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When knowing the name of objects is not enough to categorize them

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Two experiments explored 16-month-olds' learning of new nouns, and their use of these nouns to categorize objects. In both experiments, infants were presented with triads of perceptually dissimilar objects, which were given made-up names, two of the objects receiving the same name. Following each training phase, infants were tested on whether: (a) they could use the names to categorize the objects (Experiment 1), or (b) they had actually learned the association between the names and the objects (Experiment 2). Our results show that 16-month-olds can simultaneously learn the name of three objects, but cannot use these newly learned names to categorize the objects in the absence of any other cue to categorization. These results are discussed in light of different hypotheses regarding the way infants come to use names to categorize objects.

Infants and young children use a variety of cues to categorize objects taxonomically (see Rakison & Oakes, 2003). On one hand, many studies have shown that obvious (i.e., easy to observe and stable in time) cues such as colour and shape are used for categorization in infancy and early childhood (see Quinn & Eimas, 1997, for a review). On the other hand, several studies have shown that children from at least 2 to 3 years of age can use different non-obvious (i.e., more transiently observable and/or more arbitrary) cues to categorize objects taxonomically and make inferences about their properties, even in the absence of any other categorization information. The non-obvious properties investigated include functional

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attributes (Kemler Nelson & 11 Swarthmore College Students, 1995; Kemler Nelson, Frankenfield, Morris, & Blair, 2000a; Kemler Nelson, Russell, Duke, & Jones, 2000b), and causal properties (Gopnik & Sobel, 2000; Gopnik, Sobel, Schulz, & Glymour, 2001; Nazzi & Gopnik, 2000, 2003; Sobel, Tenenbaum, & Gopnik, 2004). There is also emerging evidence that some of these cues are used at a younger age, although some visual support seems to be needed (see Booth & Waxman, 2002, for data related to functional attributes at 14 and 18 months). In the present paper, we will be concerned with another one of these non-obvious cues, names, and more specifically with the evaluation of the effect of the early learning of names on taxonomic categorization.

Although there is a consensus that language is not a prerequisite for categorization, the question of the influence of naming on categorization by children 2.5 years and older has often been addressed (Gelman & Coley, 1990; Gelman & Markman, 1986, 1987; Gopnik & Sobel, 2000; Markman & Hutchinson, 1984; Smiley & Brown, 1979). These studies show that naming the objects to be categorized changes the categorization biases in the following ways. First, given that count nouns denote taxonomic rather than thematic categories across languages, it was hypothesized that hearing a count noun applied to an object should focus children on taxonomic relations (Markman & Hutchinson, 1984). Accordingly, when children, from the age of 2 years onward, are requested to make either a thematic or a taxonomic choice ("Can you find another one that is the same as this?"), the fact of naming the objects induces a change from thematic or random choice to clear taxonomic categorization (Markman & Hutchinson, 1984; Smiley & Brown, 1979). These studies therefore provide evidence in favour of the proposal that by at least 30 months, children have implicit hypotheses about the possible meaning of words.

Second, following-up on the finding that naming (count nouns) induces taxonomic categorization, several studies have explored the impact of denomination on taxonomic categorization itself. In order to do so, children were presented with triads of objects that had no possible thematic relation but could be taxonomically categorized by relying either on perceptual information (the similarity between the objects) or naming information (the name given to the objects). From 30 months of age onwards, children gave more weight to the naming information, categorizing together the objects having received the same label (Gelman & Coley, 1990; Gelman & Markman, 1986, 1987; Gopnik & Sobel, 2000). The taxonomic status of the categorizations performed is attested by children's ability to generalize various properties to all the objects categorized together.

More recently, the influence of naming on taxonomic categorization has been explored at even younger ages, motivated by the demonstration of infants' ability to rapidly learn new words around their first birthday

(Hollich, Hirsh-Pasek, & Golinkoff, 2000; Schafer, 2005; Schafer & Plunkett, 1998; Stager & Werker, 1997; Werker, Cohen, Lloyd, Casacola, & Stager, 1998; Woodward, Markman, & Fitzsimmons, 1994). The possibility of an early effect of naming on categorization was initially suggested by a study establishing that naming influences 10- to 14-month-old infants' attention to objects, as attested by longer looking times to previously named objects as opposed to unnamed objects (Baldwin & Markman, 1989).

Building on this initial result, Waxman and Markow (1995) presented 13-month-old infants with four exemplars of *known object categories* during a familiarization phase, the categories being defined either at the basic level (e.g., cars) or at the superordinate level (e.g., vehicles). Depending on the conditions, the familiarization objects were labelled with the same known noun, with the same new noun, with the same new adjective, or they were not labelled. Then, two objects were simultaneously presented during a test phase, one object belonging to the familiarized taxonomic category and one object belonging to a different taxonomic category. The infants were encouraged to look at and manipulate the objects in a neutral way ("See", "Look what I have"), and looking and manipulation times to both objects were measured.

For basic level categories, infants' behaviour in the test phase revealed a preference for the object of the different category for the four experimental conditions. This suggests that, independently of the presence and the kind of naming, infants had generalized the objects to the basic level during the familiarization phase. However, for superordinate categories, the novelty effect was found in the three naming conditions (known noun, new noun, new adjective) but not in the silent condition. More recent evidence has shown that this effect of naming on categorization behaviour is found only when consistent (but not variable) names are applied (Waxman & Braun, 2005). This pattern of results thus suggests that giving the same name to different objects makes it easier for the infants to generalize to the superordinate level, probably by highlighting their common properties.

However, the fact that this effect was found for both nouns and adjectives raises the question of whether language highlights any kind of commonalities. In this context, Waxman (1999) proposed that nouns can induce taxonomic but not property-based (e.g., colour, texture) groupings, while adjectives promote both kinds of groupings. This hypothesis is based on the crosslinguistic observation that count nouns designate taxonomic categories, while adjectives can be used to designate taxonomic or property-based groups of objects. To test this hypothesis, 13-month-olds were familiarized with four objects that all shared a property (colour or texture) that had no taxonomic value. There were three different conditions: no word, new noun, and new adjective. They were then tested on two objects,

one similar to the familiarized objects and one different from them. An effect of language was found for the adjective but not the noun condition. Together with the data by Waxman and Markow (1995), these results are compatible with the notion that nouns highlight taxonomic categories as early as 13 months of age, while adjectives highlight a wider range of commonalities.

The above studies thus indicate that, as early as 13 months of age, naming objects induces taxonomic categorization. However, one important limitation of the previous results is that the effect of naming at this age has only been found for known object categories. When Waxman and Markow (1995) familiarized 13-month-olds with four objects from four different known categories and labelled them with the same noun to try and induce the formation of a new category, no effect of categorization could be found. This result suggests that naming might only highlight similarities among categories already known by the infants, and might not allow the formation of new categories. However, the above failure might have resulted from an interference with previous knowledge as a result of the fact that the objects to be categorized belonged to different known categories. In order to avoid this problem, the role of naming in forming new categories has to be assessed using unfamiliar objects.

At this point, only two series of experiments have explored the effect of naming on infants' categorization of *unknown object categories*, the unfamiliar objects in the categories either sharing some visual properties (Booth & Waxman, 2002) or not (Nazzi, 2005; Nazzi & Gopnik, 2001; Nazzi & New, 2007). When the objects from an unknown category *shared some visual attributes*, the fact of presenting and naming four of these objects in a familiarization phase was sufficient to induce categorization in 18-month-olds: asked to find "another one of these", these infants chose more frequently a new object from the familiarized category than a new object from another unknown category. But 14-month-olds failed in this task, suggesting that in the presence of shared visual attributes, words *per se* become reliable, unequivocal cues to taxonomic categorization between 14 and 18 months (Booth & Waxman, 2002). However, 14-month-olds succeeded when given a hint about the function of one of the familiarization objects, a result confirming that even these young infants are performing taxonomic categorizations in these tasks when given sufficient information.

The above study shows that naming alone starts being used to build new taxonomic categories between 14 and 18 months of age, at least in the presence of shared visual properties among the objects of the new categories. Going further, Nazzi and Gopnik (2001) explored when naming becomes a tool to build new categories *in the absence of shared visual properties*. To address this question, 16- and 20-month-olds were presented with triads of unfamiliar objects. There were two conditions: In the visual condition, two

of the objects were identical and the objects were introduced to the infants without being named. In the naming condition, all three objects were perceptually dissimilar; they were labelled, two of the objects receiving the same name (the two objects to be paired being counterbalanced across infants). In both cases, categorization was evaluated by taking one of the objects of the visual/named pair, and by asking the infant to “give the one that goes with this one”. Note that the naming condition was set-up to neutralize, by counterbalancing across infants the pairs of objects defined by the names, any possible thematic or visually based categorizations. Given this and the research presented above, it was implicitly assumed that name-based categorization would happen at a taxonomic level, a point that was, however, not directly established.

In the visual condition, infants at both ages chose the perceptually similar object above chance level, and there was no age effect. This suggests that both 16- and 20-month-olds understood the task and chose to categorize according to the only similarity cue available (visual identity), suggesting that the pragmatics of the task are clear enough to promote categorization behaviour.

However, in the naming condition, only the 20-month-olds chose the object that had been labelled with the same name above chance level. Use of names to categorize objects in this task was extended to children between the ages of 2 and 6 years, showing a gradual increase in performance up to 4 years of age when children perform at ceiling (Nazzi, Gopnik & Karmiloff-Smith, 2005). The results at 20 months of age were also replicated with French-learning infants (Nazzi, 2005), and extended to situations in which the two names presented only differed by one consonant (though not if the labels only differed by one vowel, suggesting an interaction between phonological and lexical information; see Nazzi, 2005; Nazzi & New, 2007). Taken together, these results suggest that, in the absence of either visual cues or information regarding the possible core meaning of the object category (as also emphasized by Booth & Waxman, 2002), infants fail to use names as reliable cues to categorization at 16 months, but consistently do so from 20 months up to 6 years of age.

However, one question left open by the Nazzi and Gopnik (2001) study is the reason of the failure of the 16-month-olds at using the names to categorize. The fact that the 16-month-olds performed as well as the 20-month-olds in the visual condition makes it unlikely that they simply did not understand the task, or were prevented from showing their knowledge by some kind of performance limitation. More likely, Nazzi and Gopnik (2001) suggested that 16-month-olds’ failure might have resulted from the fact that they did not use the names as a reliable cue to categorization, an interpretation compatible with the data obtained by Booth and Waxman (2002).

There is, however, a more trivial reason for this failure. Indeed, the task of learning the names for three unfamiliar objects at the same time might have been too difficult for 16-month-olds, and they might not have been able to learn the names of the objects presented. Evaluating this possibility is all the more important given that in all the studies showing evidence of rapid word learning by infants at the beginning of their second year of life (Hollich et al., 2000; Schafer & Plunkett, 1998; Stager & Werker, 1997; Werker et al., 1998; Woodward et al., 1994), infants were always taught two new name/object pairings, and never three pairings as in the Nazzi and Gopnik (2001) study.

To investigate this issue, two experiments were conducted with French-learning 16-month-olds. Both experiments followed the same basic procedure and differed only in the test question asked of the infants. The procedure, similar to that used in Nazzi and Gopnik (2001) and identical to that used in Nazzi (2005), went as follows. Infants were given six trials in which three dissimilar-looking, unfamiliar objects were introduced and named, two of the objects receiving the same name. On the one hand, Experiment 1 tested name-based categorization by taking one of the two objects of the named pair, and asking the infant to give "the one that goes with this one". The data from this experiment will complement previous results showing that both English- and French-learning 20-month-olds can use names to categorize objects while English-learning 16-month-olds cannot. On the other hand, Experiment 2 tested learning of and memory for the names presented by taking one of the two objects of the named pair, and asking the infant to give "the other [object name]?"

EXPERIMENT 1

Method

Participants. Twenty-four 16-month-old infants ($M = 16$ months, 6 days; $range = 15$ months, 18 days to 16 months, 27 days) from monolingual French-speaking families participated in this experiment. There was an equal number of boys and girls. Most infants came from White, middle-class backgrounds, although infants from other ethnic backgrounds were also represented. Five additional infants were tested, but failed to complete the session.

Stimuli. Six triads of small objects were used during the testing session (an additional triad being used during a pre-test). All objects were selected so that the infants would be unfamiliar with them and would not already have a name for them. All sets were made up of three very distinct objects, that all differed in shape, colour, and texture (see example in Figure 1).

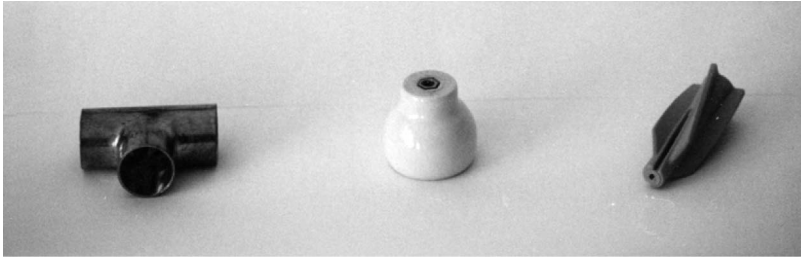


Figure 1. One of the six sets of objects used in the present study. Which two objects were given the same name was counterbalanced across participants.

Procedure. The task was identical to that used in Nazzi and Gopnik (2001) and Nazzi (2005). Infants were tested individually for about 10 minutes in a quiet room, in the presence of a caregiver. After an informal warm-up period (playing with spinning plastic rings), the infant was seated on a chair across a table from the experimenter, and the testing session started. It comprised a practice trial¹ and six test trials. All trials were “naming” trials that tested for categorization based on naming.

Each test trial was composed of a presentation phase, followed by a categorization question. Each trial started with the presentation of the three objects, one at a time. The infant was encouraged to manipulate each object for a few seconds, before placing it on the table. Within each trial, the objects were arranged on the table on a left-to-right sequence (child’s perspective) in order to minimize potential confusions. The experimenter spoke while presenting each object, saying (for example): “Look! A *zap*. This is a *zap*. Do you want to play with the *zap*? Yes, play with the *zap*. See this *zap*? All right, let’s put the *zap* on the table. Here” Each object was named exactly six times. Two objects were given the same label (e.g., *zap*) while the third object was given a different label (e.g., *douk*).

We used three pairs of nonwords: *douk/zap*, *pizé/mora*, and *képod/nulis*. All three pairs were used once, in counterbalanced order, for the first three trials. They were then reused in the same order for the last three trials. For each pair of words, the word of the pair being used as target was switched between the two times it was used.

¹The first trial was considered a practice trial, giving infants an opportunity to “practise” the task once. It was identical to the six test trials except that if the infants’ initial response was incorrect, the presentation of the objects and the categorization question were repeated to give them another chance to make the correct choice (although the infants were not told that the answer was incorrect). The nonwords used for the training trial were *laf* and *nim*.

After the presentation phase, the experimenter tested categorization by putting one object of the named pair in his own hand, placed at equal distance from the remaining two objects, and asking the infant to give him "celui qui va avec" [the one that goes with (this one)]. While waiting for the response, the experimenter looked at either the infant's face or the object in his hand in order to avoid influencing the infant's response. After the infant's response, positive feedback was provided regardless of the choice made. Successful performance corresponded to the selection of the similarly labelled object.

The order of presentation of the trials, the position of the paired objects on the table, and the side of the object picked up by the experimenter were randomized. More importantly, in order to ensure that no potential perceptual biases could determine overall performance, the pairs defined by the names were counterbalanced across participants: for each triad of objects, objects 1 and 2 were paired for a third of the infants, objects 2 and 3 for another third, and objects 1 and 3 for the last third. Therefore, infants' overall level of performance should be of 50% of correct answers if they are performing at chance; conversely, it should be above 50% if they are using the names to categorize the objects.

Finally, before the testing session, the parents filled out the vocabulary part of the French equivalent (Kern, 2003) of the MacArthur Communicative Development Inventory: Toddlers (CDI; Fenson et al., 1993) in order to determine the size of the infants' productive vocabulary.

Results and discussion

For each trial, infants were given a score of 1 when the chosen object was the second of the named pair, and a score of 0 otherwise. Total scores could range from 0 to 6. The infants chose the second object with the same name 55.6% of the time (see Figure 2, left panel), which is not significantly different from the 50% chance level, $t(23) = 1.19$, $p = .25$. Moreover, as can be seen from Figure 3, only 11 of the 24 infants chose the correct object on more than half of the test trials while six infants chose the incorrect object on more than half of the test trials, $p = .166$, 1-tailed binomial test. Finally, we compared infants' performance on the first three and the last three test trials; there were no significant differences, $t(23) = 1.5$, $p = .15$.

The infants had a mean of 15 words ($SD = 12$; range 1–54); the median was 14 words. There was no correlation between vocabulary size and categorization performance, $r(22) = -.14$, $p = .52$.

The present results are congruent with the finding by Nazzi and Gopnik (2001) that in the absence of any visual cue, 16-month-old infants fail to categorize unfamiliar objects based on their recently taught names, extending these results to a new language: French. Given 20-month-olds'

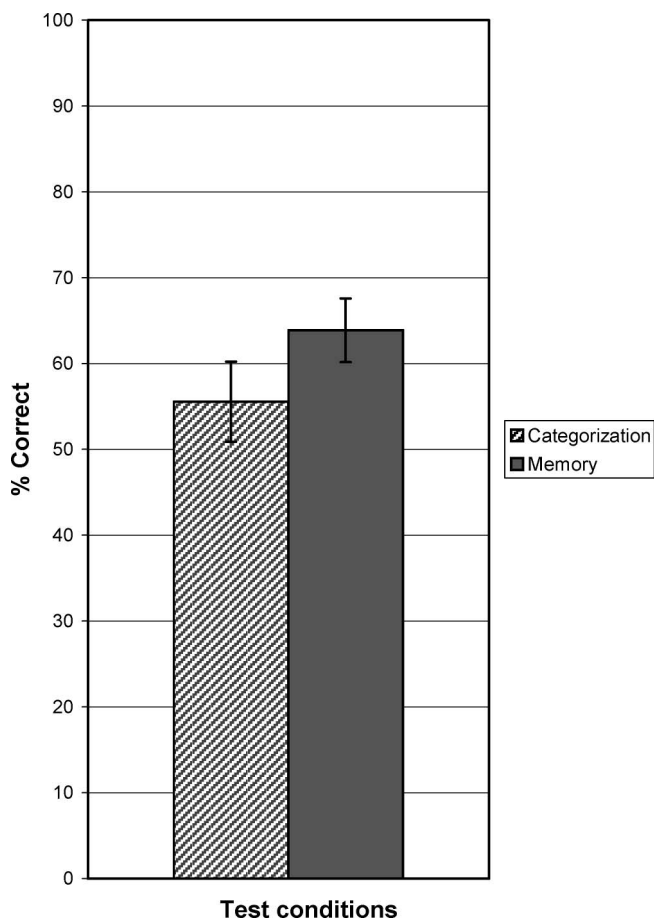


Figure 2. Infants' mean performance (and standard error of the mean) in the name-based categorization condition (Experiment 1, left panel) and in the memory condition (Experiment 2, right panel).

success at name-based categorization (Nazzi, 2005), we now have evidence from two different languages that name-based categorization emerges between 16 and 20 months of age.

Having extended to French the failure of 16-month-olds to use names to categorize, we proceeded to evaluate the possible causes for this failure. As discussed earlier, our goal was to tease apart two possible interpretations of infants' failure in our task: an inability to use names as cues to object categories, or a failure to have learned the name/object associations for the three objects of each triad. Accordingly, the procedure used in Experiment 1 was slightly modified. The presentation phase was left unchanged in order to

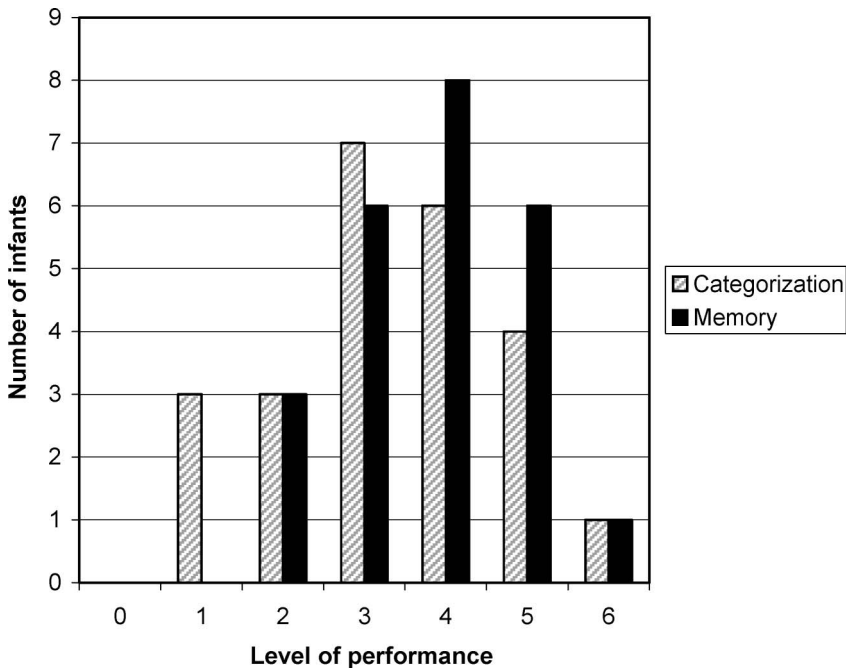


Figure 3. Number of infants at each level of performance for the name-based categorization condition (Experiment 1) and the memory condition (Experiment 2).

retain the same learning conditions, but the question asked of the infants was modified in order to evaluate their memory for the name/object pairings.

EXPERIMENT 2

Method

Participants. Twenty-four 16-month-old infants ($M = 16$ months, 14 days; $range = 15$ months, 27 days to 17 months, 10 days) from monolingual French-speaking families participated in this experiment. There was an equal number of boys and girls. Most infants came from White, middle-class backgrounds, although infants from other ethnic backgrounds were also represented. Three additional infants were tested, but failed to complete the session.

Stimuli and procedure. The procedure was identical to that used in Experiment 1; the object triads and the noun pairs were the same. The single

but crucial difference was in the question asked of the infants during the test phase. Instead of asking the child to give her/him “the one that goes with this one”, the experimenter would say: “See this [object name]? Can you give me the other [object name]?” This question is probing infants’ memory for the name/object associations presented to the infants, rather than evaluating whether they use the names to categorize the objects.

Results and discussion

For each trial, infants were given a score of 1 when they chose the object with the same name, and a score of 0 otherwise. Total scores could range from 0 to 6. The infants chose the correct object 63.9% of the time (see Figure 2, right panel), which was significantly above the 50% chance level, $t(23) = 3.74$, $p = .001$. Moreover, as can be seen from Figure 3, 15 out of 24 infants chose the correct object on more than half of the test trials while only three infants chose the incorrect object on more than half of the test trials, $p = .004$, 1-tailed binomial test. Finally, we compared infants’ performance on the first three and the last three test trials. There was a non-significant tendency for infants’ performance to increase between the two halves of the testing phase (from 58 to 69%), $t(23) = 1.88$, $p = .073$.

The infants had a mean of 18 words ($SD = 15$; range 0–52); the median was 14 words. There was no correlation between vocabulary size and categorization performance, $r(22) = .06$, $p = .80$.

The present results establish that under presentation conditions identical to those of Experiment 1, infants are able to learn the name/object pairings, ruling out a failure at this level as an explanation for infants’ name-based categorization failure in Experiment 1.

GENERAL DISCUSSION

In the present study, French-learning 16-month-olds were presented with triads of unknown, dissimilar objects. All three objects were given a name, and two of these objects were given the same name. Following this, we evaluated whether these infants could use the recently presented names to categorize together the two objects with the same name.

Our results first suggest that they could not. Taken together with results showing name-based categorization effects in French-learning 20-month-olds under the exact same experimental conditions (Nazzi, 2005), the present results establish that the ability to use names to categorize unfamiliar objects in the absence of any other cue emerges between 16 and 20 months in French-learning infants. As discussed in the introduction, the taxonomic nature of the observed categorizations was not explored here, a point that will have to be established in future research. Note, however, that it would

be consistent with results showing that naming induces taxonomic categorization possibly as early as 13 months of age in some specific conditions (Booth & Waxman, 2002; see also Gelman & Coley, 1990; Gelman & Markman, 1986, 1987; Gopnik & Sobel, 2000; Markman & Hutchinson, 1984; Waxman, 1999; Waxman & Markow, 1995).

Second, it should be noted that the age of emergence of name-based categorization found for French is similar to the age previously found in a population of English-learning infants (Nazzi & Gopnik, 2001). Moreover, in both populations, this emergence happened in parallel to a significant increase in (productive) vocabulary evaluated with the French and English versions of the CDI (Kern, 2003, and Fenson et al., 1993, respectively). Indeed, between the two ages, the productive vocabularies of the infants we tested increased from 15 to 80 for the French-learning infants and from 28 to 141 for the English-learning infants. The synchrony between these two developmental changes in both language groups further supports the proposal put forward by Nazzi and Gopnik (2001) of a specific link between the emergence of name-based categorization and (both productive and receptive) lexical development. Future research will have to investigate the direction of this link (better lexical skills leading to changes in object categorization or vice versa, or whether both developments happen in parallel), which could be done by simultaneously evaluating the development of these two skills in a longitudinal study.

It is worth noting that although there was an increase in productive vocabulary in both languages, French-learning infants were reported to produce fewer words than English-learning infants. A similar disadvantage of the French-learning infants is found when comparing the CDI norms for French (Kern, 2003) and English (Fenson et al., 1993), for both receptive and productive vocabulary. For example, at 16 months, French-learning infants understand 145 words and produce 16 words (CDI – infant form) while English-learning infants understand 190 words and produce 64 words (CDI – infant form). It is unclear at this point why such crosslinguistic differences are found. This will have to be clarified in the future, bearing in mind that these differences might simply reflect slight differences in the elaboration of the CDIs in the two languages or in the way parents of different cultures/ languages evaluate their infants' knowledge. However, these differences do not seem to crucially affect the development of name-based categorization.

Finally, the present study had been designed to start evaluating the reason for 16-month-olds' failure to use names to categorize unknown dissimilar objects. On the basis of 16-month-olds success on the visual condition of Nazzi and Gopnik (2001), it seemed unlikely that the failure in the name-based condition was due to difficulties with the task used. However, we needed to establish whether or not these infants had actually learned the name/object associations they were presented with. The results

of Experiment 2 establish that 16-month-olds remember the word/object associations. This shows that the failure to use names to categorize in Experiment 1 was not due to the fact that they had not learned the words. Therefore, the present study establishes that 16-month-olds can simultaneously learn the name of three unfamiliar objects (previous studies had never presented infants with more than two new name/object associations) and that they can remember that two of these unknown, dissimilar objects have the same name. However, they cannot use this new lexical knowledge to categorize together two perceptually unrelated objects with the same name, at least when the newly learned label is not mentioned in the question (similar to what had been done by Booth & Waxman, 2002).

If 16-month-olds' inability to use names to categorize objects is not due to their failure at learning the new word/object associations, what could be the cause of this failure? One possibility is that the memory trace of the word/object associations are not strong enough to support categorization. This associationist interpretation is testable in different ways. One possibility is to give the two tasks used in the present study to the same infants, with the prediction that performance in both tasks would correlate. Another possible test of this hypothesis would be to modify the procedure used in Experiment 1 by presenting infants with more instances of the word/object associations during the training phase. According to this associationist interpretation, such a manipulation should strengthen the word/object associations in memory, and should therefore boost categorization performance. Note, however, that there is evidence that increasing the number of word/object associations will not always guarantee early word learning (see Werker, Fennell, Corcoran, & Stager, 2002, in which 14-month-olds were not able to learn simultaneously two phonetically similar words, in spite of being presented with 40 to 120 repetitions of each word).

Alternatively, 16-month-olds' failure could reflect the fact that infants at the onset of lexical acquisition do not yet use nouns as cues to categories in the absence of any other cue. Booth and Waxman (2002) noticed that names, unlike many other cues to categorization, hold a totally arbitrary relation to the object categories they label. In this context, they proposed that word-learning beginners (before the acquisition of a sufficiently large comprehensive lexicon) might not have already specified that names point towards the core meanings of objects/categories. Accordingly, they might not use names alone as category cues. That is, word-learning beginners would be "less captured by the naming episode and may therefore fail to learn the new word or to categorize the objects labelled by it" when the word to be learned does not have a clear core meaning (p. 955). Both the results by Booth and Waxman (2002) and those of the present Experiment 1 are consistent with this proposal. However, the data from the present Experiment 2 allows us to rule out that the words (i.e., the name/object

associations) cannot be learned in the absence of a core meaning. In the future, it will be worth testing whether giving word-learning beginners a hint at the core meaning of the words in acquisition would allow them to use the names as category cues when no other cues are presented. Following Booth and Waxman (2002), this could be evaluated by testing whether the demonstration of the function of one of the two objects with the same name would affect categorization performance at 16 months. Note that name-based categorization data previously obtained with the 20-month-olds (Nazzi, 2005; Nazzi & Gopnik, 2001; Nazzi & New, 2007) show that at this age, infants can use names to categorize objects even in the absence of a core meaning, which in this framework would suggest that they have specified that names point towards the core meanings of object categories.

In summary, together with Nazzi (2005), the present study extends to French previous data on English (Nazzi & Gopnik, 2001), showing that the ability to use names to form new object categories in the absence of any shared visual properties emerges between 16 and 20 months of age. As for English, this emergence happens in parallel with an increase in vocabulary (from a mean of 15 words at 16 months to a mean of 80 words at 20 months of age for the French data). Importantly, the present data demonstrates that 16-month-olds' inability to use names to form new object categories is not due to a failure in learning the name/object associations, but is rather due to a failure in using the name shared by two objects to put them in a shared-object category.

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