EUROPEAN JOURNAL OF COGNITIVE PSYCHOLOGY, 2005, *17* (0), 000–000

Objective-AoA norms for 175 names in Spanish: Relationships with other psycholinguistic variables, estimated AoA, and data from other languages

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There is a large body of evidence suggesting that words learnt early in life are recognised and produced faster than words learnt later in life, even when other variables are controlled. This is known as the Age of Acquisition (AoA) effect. However, there is an aspect of AoA that requires research of a greater depth, namely the method of obtaining the AoA measures. In the majority of studies, adult participants were asked to estimate the age at which they learnt a given word. Morrison, Chappell, and Ellis (1997) proposed a new method for obtaining objective-AoA data. They asked children to name some objects, and the age at which a given word appeared with 75% or more frequency was considered the AoA of that word. Although this method is more valid than adult ratings, it has only rarely been used. The main aim of this work is to provide objective-AoA norms in Spanish for a set of 175 object names following the procedures used by Morrison et al. The relationships among objective-AoA, estimated-AoA, and other psycholinguistic variables (name-agreement, familiarity, visual complexity, word length, etc.) obtained from a previous study are also analysed. Finally, the similarity of objective- and estimated-AoA measures was examined using data from

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The AoA norms presented here are available for downloading in Excel format at http://www.um.es/psibm/basica/grupos/conr/produccion.html. Extended information can also be obtained from the authors, preferably, by email.

This research was supported by Grant PL/17/FS/00 from the Séneca Foundation, Murcia, Spain. We would like to thank several educational centres for their cooperation in collecting the data on children: S. Vicente de Paul and Virgen del Carmen, in Cartagena; La Merced-Fuensanta, Sta. María de Gracia, Ntra. Sra. de Arrixaca, Cipriano Galea, E. I. Sagrada Familia, and María Maroto, in Murcia; La Inmaculada, in Yecla; Oleza, in Orihuela; Jacinto Benavente, in Alcantarilla; Sagrado Corazón and E. I. Municipal, in Librilla; E. I. Municipal in La Unión. Moreover, special thanks to Victoria Cuello, Daniel López, Francisco Romera, and Mª del Carmen Sánchez, for their help and collaboration, and to Fernando Cuetos, Javier Marín and José A. López for helpful comments on an earlier version of this paper. We also want to thank Marc Brysbaert, Catriona Morrison, and an anonymous reviewer for helping us to improve this paper. Finally, we are grateful to Tomás Jiménez for the first translation into English and to Stephen Hasler for the final review.

http://www.tandf.co.uk/journals/pp/09541446.html DOI:10.1080/09541440340000547

several languages. A cluster analysis and a multidimensional-scaling analysis revealed that the estimated-AoA measures in a language correlated more with the estimated-AoA measures of the other languages than with the objective measures in the same language. The results suggest that it would be desirable to always use objective-AoA norms because they are less skewed by familiarity.

There is currently a large body of evidence suggesting that words learned early on in life are recognised and produced faster than words learned later on in life, even when other variables are controlled. This effect, called the Age of Acquisition (AoA) effect, has been found in several experimental tasks: picture naming (e.g., Barry, Morrison, & Ellis, 1997; Carroll & White, 1973b; Ellis & Morrison, 1998; Meschyan & Hernandez, 2002; Snodgrass & Yuditsky, 1996), word naming (e.g., Coltheart, Laxon, & Keating, 1988; Gilhooly & Logie, 1981; Morrison & Ellis, 1995, 2000), and lexical decision (e.g., Gerhand & Barry, 1999; Morrison & Ellis, 1995, 2000; Turner, Valentine, & Ellis, 1998). There also exists support from studies with patients with neuropsychological disorders (e.g., Cuetos, Aguado, Izura, & Ellis, 2002; Hirsh & Ellis, 1994; Kremin et al., 2001; Lambon Ralph, Graham, Ellis, & Hodges, 1998; Taylor, 1998). Despite this wide experimental evidence, uncertain aspects of AoA remain, which justifies research of a greater depth. One such issue concerns theories that aim to explain the effects of AoA (see Brysbaert, Wijnendaele, & Deyne, 2000b; Ellis & Lambon Ralph, 2000; Monaghan & Ellis, 2002; Morrison, Hirsh, Chappell, & Ellis, 2002). Another subject of discussion is the possible confusion between AoA and lexical frequency (Carroll & White, 1973a; Lewis, 1999a, 1999b; Lewis, Gerhand, & Ellis, 2001), although there exists a significant body of evidence that supports the idea of the independence of both variables (Ellis & Lambon Ralph, 2000; Moore, Valentine, & Turner, 1999; Morrison & Ellis, 1995, 2000; Morrison et al., 2002). Finally, and closely related to the comments above, the system by which AoA is measured is an aspect of methodology that is open to questioning. This issue will be studied in depth below since it is directly related to the principal objective of this research.

METHODS FOR OBTAINING AOA

The most widely used method for obtaining data on AoA has been adult subject estimations (e.g., Alario & Ferrand, 1999; Barca, Burani, & Arduino, 2002; Barry et al., 1997; Carroll & White, 1973a; Cuetos, Ellis, & Alvarez, 1999; Dell'Acqua, Lotto, & Job, 2000; Gilhooly & Hay, 1977; Gilhooly & Logie, 1980; Iyer, Saccuman, Bates, & Wulfeck, 2001; Jorm, 1991; Rubin, 1980; Snodgrass & Yuditsky, 1996; Winters, Winter, & Burger, 1978; Yamazaki, Ellis, Morrison, & Lambon Ralph, 1997). The method consists of asking adult subjects to estimate when they learnt a given word, by indicating an age range on a scale. The scales normally used cover from 2 years up to an age varying

from 10 to 15 years, which in turn corresponds to seven or eight intervals on the scale. This asymmetry between age ranges and intervals on the scale is due to the fact that the intervals for the older ages usually cover a greater age range on the scale. Snodgrass snd Yuditsky (1996, pp. 523–524) suggested this calculation method could be biased by the influence of other variables, such as word length, frequency, or familiarity, in the sense that a subject may believe that he or she learned short and/or more common (frequent) words earlier. If this were true, greater association would be found between measures of length, familiarity, and frequency with estimated AoA than with real AoA.

Another way of measuring AoA is by means of observation in natural environments, by registering the spontaneous oral linguistic production of children of different ages. To achieve this, words are counted by age groups, and the age at which a given word appears with a given frequency is considered the AoA of that word (e.g., Piñeiro & Manzano, 2000, in Spanish; Pine, 1995, in English). The technique presents two significant limitations. On the one hand, there is a considerable cost associated with carrying out the recording of the oral production of large samples of young subjects in a natural setting; on the other hand, the vocabulary observed is limited to those words that children use in their school environment, which could lead to an undesirable invariance of other characteristics of the words studied, such as familiarity, length, or imageability. A variation on the above method consists of eliciting the child's verbal production (Morrison, Chappell, & Ellis, 1997). To this end, and given the absence of the spelling code of words (reading has not yet been learned) at these young ages, subjects are shown a set of pictures of common objects which they have to name. To obtain the AoA, subjects are classified by ages and it is considered that the mean age of the group in which the picture has been correctly named with relative frequency (usually, equal to or greater than 75%) is the age at which the name for that object is acquired. The AoA obtained by this method has been called *objective* AoA, to emphasise the real and exact nature of the measurement. Working in a similar way to Morrison et al. (1997), other authors have used this objective method to calculate the AoA of words in French (Chalard, Bonin, Méot, & Fayol, 2003) and Icelandic (Pind, Jonsdottir, Tryggvadóttir, & Jonsson, 2000).

RELIABILITY AND VALIDITY OF ESTIMATED AOA

In spite of the apparent inexactness, the estimation of AoA from adult subjects (*estimated* AoA) is, nevertheless, reliable and valid for use in experimentation (e.g., Morrison et al., 1997). As can be seen in Table 1, which summarises the coefficients of reliability obtained in various studies, the reliability of estimated AoA has always been acceptable (see Iyer et al., 2001; Pérez, Marín, Navalón, & Campoy, 2002). Its validity is supported by two aspects: (1) The experimental effects found in estimated AoA are similar to those found in objective AoA (see

TABLE 1
Reliability coefficients of AoA obtained in several studies

Study	*Reliability*
Alario and Ferrand (1999)	.94[a]
Carroll and White (1973a)	.97[b]
Carroll and White (1973b)	.98[b]
Gilhooly and Hay (1977)	.96[c]
Gilhooly and Logie (1980)	.98[c]
Iyer et al. (2001)	.93[d]
Jorm (1991)	.80[a]
Rubin (1980)	.99[e]
Snodgrass and Yuditsky (1996)	.96[d]
Winters et al. (1978)	.93[c]
Yamazaki et al. (1997)	.99[e]

[a] Test-retest. [b] Ebel's method. [c] Correlation between two subjects groups' data. [d] Correlation between AoA rates obtained from two different tasks; [e] Cronbach's α.

Morrison & Ellis, 2000); and (2) there exists a high correlation between both measures (r = .687 in Chalard et al., 2003; r = .747 in Morrison et al., 1997; r = .718 in Pind et al., 2000). Nonetheless, recent studies (e.g., Chalard et al., 2003; Pérez, 2003) have found that the objective AoA offered a better explanation of picture naming times than the estimated AoA. For this reason and for methodological refinement, the use of objective AoA is thus recommended.

NORMS AND EFFECTS OF AOA IN SPANISH

Manzano, Piñeiro, and Reigosa (1997) report the estimated AoA with adults, and Piñeiro and Manzano (2000) present the data for objective AoA of 1259 words from the child lexicon database produced spontaneously by 200 Cuban children (aged 11–49 months). In a Spanish population, Cuetos et al. (1999) calculated the AoA of 140 words from adult estimates and, using a multiple regression method, found that this variable was the best predictor for picture naming times. Similar effects have been found recently in aphasic patients (Cuetos et al., 2002). Recently, Hirsh, Morrison, Gaset, and Carnicer (2003) estimated the AoA of 83 Spanish words and found an L2-AoA effect on L2 picture naming performance in late bilinguals (see Izura & Ellis, 2002, for similar results). Cuetos and Álvarez (2000) also found effects of AoA in experiments of word naming and lexical decision, in this case, with the AoA and lexical frequency orthogonally manipulated.

Since the data of Manzano et al. (1997) and Piñeiro and Manzano (2000) are not relevant in studies with Spanish subjects, due to an obvious cultural bias (see Pérez & Navalón, 2003), the 140 words of Cuetos et al. (1999) and the 83 words of Hirsh et al. (2003) are the only data available at present in Spain. Hence, the principal objective of this study is to address this lack of material for experimentation, determining objective AoA data for a set of Spanish words.

In addition, we aim to study the relation of the objective AoA with other psycholinguistic indices, especially those that refer to lexical familiarity and frequency, as well as to analyse the validity of the estimated AoA in comparison to the objective.

Method

Participants

A total of 397 monolingual Spanish children between 2.5 and 9 years of age took part in this study. Given that the vocabulary explosion occurs around 3 to 4 years of age, and that it could be expected that a considerable percentage of the words studied were learnt during that period, age groups were formed in 6 month intervals to achieve a more exact AoA measure. From 5 years of age, the groups were spaced at 1 year intervals. The age groups created, therefore, were of the following intervals (years:months): (1) 2:6–2:12, (2) 3:1–3:6, (3) 3:7–3:12, (4) 4:1–4:6, (5) 4:7–4:12, (6) 5:1–5:12, (7) 6:1–6:12, (8) 7:1–7:12, (9) 8:1–8:12, and (10) 9:1–9:12.

To avoid a possible fatigue effect throughout the test, each subject was shown only half of the total number of stimuli, except in the case of children from 8 to 9 years of age, who being less prone to fatigue, were shown the complete set of pictures. In any case, at least 22 children viewed each item. The group labelled (1) was added in a second phase of the study, and only shown the 65 pictures (35% of the total of the items) that were at ceiling for age group 2.

All the children were selected by a pseudorandom method[1] from schools within the province of Murcia, from rural locations (less than 15,000 inhabitants), from medium-sized locations (between 30,000 and 55,000 inhabitants), and from urban locations (more than 180,000 inhabitants). Of the eleven primary schools that participated in the study, two were private, three were grant-maintained foundation schools, and six were nonselective state schools; and of the four infant schools, two were nonselective state schools and the other two were private. This should mean that all the different social levels were represented in the sample. In Table 2, the characteristics of the sample in each age group are set out in detail with the average age in months and the distribution according to gender and geographical location.

[1] The selection process was not strictly random but was conditioned by subject gender. As shown in Table 2, the distribution by gender in each age group was practically the same.

TABLE 2
Summary of data on children tested for each age group

				Gender		*Geographical location*			
Group	*Age band*[a]	*Mean age*[a]	*N*	*n of females*[b]	*n of males*[b]	*n from rural populations*[b]	*n from medium populations*[b]	*n from urban populations*	*n of items tested*
1	30–35	32	25	11 (44)	14 (56)	15 (48)	6 (20)	10 (32)	65
2	36–41	40	46/2	23 (50)	23 (50)	13 (29)	14 (30)	19 (41)	89 × 2
3	42–47	45	51/2	25 (49)	26 (51)	11 (22)	14 (27)	26 (51)	89 × 2
4	48–53	52	44/2	21 (48)	23 (52)	6 (14)	11 (25)	27 (61)	89 × 2
5	54–59	57	46/2	24 (52)	22 (48)	8 (18)	14 (30)	24 (52)	89 × 2
6	60–71	68	46/2	21 (46)	25 (54)	7 (15)	16 (35)	23 (50)	89 × 2
7	72–83	79	44/2	23 (52)	21 (48)	2 (5)	11 (25)	31 (70)	89 × 2
8	84–95	91	49/2	25 (51)	24 (49)	5 (10)	6 (12)	38 (78)	89 × 2
9	96–107	103	24	13 (54)	11 (46)	2 (8)	7 (29)	15 (63)	178
10	108–119	114	22	11 (50)	11 (50)	2 (9)	4 (18)	16 (73)	178

[a] Months. [b] Percentage is given in parentheses.

Materials

One-hundred-and-seventy-eight pictures from the Pérez and Navalón (2003) battery were selected in accordance with the following criteria (see Table 3 for basic descriptive statistics): (1) high percentage of *name agreement* (%NA) of the most frequent name, (2) low dispersion of names (index *H*),[2] (3) high *image agreement* (IA), and (4) by the type of procedure that was to be followed, pictures that had single-word and non-monosyllabic names. The names of the objects obtained by Pérez and Navalón were considered the target words that the subjects should say. The pictures consisted of a black line drawing over a white background—similar to those of Snodgrass and Vanderwart (1980)—and were surrounded by a black frame with an overall measurement of 10 × 10 cm to provide the subject with a reference as to the relative size of each picture.

To avoid a possible order of presentation effect, four random permutations of the complete sets of stimuli were carried out. The order in which those pictures belonging to the four random sets were presented was counterbalanced, thus giving eight different lists of the 178 stimuli. For the purpose of presenting the pictures to the children, notebooks were created containing half the stimuli from each list. Thus, those children aged between 3 and 7 years saw only the pictures from one notebook, while the 8- and 9-year-old children saw the two notebooks, which constituted a complete list of the stimuli. Each of the eight lists of pictures was shown to approximately the same number of subjects. Finally, for each list of pictures an answer sheet was designed which contained, in the corresponding order, the names of the pictures and the respective boxes for recording the children's responses.

Procedure

Basically the procedure used by Morrison et al. (1997) was followed. The child was taken out of class (during the morning), and in a quiet, distraction-free environment a comfortable and friendly atmosphere was created. The task that the child had to carry out and the rewards that would be obtained if it were carried out attentively were explained to him or her. The reinforcement consisted of one picture card for approximately each 20 items examined, with all the picture cards from an envelope being given to the child at the end of the task. For the younger children who did not yet know how to count, the notebooks were marked with coloured stickers at the points where a reward would be given.

The crucial point was to see if the subject knew the target word. To achieve this, a detailed protocol for the experimenter's performance was developed in

[2] H is defined as: $H = \sum_{i=1}^{k} p_i \log_2(1/p_i)$, where k is the number of different names produced to a picture and p_i is the proportion of subjects producing the i-th name.

TABLE 3
Descriptive statistics for the 178 pictures selected from Pérez and Navalón (2003)

	Object variables[a]							*Word frequency (per million)*				*Word length*		
	H	*%NA*	*IA*	*FA*	*VC*	*IV*	*OPR*	*WF-AC*	*WF-LEXESP*	*WF-RAE*	*OF-RAE*	*NSyl*	*NPhon*	*NLet*
M	0.39	91.7	4.0	3.3	2.8	2.2	25.3	44.5	33.2	33.6	13.5	2.7	6.1	6.3
SD	0.34	9.0	0.5	1.0	0.8	0.4	27.3	174.3	138.0	170.8	56.6	0.9	1.9	1.9
Min.	0.00	56.5	3.0	1.6	1.3	1.4	1.2	0.0	0.0	0.1	0.0	2.0	3.0	3.0
Max.	1.46	100.0	4.9	4.9	4.6	3.5	98.2	2053.0	1633.8	2173.0	595.7	6.0	13.0	14.0

H = name dispersion index. %NA = name agreement. IA = image agreement. FA = familiarity. VC = visual complexity. IV = image variability. OPR = object-prototypic rank. WF-AC = written frequency from Alameda and Cuetos (1995). WF-LEXESP = written frequency from Sebastián, Martí, Carreiras, and Cuetos (2000). WF-RAE = written frequency from Real Academia Española (2003). OW-RAE = oral frequency from Real Academia Española (2003). NSyl = number of syllables. NPhon = number of phonemes. NLet = number of letters.

[a] From Pérez and Navalón (2003).

order to offer occasional assistance to the child. The justification for such assistance lies in the fact that with small children it is always necessary to facilitate linguistic production, given that if this were not done, the subjects' vocabulary would be underrated. There could be cases, for example, where a subject might not recognise a picture because the picture was not easy to identify (a situation that has been anticipated and prepared for by the criteria for the selection of stimuli, as detailed above). In this case, facilitating the *semantic category* of the item would help the subject to delimit and select an answer. It was also possible that the subject could consider two words for the same concept: for example, *balón*/*pelota* (both meaning *ball* in Spanish and equally present in child vocabulary). In this case, *the first syllable* would orientate the subject's response towards the target word. The syllable cue also worked in a similar manner when the subject used a word to refer to a semantically similar concept (e.g., *cat* for the picture of the lion).

Prior to beginning the experimental set, some practice pictures were presented with three aims in mind: (1) to familiarise the subject with the format of the stimuli, (2) to show the subject the kind of assistance they could receive, and (3) to detect possible problems in the child (peculiarities in phonetic production, fatigue, refused to participate, etc.).

Cues. Firstly, and in a general sense, if the response the subject gave was to a certain extent close to the target word (description of the object, its use, a semantically related name, etc.), the subject was then encouraged to give a different alternative name. Those responses that were badly pronounced due to lack of phonetic maturity or developmental dyslalias were nonetheless considered correct when they were quite unmistakably the target word (e.g., /popotamus/ meaning *hippopotamus*). In those instances where a child did not produce a response within 5 s or when the response was a name which was *distant* from the target word, the cue of the semantic category of the object was given (the denominations of the categories were adapted from those included in Pérez & Navalón, 2003). If once again the child did not produce a response within 5 s, he or she was helped with the first syllable of the target word.

Response annotations. All the experimenters strictly followed the following norms for noting responses: (1) If the subject clearly said the target word the answer was considered correct. (2) If the subject unclearly produced the target word, he or she was encouraged to repeat the answer; if the subject then said the target word clearly it was recorded as a correct answer. (3) If the subject did not say the exact target word, the following circumstances were taken into account: (a) if the emitted response had one or more phonemes that were different to the target word but did not have other lexical neighbours (that is, the subject was referring unmistakably to the target word) then the answer was considered correct (e.g., with *elephant* the subject said /lelephant/); (b) if the answer was

clearly different to the target word, the answer was recorded as it sounded and the child was given the assistance such as had been prepared. (4) If the child produced the target word as a consequence of any of the assistance (semantic or phonological) such a response was recorded as correct but the type of help given was noted. In cases where, after being given help with the syllable, the subject emitted a neighbour word to the target word, and as such there was ambiguity in the answer, it was written down as it was spoken but it was not considered correct (e.g., for *toro*, i.e., *bull*, the subject was helped with /to/ and then said *todo*, i.e., *everything*). The sessions were recorded on audiotape so that, in the eventuality of doubts arising about a response, these could be corrected or reevaluated at a later stage by various judges.

Results

All of the responses produced by the subjects were transcribed onto a spreadsheet. Although correct answers with help (category or first syllable) and without help were coded differently, for the following statistical analysis of results all those responses which coincided with the target word were used, independently of whether they were produced spontaneously or evoked by using one of both of the types of assistance. On average, the number of correct responses with assistance from the semantic category was 3.15% of the total of correct responses and in the case of phonology, the figure was 18.10%.[3] The number of cues given correlated negatively with the age groups, that is, at a younger age more cues were needed ($r = -.898$ for semantic cues and $r = -.969$ for syllable cues; $p < .001$). Once the data had been debugged, the appropriate statistical analysis was carried out to determine the AoA and the correlations with the other psycholinguistic variables.

Calculating objective-AoA using a logistic-curve fitting procedure (AoA-LRp50). Morrison et al. (1997) proposed a system for obtaining the AoA based on the equation of the logistic regression curve between the number of occurrences of the target word and the age of the subjects and, from this, they situated the AoA at the probability value of 50% ($p = .50$), which is the maximum gradient point and gives the highest exactness of estimation. However, the study did not provide information about the level of adjustment of the logistic model for each word, i.e., of the R^2, nor about the level of significance. The analysis of our data found that 85 of the items fitted into the logistic regression model ($R^2 > .639$, $p < .01$), and therefore the estimations carried out with these regressions are thought to be

[3] In the analysis of the occurrence of the type of cues that were given we have not taken the youngest group (30–35 months) into account because this group viewed 65 items selected by a nonrandom criteria, which makes the comparison with data from other groups that viewed the complete series of objects impossible. In this preschool group there was the greatest occurrence of help with syllables (36.8%) and the least help with semantic meaning (1%).

reliable. There were mainly two reasons why the rest of the words did not fit into the logistic curve model: (1) invariance in emitted responses, due especially to the ceiling effect of correct responses (of 36 items the error was less than 5% in the whole sample), and (2) words whose learning curves did not fit the logistic curve, because there were atypically high scores in accuracy in certain age bands—possibly caused by temporary circumstances of a given sample subgroup, for example, by a change in school curriculum, some children may have been more familiar with a musical instrument than others, or some children might know many animals because they had visited the zoo a few days before the test. The criterion for the assignation of the AoA of the 85 words that were adjusted to the logistic model was as predicted using the logistic regression curve at $p = .50$. Nonetheless, the AoA of two words (*finger* and *giraffe*) were eliminated because they gave a prediction of less than 18 months. The data for the remaining 83 words are presented in the first column of the Appendix.

Calculating objective-AoA using the 75% rule (AoA-R75%). Another method for determining at what age a word is learnt is the *75% rule* (Morrison et al., 1997), which shows that a word is acquired at a given age if (1) at least 75% of the children of that age named that word, and (2) the average of the word being named in the two subsequent age groups is also, at least, 75%. This is a rather strict rule and it does not assume the majority of the children (half of the sample plus one) guarantees a good estimation, rather it is based on the vast majority (75%) of subjects within an age group. In addition, to avoid an erroneous calculation of the AoA from a group of children who, for whatever temporary circumstance, have had an untypical contact with some words, it is necessary for the percentage of naming of words to be, at least, stable in earlier generations of children, or put another way, persistent in older age groups.

The value assigned to AoA was the mean age (in months) of the youngest age group that fulfilled the 75% rule. For example, if a word was spoken by at least 75% of the children within the 36–42 month age band—and this percentage was maintained on average in the two following age bands—the word was assigned the AoA for 40 months (see Table 2). In this way, it was possible to calculate the objective AoA of the majority of the words studied (see the second column in the Appendix). According to the results obtained through this procedure by Morrison et al. (1997), the AoAs using the 75% rule are systematically and significantly higher than the AoAs using the LRp50 method. The vast majority of the children in the youngest age band named 43 objects correctly. Consequently, it is not possible to state firmly that 32 months is really the AoA of these words, since it is possible that they are acquired earlier. On the other hand, another 12 objects did not achieve the percentage criterion in the older age band (average age of 114 months), which makes us think that the AoAs of these words is later than 120 months. To ascertain the possible AoA under 30 months of the 43 words of the lowest age band and the AoA for the age band above 119

months of the 12 words that did not fulfil the 75% rule, an estimation of these AoAs was carried out with the logistic regression, but with $p = .75$.

Estimating lower and upper AoAs using the logistic-curve fitting procedure (AoA-LRp75). Of the 43 words with AoA for 32 months according to the 75% rule, three of these (*finger*, *giraffe*, and *nose*) fitted to the logistic model ($R^2 > .731$, $p < .01$) and the predictions were calculated with $p = .75$ (third column in the Appendix) and were thus comparable with those obtained using the 75% rule. The results (see Table 4) showed that only *finger* and *giraffe* had AoAs below 32 months (measurement assigned using the 75% rule). The same was done with those words located at the top extreme point of the distribution of the AoA or those that did not have values assigned using the 75% rule. Seventeen words were obtained which fitted the logistic model ($R^2 > .639$, $p < .01$): *rocking chair*, *harp*, *file*, *dragonfly*, *soup tureen*, *drummer*, *apricot*, *saucepan*, *strainer*, *accordion*, *pliers*, *adjustable lamp*, *artichoke*, *eel*, *humming bird*, *stomach*, and *girder*. As can be appreciated in Table 4, the predicted values (AoA-LRp75) are significantly close to those calculated using the 75% rule.

To achieve maximum accuracy and at the same time to achieve a greater quantity of AoA data within the same scale, it was decided to add the predictions obtained using the logistic curve ($p = .75$) to the AoA-R75% data. The combined

TABLE 4
Data on logistic regression ($p = .75$) for upper, lower, and null scores on AoA-75%

English name	*Spanish name*	*AoA-R75%*[a]	*Age band*[a]	*AoA-LRp75*[a]	*Difference from AoA-LRp75 to age band*[a]
Finger	Dedo	32	30–35	23	−7
Giraffe	Jirafa	32	30–35	27	−3
Nose	Nariz	32	30–35	34	0
Harp	Arpa	114	108–119	107	−1
Dragonfly	Libélula	114	108–119	110	0
File	Lima	114	108–119	108	0
Rocking chair	Mecedora	114	108–119	106	−2
Soup tureen	Sopera	114	108–119	114	0
Accordion	Acordeón	none		118	
Apricot	Albaricoque	none		112	
Artichoke	Alcachofa	none		140	
Pliers	Alicates	none		131	
Eel	Anguila	none		143	
Drummer	Batería	none		105	
Saucepan	Cazo	none		116	
Strainer	Colador	none		116	
Adjustable lamp	Flexo	none		132	

[a] Months.

AoA for 175 words is thus finally obtained (fourth column in Appendix), from the combination of the methods explained above, i.e., taking the AoA-R75% as a base and completing it with data of AoA-LRp75 of 85 words. Finally, three words (*humming bird*, *stomach*, and *girder*) remained without AoA, given that they obtained very few correct answers in all the age ranges and the distribution functions for accuracy did not fit the logistic model.

Reliability and validity. The internal consistency (Cronbach's α) as a coefficient of reliability of the instrument used to obtain the AoA was calculated, giving $\alpha = .89$. This value assures us that the instrument is not skewed and that the items in general terms produced similar response patterns according to age. The number of correct answers in each item was also correlated between male and female subjects, producing a significantly high value ($r = .91$, $p < .001$). In addition, we must remember that the sample used included subjects of different social status and geographical location, which guarantees that the measures obtained are representative of the child population. The association between the different methods of assignation is discussed later, although we can say here that the measures of the objective AoA are highly correlated.

To evaluate the validity of the measures obtained and in the absence of any other objective data in the Spanish language for comparison, the present data were contrasted with the estimations from adults by Cuetos et al. (1999) and Hirsh et al. (2003). The correlation of AoA-R75% of the items in common with Cuetos et al. was $r = .557$ ($p < .01$, $n = 76$) and with Hirsh et al. was $r = .722$ ($p < .01$, $n = 41$; see Table 5). When the data by Cuetos et al. and Hirsh et al. were compared to the measures of combined AoA, the correlation was noticeably higher ($r = .625$, $p < .01$, $n = 77$ and $r = .736$, $p < .01$, $n = 41$, respectively), which would in the first instance support the preference for using combined AoA rather than of AoA-R75%. Nonetheless, it is necessary to compare the data obtained with other psycholinguistic indices to determine which calculation system for AoA (R75%, LRp50, or combined) is more appropriate.

Associations of objective-AoA with other psycholinguistic variables. To determine the relation of the AoA with the lexical frequency, various sources of this variable were used. From the dictionary of frequencies by Alameda and Cuetos (1995), and from the psycholinguistic data base LEXESP (Sebastián, Martí, Carreiras, & Cuetos, 2000), indices of written frequency were obtained, while data of oral and written frequency were obtained from the *Reference Corpus of the Current Spanish Language*[4] (Real Academia Española [RAE], 2003). The psycholinguistic variables that refer to the characteristics of the

[4] The CREA database corpora comprises a total of 125 million words, of which 50% are from sources published in Spain and the rest from South American sources. The data presented in this study have been obtained using the geographic filter that corresponds to Spain.

TABLE 5
Correlations between AoA measures and other psycholinguistic variables

Variable		*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*
1	AoA-75%	1.000																		
2	AoA-RL(p = .5)	.932** (74)	1.000																	
3	Combined-AoA	.972**	.973**	1.000																
4	Estimated-AoA[a]	.557** (76)	.714** (18)	.622**	1.000															
5	Estimated-AoA[b]	.722**	.852** (12)	.736**	.829** (34)	1.000														
6	WF-AC[c]	−.471**	−.483**	−.503**	−.427**	−.689**	1.000													
7	WF-LEXESP[c]	−.398**	−.460**	−.462**	−.376**	−.601**	.898**	1.000												
8	WF-RAE[c]	−.427**	−.455**	−.476**	−.357**	−.614**	.895**	.854**	1.000											
9	OF-RAE[c]	−.487**	−.464**	−.504**	−.422**	−.714**	.839**	.804**	.878**	1.000										
10	FA[d]	−.205**	−.199	−.220**	−.524**	−.298	.381**	.276**	.382**	.355**	1.000									
11	OPR[d]	−.416** (165)	−.102 (82)	−.367**	−.447** (76)	−.473** (40)	.303**	.254**	.294**	.346**	.294**	1.000								
12	H[d]	.229**	.402**	.305**	.051	.293	−.154*	−.124	−.089	−.141	−.048	−.073	1.000							
13	%NA[d]	−.127	−.254*	−.192*	−.055	−.304	.099	.083	.040	.097	.019	.029	−.914**	1.000						
14	IA[d]	−.060	−.084	−.038	.135	.066	−.115	−.114	−.078	−.075	.154*	.009	−.100	.096	1.000					
15	VC[d]	.164*	.180	.167*	.237*	−.052	−.163*	−.099	−.153*	−.112	−.428**	−.050	.115	−.116	−.320**	1.000				
16	IV[d]	−.193*	−.200	−.236**	−.150	−.085	.464**	.393**	.465**	.434**	.317**	.157*	.099	−.122	−.161*	−.082	1.000			
17	NSyl	.284**	.178	.319**	.295**	.427**	−.353**	−.326**	−.336**	−.330**	−.025	−.114	.045	−.107	.029	.183*	−.191*	1.000		
18	NPhon	.286**	.163	.302**	.308**	.476**	−.365**	−.341**	−.327**	−.326**	−.018	−.114	.028	−.082	.033	.128	−.165*	.901**	1.000	
19	NLet	.304**	.142	.311**	.363**	.458**	−.369**	−.338**	−.339**	−.339**	−.069	−.110	.028	−.082	.043	.155*	−.170*	.900**	.968**	1.000

If it is not given another in parentheses, the number of items compared was 166 in AoA-75%, 83 in AoA-RL(p = .5), 77 in estimated-AoA[a], 41 in estimated-AoA[b], 174 in OPR, and 175 in the rest of variables. WF-AC = written frequency from Alameda and Cuetos (1995). WF-LEXESP = written frequency from Sebastián et al. (2000). WF-RAE = written frequency from Real Academia Española. OW-RAE = oral frequency from Real Academia Española. FA = familiarity; OPR = object-prototypic rank. H = name dispersion index. %NA = name agreement. IA = image agreement. VC = visual complexity. IV = image variability. NSyl = number of syllables. NPhon = number of phonemes. NLet = number of letters.

[a] From Cuetos et al. (1999). [b] From Hirsh et al. (2003). [c] Logarithmic transformation, log (1 + x). [d] Extracted from Pérez and Navalón (2003).

* p = .05; ** p = .01.

drawings were taken from Pérez and Navalón (2003) and were: (1) index *H*,[5] which indicates the dispersion of names for a drawing in a written task; (2) the percentage of mention of the most frequent name or name agreement (%NA); (3) the image agreement (IA) which rates the concordance between the image evoked by the object and the drawing themselves; (4) the subjective *visual complexity* (CV), which is understood as the quantity or intricacy of the lines in the picture; (5) the *image variability* (IV), that is to say the number of different images which the name of the object evokes; and (6) the *object-prototypic rank* (OPR), i.e., the frequency with which the concept was mentioned within its semantic category. Finally, we also considered it relevant to look at the relation of the AoA with a measurement of the length of the word (number of syllables, phonemes, and letters).

The correlation matrix for the three measurements of objective AoA calculated in this study and the subjective AoA by Cuetos et al. (1999) and by Hirsh et al. (2003) are presented in Table 5, together with the rest of the variables previously described. As can be seen the pattern of relationships belonging to the measures of objective AoA is very similar, even though it is true that some correlations of AoA-LRp50 do not reach significant levels, possibly due to the quantity of items that they contain ($n = 83$). The AoA composed with data of AoA-R75% and of AoA-LRp75 is likewise related with AoA-R75% as with AoA-RLp50 ($r = .972$ and $r = .973$, respectively, $p < .001$). For these reasons and as we aim to simplify the following results and interpretations, we will use from now on the combined AoA as the only reference for the data AoA obtained in this study. The combined AoA maintains correlations between $r = .462$ and $r = .504$ with the measures of written and oral frequency; a correlation of $r = -.367$ for OPR and of $r = .305$ with the index *H* and the number of phonemes; and correlations around $r = .31$ with the measures of length. Worthy of note is the low correlation of $r = -.22$ ($p < .01$) between the combined AoA and the familiarity (FA), since this does not coincide with the strong positive associations found in many other studies. It is precisely the association with FA that constitutes a divergent aspect between profiles of correlation of combined AoA and estimated AoA, taking into account this last variable has a strong relation with FA ($r = -.524$; $p > .001$), similar to that described by Cuetos et al. with their own data of familiarity. The estimated AoAs are also different to the objective AoA, in that the latter maintains a null relation with *H*, %NA and IV variables.

Objective- and estimated-AoA in several languages. There are many studies which provide data about AoA, whether objective or by adult estimations. For this reason, we find it interesting to compare our results with the various studies in different languages and cultures. In Table 6 we show the

[5] We should remember that an *H* close to 0 indicates a low dispersion of names, while an *H* greater than 1 indicates a high dispersion of names.

TABLE 6
Correlations between objective- and estimated-AoAs in several languages and descriptive statistics

Study	*Method*	*Var.#*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
Current study[a]	OBJ (comb.)	1	1																
			(175)																
Cuetos et al. (1999)[a]	EST	2	.622	1															
			(77)	(77)															
Hirsh et al. (2003)[a]	EST	3	.736	.829	1														
			(41)	(34)	(41)														
Piñeiro and Manzano (2000)[b]	OBJ	4	.086	−.129	−.120	1													
			(26)	(21)	(15)	(26)													
Morrison et al. (1997)[c]	OBJ (75%)	5	.746	.614	.669	.102‡	1												
			(105)	(71)	(38)	(24)	(105)												
	OBJ (LR)	6	.739	.664	.651	.282‡	.962	1											
			(83)	(52)	(27)	(14)	(83)	(83)											
	EST	7	.687	.833	.849	−.104‡	.754	.752	1										
			(106)	(72)	(38)	(24)	(105)	(83)	(106)										
Iyer et al. (2001)[d]	EST	8	.670	.856	.840	−.029‡	.722	.701	.873	1									
			(118)	(70)	(39)	(25)	(96)	(75)	(97)	(118)									
Snodgrass and Yuditsky (1996)[d]	EST	9	.632	.870	.861	−.041‡	.702	.694	.886	.951	1								
			(99)	(71)	(39)	(23)	(94)	(74)	(95)	(95)	(99)								
Chalard et al. (2003)[e]	OBJ (75%)	10	.539	.535	.364	−.011‡	.717	.677	.479	.442	.423	1							
			(95)	(72)	(38)	(22)	(90)	(70)	(91)	(92)	(90)	(95)							
	OBJ (LR)	11	.620	.579	.516	.062‡	.701	.754	.530	.572	.546	.939	1						
			(102)	(73)	(39)	(23)	(96)	(75)	(97)	(98)	(96)	(95)	(102)						
Alario and Ferrand (1999)[e]	EST	12	.713	.880	.881	−.003‡	.748	.764	.847	.825	.855	.626	.690	1					
			(107)	(67)	(38)	(20)	(92)	(72)	(93)	(96)	(92)	(88)	(95)	(107)					
Pind et al. (2000)[f]	OBJ	13	.526	.597	.473	.069‡	.635	.616	.549	.514	.512	.505	.526	.566	1				
			(93)	(66)	(38)	(19)	(88)	(69)	(89)	(89)	(89)	(87)	(92)	(93)	(93)				
	EST	14	.649	.728	.817	.122‡	.722	.727	.760	.753	.764	.454	.531	.742	.820	1			
			(97)	(67)	(38)	(20)	(91)	(72)	(92)	(93)	(93)	(88)	(94)	(96)	(93)	(97)			
Barca et al. (2002)[g]	EST	15	.458	.796	.853	−.024‡	.577	.502	.653	.609	.752	.527	.588	.824	.505	.545	1		
			(59)	(38)	(23)	(16)	(43)	(30)	(43)	(49)	(43)	(42)	(44)	(49)	(42)	(45)	(59)		
Dell'Acqua et al. (2000)[g]	EST	16	.558	.802	.711	−.004‡	.728	.756	.763	.757	.813	.585	.606	.839	.654	.721	.878	1	
			(77)	(49)	(27)	(16)	(63)	(46)	(64)	(69)	(61)	(59)	(64)	(66)	(60)	(63)	(34)	(77)	
Ghyselinck et al. (2000)[h]	EST	17	.319	.241‡	.399‡	−.060‡	.268‡	.144‡	.293	.235‡	.187‡	.297	.239‡	.497	.166‡	.244‡	.600	.230‡	1
			(74)	(35)	(24)	(16)	(52)	(38)	(52)	(60)	(48)	(45)	(49)	(53)	(47)	(48)	(31)	(39)	(74)

Descriptive statistics	*Var.#*	*1*[i]	*2*[j]	*3*[k]	*4*[i]	*5*[i]	*6*[i]	*7*[i]	*8*[l]	*9*[l]	*10*[l]	*11*	*12*[m]	*13*[i]	*14*[i]	*15*[k]	*16*[n]	*17*[i]
N		175	77	41	26	105	83	106	118	99	95	102	107	93	97	59	77	74
M		57.1	4.1	2.2	26.4	48.7	43.3	44.5	4.7	3.7	54.4	45.4	2.2	46.9	47.4	2.7	3.1	77.9
SD		26.8	0.8	0.8	6.4	26.4	2.6	19.0	1.2	1.0	21.1	26.0	0.7	23.4	22.5	0.7	0.9	27.0
Min.		23.0	2.5	1.2	18.7	22.1	13.6	12.0	2.9	2.1	32.5	18.0	1.1	22.5	16.6	1.6	1.7	43.9
Max.		143.0	6.3	4.3	43.6	140.0	104.4	111.6	8.1	6.3	140.5	127.2	4.0	140.0	145.9	4.6	5.7	158.6

The number of items compared is given in parentheses. Var# = number of identification of the variables.

[a] Spanish. [b] Cuban-Spanish. [c] British English. [d] North-American English. [e] French. [f] Icelandic. [g] Italian. [h] Dutch. [i] In months. [j] 1 = before 2 years old, 2 = two years old, and so on, up to 11 = eleven years old. [k] 1 = 0–2 years, 2 = 3–4, and so on, up to 7 = 13+ years. [l] 1 = 2 = 2 years old, 3 = 3 years old, and so on to 6 = 7–8, 7 = 9–10, 8 = 11–12, and 9 = 13+. [m] From 1 = learned at 0–3 years, to 5 = learned at age 12+. [n] 1 = two years old, 2 = three years old, and so on, up 9 = 13 years or older.

All correlations were significant ($p < .05$), except those marked with ‡.

correlations and the descriptive statistics for AoA of the words in our study that coincide in studies in Spanish (Cuetos et al., 1999; Hirsh et al., 2003), Cuban Spanish (Piñeiro & Manzano, 2000), British English (Morrison et al., 1997), North American English (Iyer et al., 2001; Snodgrass & Yuditsky, 1996), French (Alario & Ferrand, 1999; Chalard et al., 2003), Icelandic (Pind et al., 2000), Italian (Barca et al., 2002; Dell'Acqua et al., 2000), and Dutch (Ghyselinck, de Moor, & Brysbaert, 2000). Objective as well as subjective indices have been included, with the purpose of determining whether there indeed exists a greater correspondence between objective and subjective data in different cultures.

With the exception of the data from Piñeiro and Manzano (2000) and from Ghyselinck et al. (2000), the rest of the AoAs are closely intercorrelated, independently of the language. Therefore, in general terms we can say that those words that make up the child vocabulary are acquired in a similar order in different cultures and languages. However, we note that estimated AoAs have a greater intergroup similarity than when they are compared to objective AoAs. To prove this, an exploration using a cluster analysis was carried out with eleven

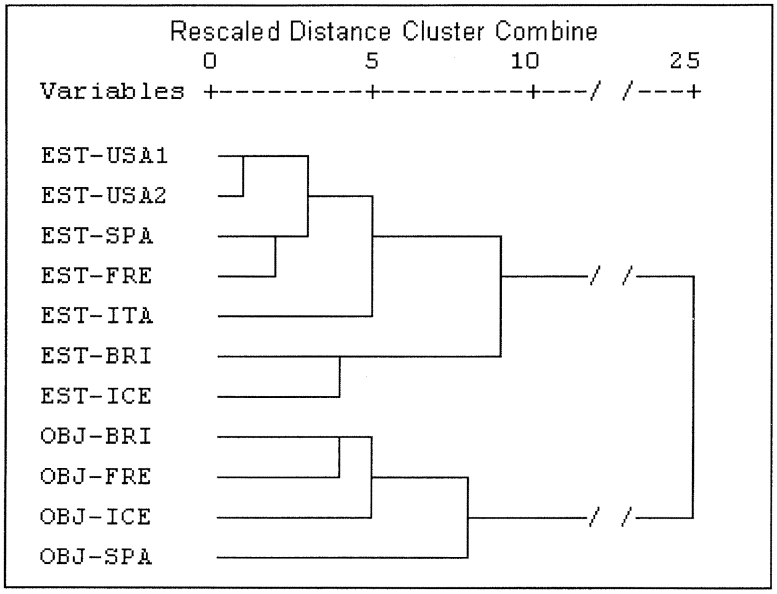

Figure 1. Dendrogram of objective- and estimated-AoA measures in several languages.
Note. Forty-two cases analysed (common words in 11 variables; outliers removed). Ward method and squared-Euclidean distances (Z-standardisation) were used.
OBJ = objective AoA. EST = estimated AoA. SPA = Spanish. ICE = Icelandic. FRE = French. BRI = British English. USA1 = North American English (Iyer et al., 2001). USA2 = North-American English (Snodgrass & Yuditsky, 1996). ITA = Italian.

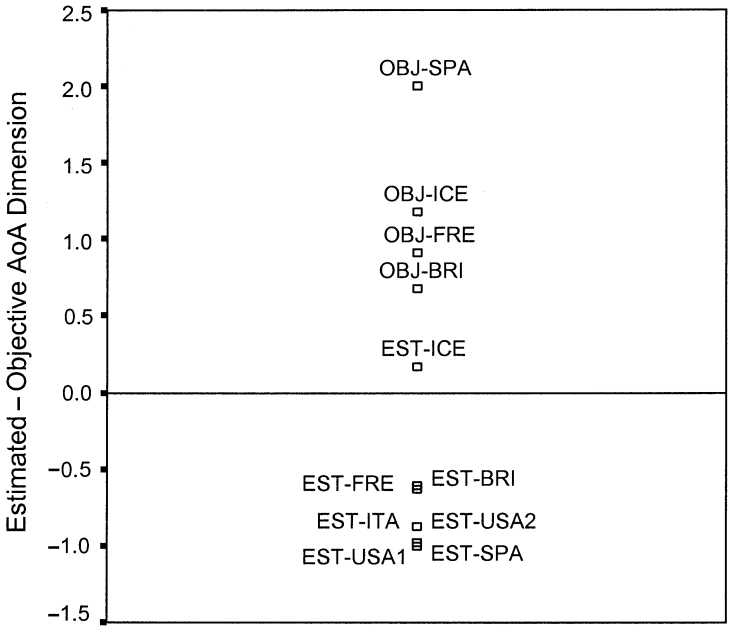

Figure 2. Multidimensional-scaling graph of objective- and estimated-AoA measures in several languages.

Note. Forty-two cases analysed (common words in 11 variables; outliers removed), squared-Euclidean distances (Z-standardisation) were used.

OBJ = objective AoA. EST = estimated AoA. SPA = Spanish. ICE = Icelandic. FRE = French. BRI = British English. USA1 = North American English (Iyer et al., 2001). USA2 = North-American English (Snodgrass & Yuditsky, 1996). ITA = Italian.

measures of AoA: seven subjective measures (one from Spanish, British English, French, Icelandic, and Italian, and two from North American English) plus four objective measures, but without repeating variables obtained from the same sample of subjects.[6] The dendrogram (Figure 1) shows that two clear groups of variables do indeed exist that correspond to the objective and subjective AoAs. A multidimensional scale analysis confirmed this structure of the data (Kruskal's stress = .257; r^2 = .841, for matrix), grouping the subjective measures (except the estimated Icelandic norms) on one side and the objective measures on the opposite side (Figure 2).

[6] We selected these studies because they shared many words and thus the cluster and multidimensional-scaling analysis becomes more powerful. We then tried to include data from Barca et al. (2002), Ghyselink et al. (2000), Hirsh et al. (2003), and Piñeiro and Manzano (2000) into the analysis, but the number of words in common with the other studies was too small, $n = 22$, $n = 24$, $n = 11$, and $n = 24$, respectively.

CONCLUSIONS

In the first place, valid and reliable data have been presented for objective AoA obtained from picture naming by children from 2.5 to 9 years of age. The assignation of AoA for each word has been carried out in two different ways, using the 75% rule and using the predictions from logistic regression (only when the data could be fitted to that model). Although both methods for assignation are closely correlated to each other, we chose to construct a new variable using the combination of these two methods. This measure, called *combined AoA*, collects the AoA (in months) of 175 words.

Secondly, we have seen that the combined AoA presents a very low association level with regard to the familiarity of the object ($r = -.22$), unlike the evidence that has been observed in other studies (e.g., Alario & Ferrand, 1999; Barca et al., 2002; Cuetos et al., 1999; Morrison et al., 1997), even though it is true that the association with respect to measures of frequency is as normally found ($-.4 < r < -.6$). From these data, we can deduce that although we have attempted to obtain objective data of AoA independent of written frequency, oral frequency, or familiarity, there is an intrinsic association between them that is difficult to avoid. Due to this, it would always be desirable to: (1) use objective AoA norms, given that they are less skewed by familiarity ($r = -.22$ by objective AoA vs. $r = -.524$ by estimated AoA), and (2) when the influence of frequency or familiarity in cognitive processes is analysed the AoA in addition to other variables should be controlled and vice versa.

Thirdly, in the comparison of different languages, it has been shown on the one hand that a common pattern of lexical acquisition does exist, and on the other that the subjective AoA measures are strongly associated, while more dispersion exists in the case of objective AoAs. With regard to this phenomenon, adult subject estimations show an order of acquisition of words close to that found with children (e.g., Morrison et al., 1997), but the AoA tends to be undervalued, that is to say they rate the acquisition of words at a younger age than at which they are in fact learned, as can be seen in the averages of the analysed measures of AoA (see descriptive statistics in Table 6). This may all be explained by the existence of a skew with regard to adult subjects concerning the order in which they believe that they learn given words, perhaps caused by variables such as familiarity, which may finally determine common response patterns in different samples (see Figures 1 and 2).

Finally, studies in several languages and tasks confirm the effects of AoA found in English (e.g., Alario & Ferrand, 1999; Barca et al., 2002; Brysbaert, 1996; Brysbaert, Lange, & Wijnendaele, 2000a; Chalard et al., 2003; Cuetos et al., 1999; Dell'Acqua et al., 2000). However, we believe that more experimental research to determine the role and *locus* of AoA would be interesting, especially in Spanish. Thus, we hope these new data will provide researchers with the necessary material to perform such work.

Original manuscript received July 2003
Revised manuscript received November 2003
PrEview proof published online month/year

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APPENDIX
Objective-AoA values (in months) for the names for each method

Names		*Method*			
English (synonym)	*Spanish*	*AoA-LR (p = .50)*	*AoA-75%*	*AoA-LR (p = .75)*	*Combined-AoA*
Accordion	Acordeón	109		118	118
Adjustable lamp	Flexo	106		132	132
Aeroplane (airplane)	Avión		32		32
Ant	Hormiga		52		52
Apple	Manzana		40		40
Apricot	Albaricoque	95		112	112
Arrow	Flecha		45		45
Artichoke	Alcachofa	109		140	140
Axe	Hacha	70	91	86	86
Back	Espalda	51	57	63	63
Balloon	Globo		32		32
Banana	Plátano		32		32
Basin	Lavabo		79		79
Bear	Oso		40		40
Bed	Cama		45		45
Belt	Cinturón	43	57	51	51
Bike	Bicicleta	36	45	44	44
Bomb	Bomba	39	52	47	47
Bone	Hueso		45		45
Book	Libro		32		32
Bra	Sujetador	56	68	67	67
Brain	Cerebro	69	79	83	83
Brick	Ladrillo	41	52	49	49
Bull	Toro		32		32
Butterfly	Mariposa		40		40
Calculator	Calculadora	44	68	51	51
Calendar	Calendario	72	79	79	79
Cannon	Cañón	70	91	91	91
Cap	Gorra	33	40	42	42
Car	Coche		32		32
Cart	Carro	39	79	82	82
Cat	Gato		32		32
Catapult	Tirachinas	64	91	73	73
Chair	Silla		32		32
Cherry	Cerezas		68		68
Chess	Ajedrez	64	91	73	73
Coffeepot	Cafetera	57	79	68	68
Comb	Peine		32		32
Computer	Ordenador		52		52
Cow	Vaca		32		32
Crocodile (alligator)	Cocodrilo	22	40	32	32
Cup	Taza		40		40

(Continued)

APPENDIX
(Continued)

Names		*Method*			
English (synonym)	*Spanish*	*AoA-LR (p = .50)*	*AoA-75%*	*AoA-LR (p = .75)*	*Combined-AoA*
Cymbals	Platillos		68		68
Dice	Dado	27	45	37	37
Dog	Perro		32		32
Dominoes	Dominó	55	79	63	63
Donkey	Burro		52		52
Door	Puerta		32		32
Dragonfly	Libélula	85	114	110	110
Drawer	Cajón	46	57	53	53
Drum	Tambor		32		32
Drummer	Batería	88		105	105
Duck	Pato	27	45	37	37
Ear	Oreja		40		40
Eel	Anguila	118		143	143
Elephant	Elefante		32		32
Elevator	Ascensor	54	79	65	65
Envelope	Sobre		57		57
Eye	Ojo		40		40
File	Lima	87	114	108	108
Finger	Dedo	<18	32	23	23
Flute	Flauta		40		40
Fly	Mosca		32		32
Folder	Carpeta	48	68	57	57
Fork	Tenedor		32		32
Fox	Zorro		45		45
Frying pan	Sartén		52		52
Giraffe	Jirafa	<18	32	27	27
Glass	Vaso		32		32
Glass	Copa	40	52	47	47
Glove	Guante		32		32
Goat	Cabra	43	52	51	51
Grenade	Granada	95	103	114	114
Guitar	Guitarra	26	40	35	35
Gun	Pistola		32		32
Harp	Arpa	85	114	107	107
Hat	Sombrero	35	40	44	44
Heart	Corazón		79		79
Helicopter	Helicóptero	36	40	45	45
Hen (chicken)	Gallina		32		32
Hippopotamus	Hipopótamo	47	52	59	59
Horse	Caballo		32		32
House	Casa		32		32
Hyena	Hiena	88	103	111	111

(Continued)

APPENDIX
(Continued)

Names		*Method*			
English (synonym)	*Spanish*	*AoA-LR (p = .50)*	*AoA-75%*	*AoA-LR (p = .75)*	*Combined-AoA*
Jacket	Chaqueta	29	52	39	39
Jug	Jarra		40		40
Ladder	Escalera		40		40
Ladybird	Mariquita		57		57
Leg	Pierna		32		32
Lemon	Limón		52		52
Lettuce	Lechuga	31	52	40	40
Lion	León		40		40
Lips	Labios		40		40
Lorry (truck)	Camión		32		32
Ludo	Parchís	46	57	55	55
Melon	Melón		57		57
Mirror	Espejo	33	52	43	43
Mixer	Batidora	57	68	65	65
Monkey	Mono		32		32
Motorbike (motorcycle)	Moto		32		32
Motorboat	Lancha	60	79	77	77
Mouse	Ratón		45		45
Mushroom	Seta		52		52
Nail	Uña	29	52	38	38
Nose	Nariz	25	32	34	34
Nut	Tuerca	62	91	86	86
Orange	Naranja		57		57
Ostrich	Avestruz	72	91	90	90
Owl	Búho	28	40	38	38
Parrot	Loro		57		57
Pear	Pera		32		32
Pen	Pluma	43	52	51	51
Pencil	Lápiz		32		32
Penguin	Pingüino	43	52	51	51
Pepper	Pimiento	64	91	90	90
Photocopier	Fotocopiadora		114		114
Piano	Piano		52		52
Pig	Cerdo		32		32
Pigeon	Paloma		52		52
Pineapple	Piña		40		40
Plate	Plato		32		32
Pliers	Alicates	106		131	131
Pumpkin	Calabaza		79		79
Rabbit	Conejo		32		32
Racket	Raqueta		68		68
Rhinocerous (rhinoceros)	Rinoceronte		68		68

(Continued)

APPENDIX
(Continued)

Names		*Method*			
English (synonym)	*Spanish*	*AoA-LR (p = .50)*	*AoA-75%*	*AoA-LR (p = .75)*	*Combined-AoA*
Robot	Robot	41	52	49	49
Rocking chair	Mecedora	70	114	106	106
Roof	Tejado	40	52	48	48
Rose	Rosa	47	68	55	55
Salt cellar	Salero		79		79
Saucepan	Cazo	75		116	116
Saw	Sierra	47	68	55	55
Scarf	Bufanda	37	40	46	46
Scissors	Tijeras		32		32
Screwdriver	Destornillador		79		79
Shade	Persiana	56	91	64	64
Shark	Tiburón	39	52	49	49
Sheep	Oveja	36	52	44	44
Ship	Barco		32		32
Shirt	Camisa	62	91	83	83
Shoulder	Hombro	51	79	63	63
Skate	Patín	54	68	62	62
Skateboard	Monopatín		79		79
Skipping rope	Comba	47	57	56	56
Skirt	Falda		32		32
Sock	Calcetín		32		32
Soup tureen	Sopera	91	114	114	114
Squirrel	Ardilla	39	52	47	47
Stamp	Sello	64	91	71	71
Staple	Grapa		103		103
Strainer	Colador	93		116	116
Strawberry	Fresa		32		32
Suitcase	Maleta	40	57	48	48
Swan	Cisne	45	57	54	54
Table	Mesa		32		32
Table football	Futbolín	66	91	76	76
Tank	Tanque	76	103	96	96
Tie	Corbata	50	68	58	58
Tiger	Tigre		32		32
Tomato	Tomate		52		52
Tongue	Lengua	22	40	31	31
Tractor	Tractor	43	45	53	53
Tray	Bandeja	48	68	72	72
Triangle	Triángulo		45		45
Tricycle	Triciclo		103		103
Trousers (pants)	Pantalón		32		32
Trumpet	Trompeta		40		40

(Continued)

APPENDIX
(Continued)

Names		*Method*			
English (synonym)	*Spanish*	*AoA-LR* (p = .50)	*AoA-75%*	*AoA-LR* (p = .75)	*Combined-AoA*
Turtle	Tortuga		32		32
Waistcoat	Chaleco	68	91	92	92
Wastebasket	Papelera	47	57	55	55
Wolf	Lobo		40		40
Yo-yo	Yoyó		68		68
Zebra	Cebra		57		57
—(drum-like instrument)	Zambomba		103		103