.02)	0.07 (0.03)	0.03 (0.02)	0.05 (0.03)	0.02 (0.02)	0.03 (0.04)

Note. Visual lures were classified as unrelated when they were presented in the word condition, and auditory lures were classified as unrelated when they were presented in the picture condition

Signal detection analyses

To identify the contribution of sensitivity and response bias to children's reduced false recognition rate with pictures compared to words, a signal detection analysis was performed (Macmillan & Creelman ,2005). The sensitivity (*d')* and response bias (*C)* scores were estimated by comparing the number of studied items that were correctly identified with the number of unrelated lures that were falsely recognized (Table 2).

Sensitivity. No significant age effect, $F(2,69) = 1.23$, $p = .30$, or Age × Condition interaction, $F < 1$, was found. However, the results of the mixed ANOVA revealed a significant main effect of condition, $F(1,70) = 100.46$, $p < .001$, $\eta^2_p = .59$, indicating greater sensitivity in the picture condition than in the word condition for all children, regardless of age.

Response bias. The results of the mixed ANOVA demonstrated a statistical trend toward an interaction, $F(2,69) = 2.75$, $p = .07$, $\eta^2_p = .07$, and a significant main effect of condition for the sample as a whole, $F(1,70) = 8.23$, $p = .005$, $\eta^2_p = .11$, as well as for the 4-year-old group, $F(1,22) = 6.91$, $p = .01$, $\eta^2_{p =}$ .24. Analyses also revealed a statistical trend in this direction for 6-year-old children, $F(1,22) = 3.78$, $p = .06$, $\eta^2_p = .15$, but not for 9-year-old children, $F < 1$. On the whole, these results indicate that the children in the two younger age groups tended to respond more conservatively after picture encoding than after word encoding. Regardless of the experimental condition, no effect of age was found, $F(2,69) = 1.89$, $p = .16$.

Table 2. *Values of Sensitivity* (*d'*) *and Response Bias* (*C*) *by Age Group for the Two Experimental Conditions*

	All (*n* = 72)		4 years (*n* = 24)		6 years (*n* = 24)		9 years (*n* = 24)	
	Picture	Word	Picture	Word	Picture	Word	Picture	Word
Sensitivity (*d'*)	2.70 (0.51)	1.59 (0.92)	2.56 (0.59)	1.43 (0.96)	2.78 (0.44)	1.72 (0.99)	2.76 (0.49)	1.61 (0.84)
Response bias (*C*)	0.22 (0.26)	0.04 (0.47)	0.26 (0.35)	-0.10 (0.52)	0.20 (0.18)	-0.01 (0.47)	0.21 (0.22)	0.21 (0.38)

Note. A high *d'* value represents good discrimination between signal and noise distributions (i.e., greater probability of "yes" responses when a target is presented and "no" responses when a lure is presented) while a low *d'* value represents poor discrimination between signal and noise (i.e., greater probability of "no" responses when a target is presented and "yes" responses when a lure is presented). A negative *C* value represents liberal responding (i.e., greater tendency to classify an item as "old" whether it is a target or a lure), while a positive value represents conservative responding (i.e., greater probability of classifying an item as "new" whether it is a target or a lure).

Explicit questionnaire

Children's explicit knowledge of memory functioning has often been found to be related to executive functions and demographic characteristics (Grammer et al., 2011). To confirm these previous findings, a hierarchical multiple regression analysis was carried out on the total score from the explicit questionnaire. The variables included in the analysis were, in order: (1) chronological age, (2) composite executive functioning scores—i.e., EF (Errors) and EF (RT), (3) standard score on the Matrix test, and (4) standard score on the PPVT-R. Explicit knowledge of the distinctiveness advantage was predicted by chronological age, $R^2 = .36$, $\beta = .35$, $p = .045$, and the composite score of executive functions labeled "EF (RT)", $R^2 = .05$, $\beta = -.35$, $p = .029$. None of the other predictors added significantly to the total amount of variance explained, $F(5,66) = 9.40$, $p < .001$, $R^2 = .41$.

Finally, the relation between explicit knowledge of the distinctiveness rule and the use of the heuristic was examined. As the implementation of a more conservative response criterion for pictures than for words is traditionally regarded as the best indicator of the use of the distinctiveness heuristic (Schacter et al., 1999), the participants' reliance on the distinctiveness rule was estimated by subtracting the response bias score in the picture condition from the response bias score in the word condition. A high (positive) score indicated a change of response strategy. Once the effect of chronological age was taken into account, no correlation was found between the two variables, either for the sample as a whole ($r_p = .05$, $p = .70$) or for the 4-year-old ($r_p = -.16$, $p = .47$), 6-year-old ($r_p = .04$, $p = .87$), or 9-year-old ($r_p = .22$, $p = .31$) groups.

Discussion

The aim of the present experiment was to determine whether children are able to use metacognitive expectations to guide their memory decisions. Using an experimental procedure that makes it possible to rule out the impoverished relational encoding account, our study indicates that even young children demonstrate a lower false recognition rate after picture rather than word encoding. The remaining question is whether this result truly reflects the use of a heuristic based on metacognitive expectations.

According to the impoverished relational encoding account, distinctive encoding enhances the processing of the differences between studied items, resulting in a reduction of the false recognition rate at test (Ghetti et al., 2002; Smith & Hunt, 1998). However, this explanation is only conceivable if, as in the DRM paradigm, the studied items share some common features (e.g., semantic relation) and the false-recognition rate at test depends on the participants' ability to detect these common features during study. Because the method employed in the present experiment did not rest upon such a relational paradigm, there is less reason to attribute the distinctive-encoding effect to an item-specific processing account (Hege & Dodson, 2004).

On the other hand, the false recognition rate could be lower with pictures simply because picture encoding produces high-quality memories that make participants more likely to recall logically inconsistent information which they can then use to reject the lures (Gallo et al., 2006; Rotello et al., 2008). To some extent, our findings are consistent with this hypothesis: children's ability to discriminate between targets and lures is higher after picture encoding than after word encoding. This result suggests that children may rely on the recall-to-reject process to guide their memory decisions. However, although the significant difference between the participants' levels of sensitivity to picture and word stimuli provides evidence for the recall-to-reject account, some of our findings cannot be explained without postulating the involvement of the distinctiveness heuristic as well.

According to the heuristic hypothesis, the lesser false-recognition rate after distinctive encoding results from the implementation of a conservative response criterion based on participants' expectations about the kinds of information that they feel they should be able to recollect. The signal detection analysis that we carried out seems to confirm this theory: children generally respond more conservatively after picture encoding than after word encoding. Furthermore, the finding that the false memory rate for visual/auditory lures was significantly lower in the picture than in the word condition is also coherent with this idea. In fact, the physical features shared by studied pictures and visual lures could have induced people not to reject these lures simply because the amount of details they recollected about them was sufficient to satisfy their expectations. Nevertheless, to fully demonstrate the heuristic hypothesis, an experimental paradigm manipulating item type within list could be employed. In a within-list design, the use of the distinctiveness rule should require (1) tracking the memory source to determine whether recollection of physical details is to be expected (Schacter et al., 1999) and (2) adjusting the response criterion on a trial-to-trial basis (Dobbins & Kroll, 2005). If the conservative bias observed here truly results from children's reliance on the distinctiveness heuristic, then such within-list manipulation should eliminate it. Increased sensitivity due to the implementation of a recall-to-reject process, in contrast, should persist.

From a developmental perspective, our analyses reveal that 4- and 6-year-old children tend to demonstrate a conservative response bias for pictures and a liberal response bias for words, indicating the use of the distinctiveness heuristic. However, 9-year-old children showed a conservative response criterion for both experimental conditions. Specifically, their response bias score was higher in the word condition, but was comparable to that of the younger children in the picture condition. There are two possible explanations for this last result. The first is that the task was too easy for the 9-year-old group, who were thus perfectly able to discriminate between targets and lures without relying on their expectations. However, as no age difference was found in the sensitivity score, this hypothesis does not seem plausible. The second is that children naturally become more conservative with age, but their high level of sensitivity arithmetically prevents them from further increasing their response bias score in the picture condition, making the comparison between the two response bias scores unsuitable to appraise 9-year-old children's use of the distinctiveness rule. In the literature, adults are generally demonstrated to be conservative in all circumstances, but to be even more so after a distinctive encoding (e.g., Dodson & Schacter, 2002). Considering this fact and the communicating vessels principle which governs sensitivity and response bias scores (e.g., Lynn & Barrett, 2014), it can be reasonably suggested that a combination of developmental and mathematical factors played a role in this lack of effect.

The second aim of this study was to explore the relation between children's use of the distinctiveness heuristic and explicit knowledge of this metacognitive rule. In accordance with some previous findings (Grammer et al., 2011), the metacognitive knowledge assessed by our distinctiveness questionnaire was demonstrated to improve with age, and to be predicted by executive abilities. The latter result is notable, because it confirms the involvement of high-level cognitive functions in children's explicit metacognitive knowledge. Nevertheless, no correlation was found between children's explicit knowledge of the distinctiveness heuristic and what appears to be the actual use of this metacognitive rule. Interestingly, the failure to find such a relation replicates the results of Koriat et al. (2009, see also Paulus, Tsalas, Proust, & Sodian, 2014), who found no link between participants' explicit knowledge of the memorizing-effort heuristic and the extent to which they resorted to this heuristic. Therefore, although the absence of a significant correlation is not sufficient to prove the absence of a relation, the results of the present experiment seem to suggest that metamemorial expectations are not always consciously accessible to children and that metacognitive heuristics may guide memory decisions through implicit processes. However, to confirm this hypothesis, children's use of the metacognitive rule needs to be established with certainty. Until this is achieved, the absence of a correlation between explicit knowledge of the heuristic and the score employed to assess the use of the metacognitive rule can be interpreted as further evidence that our data do not reflect the implementation of the distinctiveness heuristic.

Conclusion

Children's propensity to false memories is well-known (Brainerd, Reyna, & Ceci, 2008; Ghetti et al., 2002) which can prove quite troublesome in situations that require high memory accuracy (e.g., testimony). The finding that children are sometimes able to spontaneously employ procedures and mechanisms that reduce the inaccuracy of their memory is thus quite interesting. The results of the experiment presented here revealed that children made fewer false recognitions after studying more distinctive items. We presented some evidence that this distinctive-encoding effect could be due to the implementation of a metacognitive rule—the distinctiveness heuristic—that is based on participants' implicit metamemorial expectations. This interpretation will require further corroboration because our results are not sufficient to establish the implicit nature of the processes that underlie children's apparent use of metacognitive heuristics. Nonetheless, if confirmed, the finding that young children can rely on the distinctiveness heuristic to guide their memory decisions would be a strong argument in favor of this hypothesis.

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Appendix

Details of the Distinctiveness Heuristic Questionnaire

Q 1	Question	What would you remember best? That you saw Santa Claus at school or that you drew at school? Why do you think you would remember Santa Claus/drawing best?
	Answer	(1) Santa Claus
		(2) A justification related to the frequency of the event was expected
Q 2	Question	What would you remember best? That you saw a gazelle or a giraffe? Why do you think that you would remember a gazelle/giraffe best?
	Answer	(1) Giraffe
		(2) A justification related to the physical salience of the animal was expected (e.g., neck size)
Q 3	Question	After watching a film, what would you remember best? The scenes where characters talked or the scenes that made you afraid? Why do you think you would remember talking scenes/scary scenes best?
	Answer	(1) Scary scenes
		(2) A justification related to the emotionality of the scenes was expected
Q 4	Question	Would you remember a song best after listening to me sing it several times, or after singing it yourself several times? Why do you think you would remember best if I/you sang?
	Answer	(1) Oneself
		(2) A justification related to the effect of generation/production was expected
Q 5	Question	Would you remember best a book that has pictures in it or a book that has words in it? Why do you think you would remember the book with pictures/words best?
	Answer	(1) Pictures
		(2) A justification related to the number of physical details in the pictures was expected

Note. The questionnaire was constructed in two steps: first, by listing experimental conditions in which the use of the distinctiveness heuristic has been demonstrated (i.e., frequency, salience, emotional content, self-production, and picture effects) and, then, by finding relevant everyday situations to illustrate them. The maximum score was ten points.