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Impact of semantic or phonemic cues in picture-naming tasks on the calculation of the objective age-of-acquisition norms: A cross-linguistic study

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In picture-naming tasks, participants name a picture as quickly as possible. In several studies, when the participant did not provide the picture name in the first seconds after object presentation, the examiner provided phonemic or semantic cues. Under these conditions, word retrieval should be easier, thus lowering the age of acquisition (AoA). The goal of the present study was to collect objective norms of AoA in French without any kind of cue. The results were then compared with other European databases that relied on picture-naming tasks conducted with phonemic or semantic cues. Globally, the data of all the databases are significantly correlated. However, the AoA measures in these databases are always lower than in our study, except in Álvarez and Cuetos (2007), who did not provide any assistance to the participant. Therefore, giving phonemic and/or semantic cues lowers the AoA values, indicating that the values from different databases in this domain should be taken with caution. The objective AoA norms from this study may be downloaded from the Psychonomic Society's Archive of Norms, Stimuli, and Data, www.psychonomic.org/archive.

It is now well established that the age at which a word is acquired, the *age of acquisition* (AoA), is the best predictor of name agreement in adults (speed and accuracy). The AoA effect is even more important than word frequency in lexical processing (for a review, see Juhasz, 2005). The AoA effect has been evaluated with subjective as well as with objective AoA ratings. The former refers to AoA estimated by adults and the latter concerns children's performance. Most studies used adult estimates to assess the impact of AoA on word processing. This consisted of adults' estimations of when they acquired a word when they were young. Insofar as most adults do not remember the exact age at which they learned a certain word, this calculation method is likely to be influenced by other variables, such as word frequency or familiarity (Barbarotto, Laiacona, & Capitani, 2005; Cuetos, Aguado, Izura, & Ellis, 2002). Recently, Sirois, Kremin, and Cohen (2006) also showed the impact on AoA estimation of a participant's age and level of education. The authors indicate that younger participants (18–39 years old) estimated that they learned words earlier than middle-aged (40–59) and older (60–85) participants. Furthermore, the participants with a higher level of education estimated that they learned words earlier than did the ones with a lower level of education. This led some researchers to collect objective AoA data from a picture-naming task performance in several languages: English (Ellis & Morrison, 1998; Funnell, Hughes, & Woodcock, 2006; Morrison, Chappell, & Ellis, 1997), French (Chalard, Bonin, Méot, Boyer, & Fayol, 2003), Icelandic (Pind, Jónsdóttir, Gossurardóttir, & Jónsson, 2000), Spanish (Álvarez & Cuetos, 2007; Pérez & Navalón, 2005), and Italian (Barbarotto et al., 2005). Although the authors found that objective AoA ratings highly correlated with estimated AoA by adults, the use of objective AoA is recommended, especially because objective ratings are less correlated with other lexical properties than are subjective ones (Álvarez & Cuetos, 2007; Barbarotto et al., 2005; Bonin, Barry, Méot, & Chalard, 2004; Chalard et al., 2003; Morrison et al., 1997).

AoA has been extensively investigated with many different types of tasks. Its calculation is therefore crucial in the validation of this concept. Objective AoA was measured using the 75% rule (Morrison et al., 1997)—that is, the three age bands in which at least 75% of the children

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could name the item correctly. The precise AoA value assigned to a word was the midpoint of the age band, expressed in months. According to Chalard et al. (2003),

> For instance, a picture named correctly by at least 75% of the children in the 78–83 age band and by at least 75% of the children in the 84–89 and 90–95 age bands was assigned an objective AoA value of 80.5 months. Therefore, the word that is used to refer to the picture is considered to be acquired at 80.5 months." (p. 217)

Objective AoA, as we saw, is based on the children's ability to name pictures. A crucial question, according to Zevin and Seidenberg (2002), concerns the problem of predicting performance in lexical tasks with AoA estimations which are also measures of performance. Indeed, in many studies on AoA, there are so many differences in the methodological procedures (see Table 1) that one might question the validity of the children's performance measure in picture naming.

During a picture-naming task, the child names a picture as quickly as possible. In Morrison et al.'s (1997) pioneer study, the children had about 5 sec to give an answer to the question "What is that a drawing of?" If their reply was anything other than the target answer, the experimenter told them to try again and cued them with the initial phoneme of the target response. Pérez and Navalón (2005) and Pind et al. (2000) also offered occasional assistance to the child when the response given by the child was very close to the target word even vaguely. Also, they helped the child if no response was forthcoming within 5 sec. Pind et al. gave the syllable attack of the correct word. Pérez and Navalón (2005) gave the semantic category of the object. Barbarotto et al. (2005) encouraged the child to give a generic name. According to these authors, the purpose of cuing is to give the children an opportunity to show their vocabulary and avoid mistakes. We believe that giving cues generates a certain number of problems, especially if the goal of the studies is to collect objective AoA norms.

Retrieving the name of a picture involves multiple stages. According to cascade theoretical models, there are three serially organized stages involved in picture naming: (1) perceptual recognition (i.e., object recognition); (2) activation of the semantic representation (i.e., semantic activation); and (3) retrieval of the phonological form (i.e., lexical access) (for a review, see Johnson, Paivio, & Clark, 1996). It is well established that in picture naming, children are less accurate than adults are. Specifically, young children ages 3 to 5 produce more alternative names (the *H* statistic),[1] and provide modal names that are often different from the adults' modal names (Berman, Friedman, Hamberger, & Snodgrass, 1989; Cannard, Blaye, Scheuner, & Bonthoux, 2005; Cycowicz, Friedman, Rothstein, & Snodgrass, 1997; D'Amico, Devescovi, & Bates, 2001; Martein, 1995; Pind et al., 2000; Pompéia, Miranda, & Bueno, 2001; Wiegel-Crump & Dennis, 1986). If the experimenter helps the child during the naming task, the child's naming difficulties will be underestimated and the AoA overestimated. The cue can be a distractor, or may interfere in the picture-naming task. The purpose of our study was to provide empirical evidence that giving the initial phoneme or syllable attack of the target facilitates the process of lexical retrieval. The cues bias the access to the lexical-phonological specification, and therefore orient the process toward the correct word.

Jerger, Martin, and Damian (2002) investigated the stages of picture naming with a picture–word task given to children between 5 and 7 years old. During the presentation, each picture appeared with an auditory distractor. The child was instructed to name each picture as quickly and accurately as possible and to ignore the auditory distractor. There were six types of distractors, but only one of them had a congruent onset (i.e., the initial consonant–vowel sequence was congruent with the beginning of the picture name). The results showed that the naming latencies were significantly influenced by the type of onset of the distractor. The congruent onsets significantly facilitated naming performance. These results are in line with Starreveld's (2000) study (cited by Jerger et al., 2002). An auditory input activates a cohort of phonological representations, including the phonologically related picture name. Since the phonological activation converges with the activated representation derived from the picture-naming process, there is a facilitation effect. The retrieval of the phonological forms (i.e., Stage 3 in the cascade model mentioned above) is easier, thus lowering the AoA.

Table 1
Methodological Information on the Different Databases

Study	Number of Children (Age in Years)	Number of Items	Type of Item	Item Source	Cue in Picture Naming
Present study	960 (2;5–9;9)	145	Black-and-white line drawing	Snodgrass and Vanderwart	No cue
Morrison et al. (1997)	280 (2;6–10;11)	297	Black-and-white line drawing	Snodgrass and Vanderwart and other sources	Initial phoneme
Pind et al. (2000)	280 (2;6–11;0)	238	Black-and-white line drawing	Snodgrass and Vanderwart	Syllable attack
Chalard et al. (2003)	280 (2;6–10;11)	230	Black-and-white line drawing	Snodgrass and Vanderwart	Initial phoneme
Pérez & Navalón (2005)	397 (2;5–9;0)	178	Black-and-white line drawing	Pérez and Navalón (2003)	Semantic category Initial syllable
Barbarotto et al. (2005)	202 (2;10–5;9)	80	Colored photographs	Laiacona et al. (1993)	If detail, name the whole item
Álvarez & Cuetos (2007)	380 (2;4–15;0)	260	Black-and-white line drawing	Snodgrass and Vanderwart	No cue

We also know that "picture naming should be influenced by both the structural and the semantic relations that may exist between a target and other objects whose representations become activated during target processing" (Humphreys, Riddoch, & Quinlan, 1988). A picture may generate associated images in multiple modalities (e.g., related objects, sounds, and motor and visceral reactions), referential activation of corresponding names (e.g., object and category names), and subsequent word associations (e.g., names of related objects and properties) (Johnson et al., 1996). Giving the semantic category of the object, as in Pérez and Navalón's (2005) study, minimizes visual complexity. Superordinate information, such as the *fruit* category for example, distinguishes a *peach* from a *ball*. It activates the category members, making it easier for the child to answer. The number of given cues correlated negatively with the age groups; the younger children needed more cues than the older ones did.

In sum, objective AoA refers to naming performance, and giving cues facilitates picture naming. These two facts challenge the reliability of objective AoA measures. According to Morrison et al. (1997), a word and its meaning are acquired when the child can name the picture that represents it. When a majority of the children in an age group can name a picture, "then it is likely that the word is normatively acquired at least as young as that age." If the experimenter provides the initial phoneme or syllable, this will constrain or avoid alternative responses, so the number of correct naming responses will, of course, increase. We determined the number of alternative names for each picture by counting the number of different names the children provided, including the target name. We know that 3- and 4-year-old children produced more alternative answers than did the 6- to 8-year-olds, expressed by a higher mean *H* value: 1.5 and 1.1 for the 3- and 4-year-olds, compared with 0.6, 0.5, and 0.4 for the 6-, 7-, and 8-year-olds (Cannard et al., 2005). The occasional assistance offered to the child reduces the objectivity of AoA measures.

Of course, there are other methodological factors that may bias the objectivity of AoA measures. First of all is the children's age, which determines how the age groups are constituted. Another factor that may affect the objectivity of AoA measures is the populations' urban or rural origin. Also, the types of images can increase or lower the children's scores. We focused on cuing; we believe that giving cues constitutes a negative bias, because AoA measures are based on picture-naming performance.

The goal of the present study was to provide a normative database with objective AoA measures that rule out the methodological problems that arise from cuing. We aimed to show that cuing lowers AoA measures, and we compared our data in French with normative data obtained in different linguistic and methodological contexts.

METHOD

Participants

A total of 960 French children (age range, 2;9 to 9;9 years) participated in this study. The preschool children's mean age was 4;4 (range, 2;9–5;10; *SD* = 0;9). The elementary children's mean age was 7;5 (range, 5;10–9;9; *SD* = 0;9). As in Chalard et al. (2003), the age groups were formed in 6-month intervals, from 2 years 9 months to 7 years 11 months, then in 12-month intervals, from 8 years to 9 years 9 months, to achieve a more exact AoA measure. Table 2 presents information about the children in each of the age bands.

Table 2
Age Bands

Age Band (Months)	Mean Age (Months)	Number of Females	Number of Males
30–35	34	14	11
36–41	38	43	61
42–47	44	67	52
48–53	51	63	77
54–59	56	56	48
60–65	62	61	50
66–71	68	48	61
72–77	75	55	37
78–83	80	52	32
84–89	86	42	41
90–95	92	26	31
96–107	101	54	88
108–116	112	8	12

All the children came from schools in the Grenoble region, from rural locations of less than 5,000 inhabitants, to medium-sized locations of between 20,000 and 50,000 inhabitants, to the urban environment of Grenoble with 155,000 inhabitants. The children belonged to middle-class and upper-middle-class families. They were native French speakers. All the schools that participated in the study were public schools. Informed consent was obtained from schools and parents before the study was carried out.

Material

At the onset, we collected information on naming performance of a large sample of children on 360 images (see database at web .upmf-grenoble.fr/Banque_images/). We did so because several researchers in our laboratory required this information for running their own experiments. However, since Snodgrass and Vanderwart's (1980) pictures are most widely used in the literature, for the present study we focused our analysis only on the 145 items in common. The set of 145 pictures was extracted from Cannard et al. (2005). The pictures were black outline drawings on a white background. Each picture occupied a square of 6 × 6 cm on an A4-format sheet of paper. The selected pictures were divided into two lists. The sets were presented randomly to each participant, either from list 1 or list 2. Two groups of 80 children at each age were tested, resulting in a total of $2 * 80 * 6 = 960$ children. The entries are listed according to the identifying numbers originally assigned to each drawing by Snodgrass and Vanderwart and Cycowicz et al. (1997).

Procedure

The procedure during the picture-naming task was the same as that used by Cycowicz et al. (1997). Each child was tested individually on a single list of pictures in a quiet room at school, during a 15- to 20-min session. The child was instructed to look carefully at the black-and-white line-drawn object and to answer the question "What is this picture?" When the child did not recognize the object depicted, or did not say anything, we presented the next picture. When the child could not name the picture, we tried to determine whether he or she knew the concept and asked "What can you do with it?" or "Where have you seen it?" There was no feedback or cue. Incorrect answers were left uncorrected. We encouraged the children regularly throughout each test session. For the younger children, we asked them every 10 min whether they were tired.

Measures

Name agreement values. Picture-naming values were extracted from Cannard et al.'s (2005) database that provides French children's

picture-naming norms for name agreement. The authors noted all the alternative answers, but they only accepted the exact name as a correct answer. They even excluded the answers that indicated that the children knew the concept (e.g., "Mom uses it to cook with"). Indeed, the authors showed that the usual measures of name agreement based on modal names were always higher than was the measure of name agreement expressed by the percentage of participants naming the picture with its expected name, especially very young children. Thus, the assessment of objective AoA in the present study is calculated on name agreement based on the production percentage of the expected name.

AoA values. Objective AoA was measured using Morrison et al.'s (1997) 75% rule. In the present article, adults' name agreement scores were taken from Alario and Ferrand (1999), who provide French normative measures for 260 of Snodgrass and Vanderwart's (1980) pictures. As did Chalard et al. (2003), we based our AoA measures on the following rules:

1. No AoA value was assigned to the items in which name agreement in adults was below 75%.

2. The 75% rule was strictly applied even for some items that easily reached the 75% criterion in the youngest age band (sometimes 100%), although it is possible that they would be acquired earlier.

3. When name agreement in both adults and children in the two last age bands was at least 75% or above, the items were assigned to the last but one age band.

4. When name agreement in both adults and children in the oldest age band was at least 75%, the items were assigned an AoA score of 140.5. To allow easy reference with Chalard et al. (2003), we noted this same arbitrary value, which corresponds for them to the midpoint of the 11;6–11;11 age band, the second 6-month interval above the oldest age band. It was chosen in order to avoid excessively "optimistic" objective AoA values that might occur as a consequence of sampling variability, and to take into account the fact that the words belonged to the adults' vocabulary (Chalard et al., 2003, p. 218).

5. When the items did not achieve the percentage criterion in the older age band, they were not assigned objective AoA scores (outliers).

RESULTS AND DISCUSSION

The Appendix presents, for each picture, the following information: (1) the item number (cf. Cycowicz et al.'s [1997] norms); (2) the expected name in French; (3) its English translation. The next six columns of the Appendix present objective AoA scores according to the 75% rule in the present study (column 4), Chalard et al. (2003) (column 5), Pind et al. (2000) (column 6), Morrison et al. (1997) (column 7), Barbarotto et al. (2005) (column 8), Pérez and Navalón (2005) (column 9), and Álvarez and Cuetos (2007) (column 10).

Objective AoA Norms in French Without Phonemic or Semantic Cue During Picture Naming

When the set of the 75% rule was applied:

1. Seven items could not be assigned an objective AoA value (as indicated by a dash in the Appendix), because the name agreement in the older age band and in adults was below 75%: wrench (*clé*), stove (*cuisinière*), clock (*horloge*), lips (*lèvres*), toe (*orteil*), peach (*pêche*), and pitcher (*pot-à-eau*).

2. In order to keep more common items with the other databases, five items were considered as acquired and were assigned the AoA values which correspond to the 75% rule, although the percentage of correct naming in adults was below 75% (as indicated in bold in the Appendix): train (*train*), pen (*stylo*), refrigerator (*réfrigérateur*), leaf (*feuille*), and sailboat (*voilier*).

3. Twenty-three items reached the 75% criterion in the youngest age band (i.e., name agreement in at least 90% of children, indicated by an asterisk in the Appendix): airplane (*avion*), ball (*ballon*), banana (*banane*), truck (*camion*), duck (*canard*), chair (*chaise*), hat (*chapeau*), dog (*chien*), scissors (*ciseaux*), knife (*couteau*), spoon (*cuillère*), flower (*fleur*), rabbit (*lapin*), bed (*lit*), glasses (*lunettes*), hand (*main*), house (*maison*), bird (*oiseau*), basket (*panier*), trousers (*pantalon*), butterfly (*papillon*), foot (*pied*), and telephone (*téléphone*).

4. Twelve items did not achieve the percentage criterion in the oldest age band (outliers, indicated by a "+" in the Appendix): bee (*abeille*), hair (*cheveux*), hanger (*cintre*), dresser (*commode*), rooster (*coq*), light switch (*interrupteur*), skirt (*jupe*), mitten (*moufle*), cloud (*nuage*), pliers (*pince*), bowl (*saladier*), and screw (*vis*).

It is noteworthy that the items excluded by application of Morrison et al.'s (1997) 75% rule were quite ambiguous in the black-and-white drawings. For instance, it was difficult to distinguish a rooster from a chicken (item 191), or to identify the cloud (item 62) or hair (item 113), because the picture is not easy to recognize out of context. These items generated many alternative answers (cf. *H* indexes in Cannard et al., 2005), even in the last age group (8-year-olds). Consequently, these items did not meet the 75% criterion, although the names of the pictures are very common in the children's vocabulary. AoA measures refer to the child's ability to name an object in a picture-naming task, but sometimes it is difficult to identify and visually distinguish the image. This is why the material may have an impact on AoA calculations.

When the remaining 126 items that were not assigned AoA values were removed, the average objective AoA in this experiment was 4.5 years (54.67 months).

Comparison With Other Normative Databases

Since the size of the samples varied from one study to another, we compared only the data referring to the items in common. This was done after the application of the 75% rule. The items with −, +, or blank spaces were therefore excluded from the statistical analyses. Then we compared our objective AoA scores with the objective AoA scores of six databases for the remaining items.

Table 3 presents (1) the number of items in common between our study and another one; (2) the average objective AoA in each study for the remaining items; (3) AoA range; (4) the average objective AoA in our study for the remaining items; (5) the *t* tests, and (6) the correlations between the present study's objective AoA scores and objective AoA scores in six other studies.

In all these studies, except for Álvarez and Cuetos's (2007), the experimenter provided cues whenever the child gave an answer that was either close to or distant from the target word, or if the child did not produce a response within 5 sec. Morrison et al. (1997) and Chalard et al. (2003) provided the initial phoneme of the target name. Pind et al. (2000) provided information on the syl-

Table 3
Mean Age-of-Acquisition Values and Statistical Comparisons Among Databases

Study	Number of Remaining Items in Common	AoA for Remaining Items in Common		Mean AoA Range		AoA in Our Study for Remaining Items in Common		t	Correlation Between Data
		M	*SD*	Min	Max	*M*	*SD*		
Morrison et al. (1997)	110	38.33	16.95	22.1	102.5	53.66	22.84	5.66***	.58**
Pind et al. (2000)	115	41.41	19.74	22.5	140	54.35	22.87	4.60***	.53**
Chalard et al. (2003)	116	49.47	17.21	30.6	113.5	52.80	21.24	1.312†	.82**
Pérez and Navalón (2005)	66	41.32	13.77	32	91	53.51	23.21	3.67***	.67**
Barbarotto et al. (2005)	30	45.95	10.46	34	66.5	50.97	18.57	1.29†	.65**
Álvarez and Cuetos (2007)	120	56.57	31.88	30	185	54.67	24.03	−0.52†	.61**

**$p < .01$. ***$p < .001$. †n.s.

lable attack of the target name. In Pérez and Navalón's (2005) Spanish research, the experimenters provided cues on the semantic category of the item and the first syllable of the target name (semantic and phonological cues). Finally, in Barbarotto et al. (2005), if the child named only a detail of the picture, the examiner asked the child to name the whole item. As we can see from this table, the correlations between our values of objective AoA and the values obtained in other investigations are significant in all cases. The correlation between our data and Chalard et al.'s is particularly high (.82), because in both studies the populations are French children. The correlations are also high with Barbarotto et al. and Álvarez and Cuetos, .65 and .61, respectively. In the latter, the authors did not provide the first phoneme, as has been done in other studies. Despite the limited number of stimuli in common (66) and a very significant difference between mean AoAs [$t(130) = 0.67$, $p < .001$], the pattern of our results is rather similar to Pérez and Navalón's (2005) (0.67, $p < .01$).

Table 3 also reveals that the objective AoA means decrease when the experimenter provides any kind of cues. Despite the significant correlations, it seems rather clear that the cues do have an impact on the naming scores and therefore on AoA. There are several items in all studies where the differences are notable (see the Appendix). In Pind et al. (2000), items 149 (*mouse*) and 224 (*sweat*) were assigned an AoA value of 23 months, which contrasts with our AoA values of 75 and 68 months, respectively. Item 171 (*piano*) had an AoA value of 140 months in Pind et al.'s study, against an AoA of 63 months in ours. Many items, like *mouse*, *nail*, *nose*, *ear*, *drum*, and *leg*, were acquired earlier by the Spanish children in Pérez and Navalón's (2005) study than they were by the French children. *Bee*, *skirt*, *mitten*, and *rooster* could not be assigned an AoA value in our study, whereas in Chalard et al.'s (2003) norms the AoA value was 75 months. The picture of the mouse (item 149) had an AoA of 75 months in our research, which contrasts with an AoA of 32.5 months in Chalard et al.'s norms. The same remarks apply for the data presented by Morrison et al. (1997).

A high *H* reflects a low dispersion name, and therefore a low percentage of expected correct responses. In children, the above-mentioned items had higher *H* scores than 1.5 (Cannard et al., 2005). The drawing of a nail, for instance, yields many alternative responses in young children ($H = 2.69$ at 3 years old), as does the drawing of the drum ($H = 1.93$). Name dispersion affects the calculation of the AoA mean, since the precise AoA value assigned to a word was the midpoint of the age band expressed in months in the first three age bands, in which at least 75% of the children could name the item correctly. For example, *mouse* (item 149), which was named correctly by at least 75% of the children in the 66–71 age band and by at least 75% of the children in the 72–77 and 78–83 age bands, was assigned an objective AoA value of 68 months. Therefore, the word that refers to the picture is considered to be acquired at 68 months in our study, versus 33 months in Chalard et al. (2003), 23 months in Morrison et al. (1997) and Pind et al. (2000), and 45 months in Pérez and Navalón (2005). As mentioned by the latter, facilitating the semantic category of the item or giving the first syllable of the name—when the child did not recognize a picture because the picture was not easy to identify, or when the child used a word to refer to a semantically similar concept (e.g., *cat* for the picture of the lion)—would help the subject to select an answer and orientate the response toward the target word (p. 187). In Pérez and Navalón's (2005) study, the percentage of correct responses with phonologic cues was 18% of the total of correct responses. This might appear low; however, we consider that the authors (1) selected from Pérez and Navalón's (2003) database pictures that are visually more adequate for young children than are Snodgrass and Vanderwart's (1980) ones; and (2) selected only items with a low name dispersion (i.e., *H* scores near 0), reducing the variability of *H*. This may explain why the AoA was much lower. Regarding Barbarotto et al.'s (2005) study, it is difficult to compare the data, because they used 80 color photographs. Moreover, we do not know the values above 69 months, and only 30 words with AoA values are common to the two studies. Finally, we would like to point out that the recent data presented by Álvarez and Cuetos (2007) reinforces our results. It is the only study that did not provide any phonological assistance during the picture-naming task. Although their population was Spanish and ours is French, the mean AoAs are similar. When the items without AoA values were removed, there were 120 words in common. The average of our study was 54.67 months and Álvarez and Cuetos's was 56.57 months. This supports the idea that phonological cues have an impact on AoA calculation.

In sum, AoA is a crucial variable for psycholinguists and clinicians. It is therefore important to associate objective AoA measures to the images used in picture-naming tasks. As mentioned above, there are three serially organized stages involved in picture naming: (1) perceptual recognition; (2) activation of the semantic representation; and (3) retrieval of the phonological form (see Johnson et al., 1996, for a review). The children can make "mistakes" at any of the three stages that lead to naming an image. AoA studies do not aim to improve the child's performance; their goal is to know at which age a given word is objectively acquired. If the experimenter helps the child by giving cues, there is facilitation in the three stages. The cues therefore bias the children's answer, because they interfere in the naming process. In addition, not all the children receive cues and not all the pictures require giving cues. Finally, the cues that have been given by the studies mentioned above are different. Giving cues is thus not systematic; it is extremely variable. This variability might have a negative impact on the objective AoA values.

CONCLUSION

Picture naming is a widely used technique in psycholinguistic and cognitive research. In their review of the picture-naming literature, Johnson et al. (1996) revealed how different naming stages are influenced by item attributes, task conditions, and participant characteristics. The influence of AoA in lexical processing, although it seems a never ending story (Bonin et al., 2004), is now widely established (review in Juhasz, 2005). However, there is an aspect of AoA measures that requires attention: The procedure that leads to the name agreement values on which AoA norms are based. Indeed, in the majority of studies, the experimenter offers occasional assistance to the child, facilitating linguistic production. The purpose of the present study was to provide new objective AoA norms from picture naming in French without any semantic or phonemic cues. We compared these AoA values to norms of databases in other languages. The results revealed that our AoA measures were always higher than in the studies that provided cues. Furthermore, they are in agreement with Álvarez and Cuetos (2007), who did not provide any cues either. This multicultural comparison suggests an equivalent order of acquisition of the words in different languages, but raised the question of the effects of picture-naming task conditions on AoA measures.

Finally, we would like to point out that if "giving cues" had been manipulated within participants, our results would have been stronger. However, the notable discrepancies between the norms of the studies that provided cues (Chalard et al., 2003; Morrison et al., 1997; Pérez & Navalón, 2005; Pind et al., 2000) and those that did not (i.e., Álvarez & Cuetos, 2007; Barbarotto et al., 2005) strongly suggest that research involving pictorial processing should be cautious when using norms from databases with different procedures. In particular, giving cues during picture naming improves performance, especially when the items generate many alternative answers, and therefore biases the reliance of the objective AoA norms.

AUTHOR NOTE

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NOTE

1. The *H* statistic is a logarithmic function that analyzes the quantity of different names that an object receives. It is computed for each picture with the formula $\Sigma_i^k = P_i \log_2(1/P_i)$, where k refers to the number of different names given to each picture and P_i is the proportion of participants who gave each name. An *H* near 0 indicates a low dispersion, and therefore a high name agreement (Snodgrass & Vanderwart, 1980).

ARCHIVED MATERIALS

The following materials may be accessed through the Psychonomic Society's Norms, Stimuli, and Data archive, www.psychonomic.org/archive.

To access these files, search the archive for this article using the journal (*Behavior Research Methods*), the first author's name (Cannard), and the publication year (2008).

FILE: Cannard-BRM-2008.zip

DESCRIPTION: The compressed archive file contains two files:

appendix2008.pdf, containing the objective French AoA norms in .pdf format.

appendix2008.xls, containing the above information in Excel spreadsheet format.

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(*Continued on next page*)

APPENDIX
Objective Age-of-Acquisition Norms in French and Other European Languages

Item No.	French Name	English Name	Present Study	Chalard et al. (2003)	Pind et al. (2000)	Morrison et al. (1997)	Barbarotto et al. (2005)	Pérez & Navalón (2005)	Álvarez & Cuetos (2007)
1	accordéon	accordion	80	75	81				136
2	avion	airplane	34*	33	23	23	37	32	30
5	fourmi	ant	75	69	87	63		52	102
7	bras	arm	75	63	33	39	61		82
12	hache	axe	101	75	63	63		91	76
14	ballon	ball	34*	33	23	23		32	36
16	banane	banana	34*	39	23	23	34	32	30
20	panier	basket	34*	39	39	39			43
21	ours	bear	63	51	39	51		40	61
22	lit	bed	34*	33	33	22	34	45	36
23	abeille	bee	+	75	–	57			173
27	vélo	bicycle	34	33	33		34	45	30
28	oiseau	bird	34*	33	23				49
30	livre	book	39	33	33	22		32	36
31	botte	boot	34	33	–	23			54
32	bouteille	bottle	34	33	39	39			36
34	saladier	bowl	+	69	39	57			173
37	balai	broom	44	45	–	87			36
38	brosse à cheveux	brush	75	75	51	23			93
40	papillon	butterfly	34*	33	33	23	34	40	36
41	bouton	button	56	69	57	39			36
42	gâteau	cake	80	75	39	23			
47	voiture	car	34	33	23	22	34	32	30
48	carotte	carrot	34	39	33	25			43
50	chenille	caterpillar	63	69	–	45			185
53	chaise	chair	34*	33	23	22	34	32	36
60	réveil	clock	–	81	23	22			30
61	pince à linge	clothespin	80	93	39				49
62	nuage	cloud	+	–	75	57			102
65	peigne	comb	68	57	33	39		32	36
67	canapé	couch	80	45	28				102
68	vache	cow	51	51	51	23	43	32	36
70	tasse	cup	101	75	39	25		40	66
73	chien	dog	34*	33	33	22		32	36
75	âne	donkey	63	57	69	51		52	61
76	porte	door	39	33	33	22		32	30
78	robe	dress	68	51	28	39			43
79	commode	dresser	+	–	75				185
80	tambour	drum	68	75	39	51	43	32	43
81	canard	duck	34*	39	51	22		45	36
83	oreille	ear	63	51	45	45	61	40	102
84	éléphant	elephant	34	33	23	23		32	30
86	œil	eye	39	57	33	45		40	30
88	doigt	finger	39	39	69	23		32	36
89	poisson	fish	34	33	23	22			36
91	fleur	flower	34*	33	23	22			36
93	mouche	fly	92	75	51	57		32	136
94	pied	foot	34*	33	33	39			36
97	fourchette	fork	34	33	33	23		32	30
100	grenouille	frog	39	39	33	23			136
103	girafe	giraffe	34	33	33	39	43	32	49
105	lunettes	glasses	34*	33	28	23		52	30
106	gant	glove	68	51	51	45		32	61
109	raisin	grapes	51	57	57	57	49		43
111	guitare	guitar	39	51	39	63		40	49
113	cheveux	hair	+	–	51	57			
114	marteau	hammer	56	57	39	25	49		36
115	main	hand	34*	33	39	23	34		36
116	cintre	hanger	+	141	75				61

APPENDIX (Continued)

Item No.	French Name	English Name	Present Study	Chalard et al. (2003)	Pind et al. (2000)	Morrison et al. (1997)	Barbarotto et al. (2005)	Pérez & Navalón (2005)	Álvarez & Cuetos (2007)
118	chapeau	hat	34*	33	33	23		40	61
120	hélicoptère	helicopter	51	51	33	23	49	40	61
55	poule	hen	63	51	non	51		32	
121	cheval	horse	39	33	23	23		32	30
122	maison	house	34*	33	23	22		32	30
123	fer à repasser	iron	80	non	51	45			61
124	table à repasser	ironing board	140.5	non	–				102
126	kangourou	kangaroo	56	57	39	45			72
128	clé voiture	key	34	45	23	23			36
129	cerf-volant	kite	63	non	51	39			49
130	couteau	knife	34*	33	28	23			36
131	échelle	ladder	51	51	39	25		40	36
132	lampe	lamp	63	51	39	75	67		61
133	feuille	leaf	**39**	39	45	25			49
134	jambe	leg	68	75	33	39	49	32	72
138	ampoule	light bulb	101	69	51	103			66
139	interrupteur	light switch	+	141	–				150
140	lion	lion	34	51	23	23		40	36
141	lèvres	lips	–	75	57	51	61	40	
144	moufle	mitten	+	75	28	115			160
145	singe	monkey	39	45	23	25		32	43
147	moto	motorcycle	34	33	39	39	34	32	49
149	souris	mouse	75	33	23	23	43	45	36
150	champignon	mushroom	44	39	39	63	49	52	54
151	clou	nail	101	75	57	69		52	82
153	collier	necklace	44	45	–	51			43
155	nez	nose	75	75	45	57		32	61
158	orange	orange	92	69	33	39	49	57	61
161	pinceau	paintbrush	51	51	39	51			61
179	casserole	pan	44	57	non	45			
163	pêche	peach	–	–	–	103			
166	poire	pear	44	57	33	45		32	43
167	stylo	pen	**75**	69	33	45		52	49
168	crayon	pencil	39	33	39	39		32	36
171	piano	piano	63	57	140	45		52	61
172	cochon	pig	34	33	33	23		32	54
173	ananas	pineapple	68	69	75	75		40	54
175	pot à eau	pitcher	–	non	51				150
176	pince	pliers	+	non	63	127			102
177	prise	plug	92	114	–	69			136
182	lapin	rabbit	34*	33	28	22		32	36
185	réfrigérateur	refrigerator	**63**	–	45				
187	bague	ring	75	75	45	51			87
189	patin à roulette	roller skate	92	non	103				136
191	coq	rooster	+	75	39		49		102
193	voilier/bateau	sailboat	**34**	–	75		55		30
195	sandwich	sandwich	63	75	57	39			114
196	scie	saw	68	75	57	69		68	126
197	ciseaux	scissors	34*	33	33	23	34	32	36
198	vis	screw	+	93	69	81			102
199	tournevis	screwdriver	92	69	51	69	67	79	82
202	mouton	sheep	63	75	33	45		52	61
203	chemise	shirt	140.5	75	63	57		91	136
204	chaussure	shoe	34	33	23	22			36
205	jupe	skirt	+	75	51	57		32	82
207	luge	sled	56	57	33		61		76
208	escargot	snail	39	45	39	45			36
211	chaussette	sock	34	33	23	23		32	36
215	cuillère	spoon	34*	33	23	22			30
217	étoile	star	44	33	23	39			36

APPENDIX (Continued)

Item No.	French Name	English Name	Present Study	Chalard et al. (2003)	Pind et al. (2000)	Morrison et al. (1997)	Barbarotto et al. (2005)	Pérez & Navalón (2005)	Álvarez & Cuetos (2007)
218	tabouret	stool	68	69	75	51			173
219	cuisinière	stove	–	–	45				102
220	fraise	strawberry	44	51	39	45	49	32	49
222	soleil	sun	39	39	28	23			30
224	pull (over)	sweater	68	non	23				93
225	balançoire	swing	75	75	57	51			43
226	table	table	34	33	23	22	55	32	36
227	téléphone	telephone	34*	33	23	23			36
228	télévision	television	39	–	33	39			36
232	cravate	tie	80	75	63	57		68	61
234	grille-pain	toaster	140.5	non	103	51			72
235	orteil	toe	–	–	–				36
236	tomate	tomato	63	57	45	69	49	52	61
237	brosse à dent	toothbrush	44	non	33				
239	feu rouge	traffic light	63	69	75				49
240	train	train	**63**	51	39	25			36
241	arbre	tree	39	31	28	22			30
162	pantalon	trousers	34*	33	non	25		32	
242	camion	truck	34*	33	–				36
243	trompette	trumpet	75	51	93	57	55	40	72
244	tortue	turtle	39	33	33			32	36
245	parapluie	umbrella	39	33	39	23			36
250	montre	watch	39	45	51	39			36
251	arrosoir	watering can	44	57	–				49
259	clé	wrench	–	non	–				160
260	zèbre	zebra	56	51	51	45		57	61
		M	54.67	52.64	42.60	41.28	46.48	41.16	63.66
		SD	23.69	21.10	19.71	20.77	10.45	13.61	39.32
		Min	34.00	30.56	22.50	22.10	34.00	32.00	30.00
		Max	140.50	140.50	140.00	126.50	66.50	91.00	185.00
		Q1	34.00	33.00	32.50	23.40	34.00	32.00	36.00
		Q3	68.00	68.50	50.50	50.50	54.50	45.00	76.00

Note—A "–" denotes items for which the percentage of correct naming in adults was below 75%. A "+" denotes outliers. The items acquired by children but not by adults according to the 75% rule are printed in boldface. *Items whose picture was named by at least 90% of children in the youngest age band.

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