Visual-word identification thresholds for the 260 fragmented words of the Snodgrass and Vanderwart pictures in Spanish

JOSÉ MANUEL REALES, SOLEDAD BALLESTEROS, and EULALIO GARCÍA
Universidad Nacional de Educación a Distancia, Madrid, Spain

Word difficulty varies from language to language; therefore, normative data of verbal stimuli cannot be imported directly from another language. We present mean identification thresholds for the 260 screen-fragmented words corresponding to the total set of Snodgrass and Vanderwart (1980) pictures. Individual words were fragmented in eight levels using Turbo Pascal, and the resulting program was implemented on a PC microcomputer. The words were presented individually to a group of 40 Spanish observers, using a controlled time procedure. An unspecific learning effect was found showing that performance improved due to practice with the task. Finally, of the 11 psycholinguistic variables that previous researchers have shown to affect word identification, only imagery accounted for a significant amount of variance in the threshold values.

The Snodgrass and Vanderwart (1980) standardized set of pictures proved to be very useful material. Researchers used these pictures, soon after their publication, in episodic and semantic memory tasks for studying processing differences between pictures and words. The nature of the representations that mediate picture and word codes has been a central topic in cognitive psychology since the seventies. The finding of the picture superiority effect has stimulated a large number of studies to try to account for this phenomenon. As a result, different models of memory structures (e.g., Paivio, 1971) and psychological processes have been proposed (e.g., Nelson, Reed, & McEvoy, 1972; see also Bajo, Puerta-Melguizo, & Gómez-Ariza, 1999).

Over the past two decades, researchers have been very interested in perceptual identification tasks such as word-fragment completion and picture-fragment completion—in part, because they have tried to explore the status of implicit memory and its dissociations from explicit memory. Explicit memory is assessed by direct tests of memory such as recognition, free recall, and cued recall tests, whereas implicit memory is measured with a wider variety of memory tests that do not ask participants to consciously retrieve previously encoded experiences. Performance on these tests is usually assessed by using different types of perceptual identification tasks. The most outstanding feature of these tasks is that the

kind of memory assessed by this method is independent from conscious or explicit recollection of the prior study episode. The manifestation of memory assessed by perceptual identification tests is usually referred to as priming. Normally, in perceptual identification tasks, participants are presented with the complete stimulus during the study phase. Then, after some variable delay between the study and test episodes, a fragmented version of the same stimulus is presented, and participants are asked to identify it as soon as possible. The way in which stimuli are presented in the implicit-memory test varies. For example, sometimes only a few selected letters of words might be shown, as in word-fragment completion (see, e.g., Blaxton, 1989; Roediger & Challis, 1992; Tulving, Schacter, & Stark, 1982). In this test, participants are shown a fragment of a target word (e.g., *_l_p_a_t*) and are asked to complete it with the first word that comes to mind (e.g., *elephant*). Another way of presenting incomplete stimuli at test consists of showing just the word stem and asking participants to write the first word that comes to mind to complete the stem *ele_____* (see, e.g., Graf & Mandler, 1984; Weldon, Roediger, & Challis, 1989). Other researchers have presented progressively less fragmented stimuli on different cards (e.g., Gollin, 1960; Warrington & Weiskrantz, 1968). A more recent task consisted of presenting the stimuli at eight levels of fragmentation on the computer screen, each presentation corresponding to a level of stimulus fragmentation (see, e.g., Snodgrass & Corwin, 1988; Snodgrass & Poster, 1992).

In the present study, Spanish words were used in the screen fragmentation procedure developed by Snodgrass and Poster (1992) for fragmenting words. The procedure was very similar to the one used by Snodgrass and collaborators for fragmenting pictures (Snodgrass, Smith, Feenan, & Corwin, 1987; Snodgrass & Yuditsky, 1996).

This research was supported by Grant PB94-393 from the Dirección General de Investigación Científica y Técnica. Correspondence concerning this article should be addressed to J. M. Reales, Departamento de Metodología de las Ciencias del Comportamiento, or to S. Ballesteros, Departamento de Psicología Básica II, UNED, Ciudad Universitaria, s/n, 28040, Madrid, Spain (e-mail: jmreales@psi.uned.es or mballesteros@psi.uned.es).

Instead of deleting whole letters or syllables, these researchers implemented a computer program that deleted blocks of pixels from a digitized image. Since its introduction, both picture- and word-fragment completion tasks have become increasingly popular as implicit-memory tasks. Today, many researchers working in cognitive psychology, especially in perception and memory, use these materials to assess implicit memory for words as well as the experimental dissociations from explicit memory. Most of these studies have been conducted on the visual modality. Stimuli were shown visually at study and at test (see, e.g., Ballesteros, Reales, Carrasco, & García, 1997; Ballesteros, Reales, García, & Carrasco, 2001; Parkin, Reid, & Russo, 1990; Parkin & Russo, 1990; Sebastián & Menor, 1999), but sometimes stimuli were also presented tactually at study and visually at several levels of completion at test (e.g., Reales & Ballesteros, 1999).

Even though many studies used pictures and words, either fragmented or completed, as stimuli in identification paradigms, most of them have been conducted with English speakers, whereas studies in other languages have been limited in number (e.g., Jescheniak & Levelt, 1994, in German; and Bachoud-Lévi, Dupoux, Cohen, & Mehler, 1998, in French). If models of object and word recognition and memory are to have a much wider application, it will be necessary to obtain comparative data from different languages.

During the last few years, several studies with native Spanish speakers have used the Snodgrass and Vanderwart (1980) pictures. For example, Sanfeliu and Fernández (1996) presented normative data for the set of 254 Snodgrass–Vanderwart pictures and showed that object names that are common in English were not so common in Spanish, and vice versa. More recently, Cuetos, Ellis, and Alvarez (1999) collected naming-time norms for a set of 140 drawings from the same set of pictures. Results showed that age of acquisition, object familiarity, image agreement, and name agreement were factors that emerged as significant determinants of picture-naming speed.

Other visual studies conducted with native Spanish speakers were designed to assess the role of attention in implicit and explicit memory by using picture-fragment completion as the implicit-memory test in a screen-fragmentation computerized version (Ballesteros et al., 1997; Ballesteros et al., 2001). This test has also been used with Spanish speakers in a booklet format to see whether the four forms of Snodgrass and Corwin's (1988) fragmented pictures were equivalent for Spanish observers (Sebastián & Menor, 1999). Moreover, picture-fragment completion in Spanish has been used to make inferences about mental representations underlying implicit memory for objects processed by vision alone and cross-modally—from tactually presented 3-D objects to visually fragmented pictures (Reales & Ballesteros, 1999, Experiment 2).

As far as we know, no one has collected normative data for screen-fragmented words in Spanish. In this paper, we report a study in which 40 Spanish participants iden-

tified the 260 fragmented words corresponding to the Snodgrass–Vanderwart (1980) pictures. The identification thresholds for these Spanish words together with those corresponding to the American study are presented in the Appendix. Other indexes such as the kurtosis, skewness, and range of word distributions are also provided. In addition, we examined whether there is unspecific learning as well as the influence of 11 psycholinguistic variables that in the literature have accounted for some of the variance in word-identification performance. These variables were number of meanings, written frequency, number of letters, number of syllables, imagery, meaningfulness, number of attributes, concreteness, category membership, familiarity, and pleasantness. From all these variables, imagery was the only index that accounted for a significant amount of variance in the threshold values.

METHOD

Participants

Forty participants, 18 to 21 years old, voluntarily participated in a 50–60-min experimental session. All had normal or corrected-to-normal vision and were naive as to the purpose of the study. All the participants were native Spanish speakers, and they had never participated in any other perception or cognition experiment.

Apparatus and Materials

The experimental stimuli were the Spanish translations of the 260 English words corresponding to the original Snodgrass and Vanderwart (1980) pictures. The Spanish words corresponded to the 250 English words used by Snodgrass and Poster (1992) plus 10 more to cover the total picture set. Of the 260 word names, 1 was a two-word phrase, and 7 were three-word phrases. The total set of 260 words was divided into two subsets (Subsets A and B) of 130 words each by assigning odd-numbered stimuli to one subset and even-numbered stimuli to the other subset. Each subset was presented to half of the participants. The Spanish word varied from 3 to 15 letters, whereas the English words varied from 3 to 12 letters in length. The experimental stimuli were presented in a different random order for each participant.

The stimuli were shown on a 14-in. SVGA color monitor interfaced with an IBM-compatible microcomputer. The resolution of the monitor was 640×480 pixels. The stimuli were presented black on white. The palette entry for white was (255, 255, 255) and for black was (0, 0, 0) in an RGB coding scheme.

The procedure used to fragment the stimuli for word presentation was similar to the one used by Snodgrass and Poster (1992) but the program was written in Pascal for PCs instead of for Apple Macintosh microcomputers. The first thing we did was fragment the stimuli and store them as images in PCX format. Then, we presented them on the PC monitor in an ascending method of limits presentation. In order to fragment the stimuli, each word was printed in uppercase New Times Roman typeface in 28-point size. Each word was located at the center of the computer screen. The surface containing the word was divided into square blocks of 8×8 pixels, and the black blocks containing letter information were identified. Finally, each word was stored as a fragmented image at eight different levels of completion (see Figure 1). The eight different levels of fragmented words were stored in order to be used in the experiment in a proper ascending method of presentation. Level 1 corresponded to the most fragmented word, whereas Level 8 was the complete word.

The rate at which pixel blocks were added followed the exponential function provided by Snodgrass and Poster (1992). This means that the proportion of pixel blocks presented at each fragmentation level followed the function $P = 0.7^{(8-\text{level})}$.

Figure 1. Examples of three fragmented words at the eight fragmentation levels. Level 1 (the most fragmented stimuli) is shown at the top, and Level 8 (the completed stimuli) is shown at the bottom.

Procedure

The participants were tested individually in a quiet room. They were given a short description of the task and were seated in front of the computer, about 50 cm away from the computer screen. The participants read the instructions displayed on the screen, which said that they would be presented with a series of fragmented words and that they would have to identify them as early in the sequence of presentation as possible. The instructions informed the participants that all the words corresponded to names of familiar objects and animals. The participants were presented with one stimulus at a time starting at Level 1. If the participant did not provide the correct answer in 1.5 sec, a progressively less fragmented word appeared on the screen (Level 2). The procedure was repeated until the correct answer was provided or until Level 8 was reached. One difference from the procedure used by Snodgrass and Poster (1992) is necessary to mention. These researchers instructed their participants that the first presentation of the stimuli would be the most fragmented and that they should try to identify the word. If the participants could not identify the word at this level, they were to press the return key and go to the next level of completion. The participants performed the task at their own pace. This procedure was repeated until the word was correctly identified. In the present study, we used a procedure that has previously been used in our laboratory in other implicit-memory studies (e.g., Ballesteros et al., 1997; Ballesteros et al., 2001; Reales & Ballesteros, 1999). The main difference from the Snodgrass (Snodgrass & Poster, 1992; Snodgrass et al., 1987) studies was that stimulus presentation at each fragmentation level was timed. Once the first fragmented stimulus appeared on the screen, if the participant was not able to identify it correctly in 1.5 sec, the next, more complete version of the stimulus was presented automatically. The same procedure was repeated until the participant provided the correct answer. The participants were asked to press the space bar of the keyboard as soon as they identified the word. A prompt on the screen indicated that they should type the word. The presentation sequence “froze” when the space bar was pressed until the participant typed the word. If the name was incorrect, the computer beeped and the word at the next fragmentation level was

automatically displayed on the computer screen. We introduced this modification because, as was pointed out, picture- and word-fragment completion tasks are mostly used as implicit-memory tests. As Snodgrass et al. (1987) recognized, the participants could use explicit retrieval strategies in performing the task. Our procedure constrained retrieval more explicitly as the time allowed to identify the stimuli at each fragmentation level, and the timing was not under the participant's control. Instead, it was the computer program that controlled the level of fragmentation and presentation rate (for further discussion, see Reales & Ballesteros, 1999, pp. 654–655).

On each trial, the computer automatically recorded the level at which each word was correctly identified. The participant's threshold for each word was defined as the fragmentation level at which he or she correctly identified the word. At the end of the session, they were debriefed and the experimenter answered all their questions about the experiment.

The participants committed two types of errors: typing errors (e.g., *regadera* vs. *recedera*—the last one is a pseudoword in Spanish) and anticipation errors (e.g., *cuervo* vs. *ciervo*—both are words in Spanish). Typing errors accounted for less than 1% of errors and were corrected by the experimenter. The threshold was the fragmentation level at which the participant produced a typing error. Anticipation errors accounted for approximately 8% of errors in the total number of trials. In this case, the correct threshold was the fragmentation level at which the correct response was given.

RESULTS AND DISCUSSION

The mean thresholds corresponding to the two subsets of words were 4.41 and 4.63. These two mean thresholds were not significantly different. The reliability of the two subsets of words was very high (Subset A $r_{xx'} = .99$, $\alpha = .96$; Subset B $r_{xx'} = .97$, $\alpha = .92$), showing that the error term was very small.

Figure 2. The unspecified learning effect. Each curve represents the mean threshold as a function of trial number.

The mean thresholds corresponding to each individual word are shown in the Appendix. As in the United States study, the variation in individual thresholds was very large, going from the lowest (1.80 for *pan-bread*) to the highest (7.60 for *rueca-spinning wheel*). The total range was similar to that in Snodgrass and Poster (1992) (1.20 for *apple-manzana*, and 7.05 for *harp-arpa*). Note that our lowest threshold was 0.60 higher than theirs, and our highest threshold was 0.55 higher than that in the English study. As is shown in the Appendix, there were stimuli that were very easy to identify, although others were very difficult. Some words were identified at a very fragmented level (e.g., *pan* $\times$ *bread*; *mano* $\times$ *hand*; or *rana* $\times$ *frog*), whereas other words were identified at a very complete level (e.g., *valla* $\times$ *wall*, *rueca* $\times$ *spinning wheel*). As we pointed out in the Procedure section, the half a threshold difference might depend on the procedure modification that we introduced (see above).

Unspecific Learning Effect

The main goal of the present study was to obtain the mean thresholds for Spanish words, so that this information could be used to select words for repetition priming experiments. Repetition priming as a measure of implicit memory is a specific effect of the experience with previously presented words. However, performance of the task itself can show an unspecific learning effect. That is, performance might improve due to practice with the task. The regression analysis between the trial sequence and the threshold showed a significant lineal relation. The slope of the least square line was -0.005 and the intercept was 4.75 . A t test showed that both values were significantly different from 0 ($p < .001$). The goodness of fit of the lineal model shows a coefficient of determination of $R^2 = .22$ and $.007$ for the even and odd stimuli, respectively. The corresponding analysis of variance (ANOVA) showed a significant linear regression [$F(1,63) = 17.70$,

$MS_e = 0.1368$, $p < .001$; $F(1,63) = 5.29$, $MSe = 0.1414$, $p < .02$]. Figure 2 shows the mean thresholds as a function of trial number and stimuli subset (even and odd stimuli). Every point reflects the mean thresholds as a function of trial number irrespective of the specific stimuli.

The positive relation between trial number and mean threshold shows an unspecific learning effect of typeface. This unspecific learning effect could have occurred because the typeface was the same at all experimental trials. Further work would be needed to explore whether the effect would persist after changing typeface across trials.

Psycholinguistic Variables That Affect Fragmented Word Identification

A number of recent psycholinguistic studies have been conducted to obtain normative data for Spanish words (e.g., Alameda & Cueto, 1995). Among them is the investigation conducted by Algarabel and his associates (e.g., Algarabel, 1996; Algarabel, Ruiz, & Sanmartín,

Table 1
Coefficient of Determination (r^2), F , p , and MS_e Values Among Identification Thresholds and Psycholinguistic Variables

Psycholinguistic Variables	R^2	F	p	MS_e
Frequency in print	.00006	0.004	.946	1.116
Number of syllables	.01991	1.604	.209	1.070
Number of meanings	.00020	0.015	.901	1.104
Number of letters	.00013	0.010	.917	1.091
Imagery	.03774*	3.098*	.082*	1.049*
Meaningfulness	.00029	0.022	.880	1.092
Number of attributes	.00435	0.345	.558	1.086
Concreteness	.01004	0.801	.374	1.080
Categorizability	.01525	1.223	.272	1.074
Familiarity	.02822	2.294	.134	1.060
Pleasantness	.01300	1.040	.311	1.077

Note—Degrees of freedom for all psycholinguistic variables were 1 and 78. *Correlation marginally significant.

1988). As is shown in the Appendix, some words are easier to identify than others in English as well as in Spanish. Snodgrass and Poster (1992) considered in their paper three variables that previous studies have shown to have a significant effect on several word-recognition paradigms. These variables were frequency in print, word length, and neighborhood size. In this paper we have considered frequency in print and word length plus nine other psycholinguistic indexes. All of them were taken from the Algarabel norms. Frequency in print, number of letters, number of syllables, and number of meanings were objective indexes that were obtained mechanically by counting the number of letters or syllables in each word, or the number of different entries for each word in the *Diccionario de la Real Academia*. Frequency in print was obtained from the Juilland and Chang-Rodriguez (1964) norms. The rest of the variables were subjective indexes (image agreement, number of attributes, concreteness, meaningfulness, familiarity, categorizability, and pleasantness). These values were taken from judgments obtained from large samples of participants. Approximately only one third of the words were from the Algarabel norms, all of which were entered into the present analysis. Since this study was not specifically designed to investigate these psycholinguistic variables, results from this analysis should be considered with caution.

We calculated the correlation coefficients (Pearson r) between the obtained thresholds and the psycholinguistics indexes mentioned above for those words that were available in the Algarabel (1996) norms. The number of words that were entered into these calculations was 83. In the Appendix, these words are marked with an asterisk. All the stimuli were single words. Table 1 shows the correlation between each of these psycholinguistic variables and identification thresholds; F values, p values, and MS_e s are also provided.

Table 1 shows that the only psycholinguistic index that correlated (marginally significant) with identification threshold was imagery [$F(1,78) = 3.098$, $MS_e = 1.049$, $p < .08$]. Our results are in agreement with Snodgrass and Poster's (1992) findings. Neither frequency in print nor number of letters was significantly related to identification threshold.

CONCLUSION

The main goal of the present study was to obtain Spanish norms for identification thresholds corresponding to 260 individually fragmented Spanish words. These words were the Spanish translations of the Snodgrass and Vanderwart (1980) pictures. These data could be used in implicit-memory studies with Spanish-speaking observers. The present data allow researchers to select words for their priming experiments more accurately in terms of their similar or dissimilar identification difficulty.

The present data might also be useful not only in word-priming studies with Spanish samples, but with picture-word intermodal repetition priming studies, as well as in semantic priming research. In the former, either pictures

or words were presented at study and at test. In the latter, the pictures and words were used as primes or targets, respectively.

Our results showed that both practice and imagery affected word-fragment completion. Any theoretical model of picture and word representation and processing should consider these results.

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APPENDIX

ID Numbers (From the Original Set), the Most Common Spanish Name, the English Name (From Snodgrass & Vanderwart's, 1980, set), Thresholds for the 260 Names of Pictures, Standard Deviations (SD), Kurtosis, Skewness, and Range From the Spanish Study

ID	English	Threshold	Spanish	Threshold	SD	Kurtosis	Skewness	Range
1	Accordion	3.90	Acordeón	4.00	1.974	2.757	1.643	7
2	Airplane	3.90	Avión*	4.40	1.188	0.254	0.159	5
3	Alligator	3.40	Cocodrilo	5.45	1.191	-1.528	0.028	3
4	Anchor	-	Ancla	4.10	1.373	0.249	0.887	5
5	Ant	3.45	Hormiga	5.60	1.231	1.755	0.872	5
6	Apple	1.20	Manzana	3.90	2.075	0.388	0.698	8
7	Arm	4.25	Brazo*	5.55	1.234	2.337	-1.247	5
8	Arrow	2.90	Flecha*	5.45	0.999	0.984	0.681	4
9	Artichoke	3.20	Alcachofa	6.45	1.146	0.532	-0.331	5
10	Ashtray	4.00	Cenicero	5.45	1.504	0.553	0.158	6
11	Asparagus	2.90	Espárrago	5.40	1.789	-1.096	-0.186	6
12	Axe	5.05	Hacha*	6.85	1.348	-0.247	0.015	5
13	Baby carriage	4.35	Carricoche	3.95	1.191	1.057	0.936	5
14	Ball	5.25	Pelota	4.10	1.071	-0.197	-0.502	4
15	Balloon	3.90	Globo*	3.50	1.192	0.190	-0.104	5
16	Banana	3.00	Plátano	4.15	1.872	0.706	0.669	7
17	Barn	3.05	Granero	5.35	0.875	-0.337	0.250	3
18	Barrel	3.50	Tonel	5.40	0.995	-1.061	-0.228	3
19	Baseball bat	4.55	Bate	6.70	0.801	2.256	1.309	3
20	Basket	3.15	Cesta	4.90	1.210	-0.621	1.003	3
21	Bear	3.60	Oso	4.20	1.361	-0.952	0.712	4
22	Bed	2.85	Cama*	3.70	1.380	1.102	0.870	6
23	Bee	6.20	Abeja*	4.85	1.182	1.611	1.169	5
24	Beetle	5.40	Cucaracha	3.30	1.418	-1.117	-0.347	4
25	Bell	6.35	Campana*	4.05	1.538	0.207	-0.478	6
26	Belt	5.30	Cinturón	5.50	1.792	-0.363	-0.671	6
27	Bicycle	2.75	Bicicleta	5.75	1.293	1.845	0.518	6
28	Bird	4.70	Pájaro*	2.15	1.899	9.139	2.834	8
29	Blouse	4.85	Blusa	4.65	1.461	-0.813	-0.442	5
30	Book	2.90	Libro*	5.05	2.012	0.076	-0.463	8
31	Boot	5.05	Bota	3.40	0.598	0.783	1.245	2
32	Bottle	4.95	Botella*	4.05	1.356	-1.248	-0.100	4
33	Bow	4.90	Lazo*	4.00	1.298	-1.196	0.161	4
34	Bowl	2.05	Cuenco	5.10	2.198	-1.309	0.024	7
35	Box	2.85	Caja*	3.35	0.875	2.176	-0.274	4
36	Bread	5.60	Pan	1.80	0.894	0.224	0.922	3
37	Broom	4.00	Escoba	4.60	0.681	-0.446	0.712	2
38	Brush	4.30	Cepillo	4.45	1.191	-0.753	-0.388	4
39	Bus	4.85	Autobús	5.00	1.451	-1.127	-0.115	4
40	Butterfly	4.20	Mariposa	4.50	1.792	-1.372	-0.122	5
41	Button	-	Botón	4.90	2.125	-0.822	0.218	8
42	Cake	2.25	Tarta	3.85	1.599	-0.634	0.099	6
43	Camel	5.25	Camello	4.90	2.673	-1.198	-0.065	8

APPENDIX (Continued)

ID	English	Threshold	Spanish	Threshold	SD	Kurtosis	Skewness	Range
44	Candle	3.05	Vela*	2.80	1.508	0.263	0.991	5
45	Cannon	—	Cañón	4.50	3.253	-1.549	0.571	8
46	Cap	1.95	Gorra	2.40	1.429	0.299	0.885	5
47	Car	3.95	Automóvil*	3.65	0.988	-0.770	-0.283	3
48	Carrot	4.80	Zanahoria	5.15	1.182	-0.653	0.318	4
49	Cat	1.75	Gato*	3.70	0.801	1.415	-1.418	3
50	Caterpillar	2.95	Gusano*	2.90	1.553	-0.198	0.840	5
51	Celery	3.85	Apio	5.40	1.818	-0.763	0.325	6
52	Chain	5.15	Cadena*	5.80	1.399	0.407	0.010	6
53	Chair	3.55	Silla*	3.95	1.146	-0.373	0.573	4
54	Cherry	5.70	Cereza	4.35	1.309	1.798	1.303	5
55	Chicken	5.20	Pollo*	5.20	0.951	6.812	-1.662	5
56	Chisel	5.30	Cincel	5.25	1.585	-0.838	-0.369	5
57	Church	5.05	Iglesia*	5.75	1.682	0.508	-0.668	7
58	Cigar	4.55	Puro	5.80	0.951	6.812	1.662	5
59	Cigarette	3.85	Cigarro	3.35	1.226	-1.047	-0.185	4
60	Clock	3.45	Reloj	4.30	1.302	-0.242	-0.146	5
61	Clothespin	4.00	Pinza	3.50	1.192	-0.668	0.311	4
62	Cloud	5.05	Nube*	2.65	1.927	0.111	1.144	6
63	Clown	3.80	Payaso	4.70	1.949	0.402	1.086	6
64	Coat	1.95	Abrigo*	5.65	1.268	2.322	-1.321	5
65	Comb	3.95	Peine	4.90	1.373	-0.435	-0.073	5
66	Corn	2.80	Maiz	3.95	1.356	-1.248	0.100	4
67	Couch	3.85	Sofá	4.00	0.918	0.536	-0.908	3
68	Cow	3.75	Vaca	4.10	1.071	0.330	-0.217	4
69	Crown	1.55	Corona*	3.65	1.137	2.905	1.260	5
70	Cup	2.10	Taza*	3.70	1.559	1.375	1.020	6
71	Deer	4.90	Ciervo	6.00	1.026	3.241	0.975	5
72	Desk	4.30	Escritorio	5.20	1.005	-0.490	0.594	3
73	Dog	4.00	Perro*	5.45	1.761	-0.948	-0.325	6
74	Doll	4.60	Muñeca*	5.20	2.858	-1.611	0.393	7
75	Donkey	4.05	Burro	2.75	1.482	0.499	0.909	5
76	Door	5.15	Puerta	4.70	1.261	0.532	0.459	5
77	Doorknob	4.25	Picaporte	5.65	0.745	0.082	-0.151	3
78	Dress	5.15	Vestido*	3.65	1.531	-0.227	0.955	5
79	Dresser	5.00	Cómoda	3.85	1.531	-0.543	-0.405	5
80	Drum	2.25	Tambor	3.80	1.881	2.001	1.270	8
81	Duck	1.80	Pato	4.50	1.732	0.789	-0.473	7
82	Eagle	6.25	Águila*	4.75	2.124	0.484	0.144	8
83	Ear	4.50	Oreja*	4.80	1.576	-0.577	0.007	5
84	Elephant	3.75	Elefante	5.35	1.565	0.677	0.263	7
85	Envelope	2.80	Sobre	5.65	1.954	-1.164	-0.392	6
86	Eye	6.45	Ojo*	3.60	2.186	-1.112	0.270	7
87	Fence	2.25	Valla	7.50	1.539	-0.381	-0.770	5
88	Finger	2.95	Dedo	5.05	1.317	3.890	-1.637	6
89	Fish	4.80	Pez*	5.80	0.696	-0.734	0.292	2
90	Flag	2.75	Bandera*	5.05	1.432	3.017	-1.890	5
91	Flower	5.10	Flor*	4.60	1.429	1.131	-0.885	6
92	Flute	4.10	Flauta	5.25	2.173	-0.995	0.566	6
93	Fly	2.75	Mosca*	2.45	1.276	-0.303	0.714	4
94	Foot	4.50	Pie*	5.20	1.963	0.851	-0.635	8
95	Football	3.15	Balón de rugby	6.20	0.834	1.080	-1.018	3
96	Football helmet	—	Casco	4.15	1.040	0.784	-0.328	4
97	Fork	5.55	Tenedor	5.50	0.688	0.083	0.000	3
98	Fox	2.85	Zorro	3.80	1.508	0.263	-0.033	6
99	French horn	4.65	Trombón	5.55	1.276	-0.303	-0.714	4
100	Frog	2.20	Rana	2.55	1.572	0.643	1.207	5
101	Frying pan	6.35	Sartén	3.55	1.191	0.195	-0.028	5
102	Garbage can	5.40	Cubo basura	5.35	1.461	2.746	1.455	6
103	Giraffe	4.05	Jirafa	4.90	1.334	-0.872	0.053	4
104	Glass	5.65	Vaso	4.25	1.293	3.242	0.944	6
105	Glasses	4.40	Gafas	3.70	0.865	2.378	0.119	4
106	Glove	3.90	Guante*	4.40	1.930	0.525	0.388	8
107	Goat	3.70	Cabra*	4.40	1.046	0.313	-0.012	4
108	Gorilla	4.70	Gorila	4.60	1.273	-0.650	0.517	4
109	Grapes	1.95	Uvas	4.60	1.142	1.029	-0.979	4
110	Grasshopper	4.55	Saltamontes	4.20	1.240	0.361	0.133	5
111	Guitar	4.60	Guitarra*	4.65	1.424	-1.194	-0.155	5
112	Gun	3.45	Pistola*	3.50	1.906	-0.421	0.761	6

APPENDIX (Continued)

ID	English	Threshold	Spanish	Threshold	SD	Kurtosis	Skewness	Range
113	Hair	3.50	Cabello*	4.00	0.858	-0.080	0.555	3
114	Hammer	1.75	Martillo*	3.35	2.084	-0.265	0.759	7
115	Hand	2.70	Mano	1.85	0.671	-0.548	0.177	2
116	Hanger	4.45	Percha	4.75	1.020	0.849	0.890	4
117	Harp	7.05	Arpa	3.75	1.970	-1.171	0.112	6
118	Hat	4.95	Sombrero*	2.75	1.118	0.027	0.549	4
119	Heart	3.20	Corazón	2.00	0.795	-1.366	0.000	2
120	Helicopter	4.90	Helicóptero	5.05	1.432	-0.469	0.382	5
121	Horse	3.65	Caballo*	3.80	1.281	-1.150	-0.253	4
122	House	5.95	Casa*	3.40	1.603	2.440	1.054	7
123	Iron	3.60	Plancha	3.45	1.432	4.791	1.486	7
124	Ironing board	4.50	Tabla plancha	5.35	1.631	-0.873	0.176	5
125	Jacket	2.30	Chaqueta	3.55	1.099	0.102	-0.802	4
126	Kangaroo	3.40	Canguro	3.25	1.650	-1.011	0.493	5
127	Kettle	3.85	Tetera	6.45	1.504	-0.821	0.055	5
128	Key	2.75	Llave*	3.25	1.743	-0.412	0.766	6
129	Kite	3.75	Cometa	2.80	1.542	-0.586	0.562	5
130	Knife	3.80	Cuchillo	4.55	1.731	1.064	0.786	7
131	Ladder	4.50	Escalera*	5.20	1.936	-0.862	-0.459	6
132	Lamp	4.35	Lámpara*	4.05	1.356	2.595	1.307	6
133	Leaf	2.55	Hoja*	5.10	0.912	7.675	-1.601	5
134	Leg	5.35	Pierna*	6.25	1.446	-0.219	0.094	5
135	Lemon	1.60	Limón*	3.55	1.099	4.321	1.577	5
136	Leopard	6.55	Leopardo	5.65	1.755	-0.515	0.339	6
137	Lettuce	3.40	Lechuga	5.05	0.887	-0.246	-0.607	3
138	Light bulb	4.85	Bombilla	4.85	1.814	0.525	0.834	7
139	Light switch	6.60	Interruptor	5.15	1.461	0.101	-0.062	6
140	Lion	2.55	León*	4.55	2.212	-1.216	-0.593	6
141	Lips	4.50	Labios	5.80	1.542	4.959	-1.063	8
142	Lobster	5.00	Langosta	3.20	1.240	-0.814	-0.236	4
143	Lock	5.60	Candado	4.25	1.070	0.892	0.877	4
144	Mitten	6.05	Manopla	3.25	1.118	0.305	0.706	4
145	Monkey	5.00	Mono	2.65	0.813	-0.406	0.113	3
146	Moon	2.35	Luna*	3.10	2.075	2.128	1.423	8
147	Motorcycle	3.25	Moto	5.65	1.309	1.502	0.262	6
148	Mountain	3.50	Montaña*	2.85	1.725	-0.893	0.666	5
149	Mouse	4.45	Ratón	2.45	0.686	0.151	0.198	3
150	Mushroom	3.00	Seta	4.45	1.504	-0.821	0.055	5
151	Nail	4.10	Clavo*	3.60	0.754	-0.073	0.033	3
152	Nail file	5.65	Lima	5.50	1.638	2.439	-0.598	8
153	Necklace	3.95	Collar*	5.45	0.945	1.277	-0.674	4
154	Needle	3.55	Aguja*	4.95	1.356	0.802	0.100	6
155	Nose	3.60	Nariz*	4.20	1.240	0.654	-0.236	5
156	Nut	3.30	Tuerca	4.40	1.698	0.075	0.155	7
157	Onion	4.85	Cebolla	4.40	1.569	2.743	1.521	6
158	Orange	5.00	Naranja	3.25	1.164	0.075	0.792	4
159	Ostrich	4.30	Avestruz	4.15	1.387	-1.045	-0.428	4
160	Owl	4.25	Búho	6.50	2.164	1.739	-1.419	8
161	Paint brush	4.90	Píncel	4.80	1.473	-1.315	0.382	4
162	Pants	4.25	Pantalón*	3.45	1.395	-0.144	0.114	5
163	Peach	2.05	Melocotón	2.80	1.056	-0.755	0.441	4
164	Peacock	3.60	Pavo real	6.00	1.622	-0.764	0.000	6
165	Peanut	3.90	Cacahuete	4.80	0.768	-1.131	0.372	2
166	Pear	3.75	Pera	2.65	1.785	2.949	1.454	7
167	Pen	3.05	Bolígrafo	4.00	1.170	1.630	0.658	5
168	Pencil	1.95	Lápiz*	3.75	1.860	-0.988	0.187	6
169	Penguin	2.60	Pingüino	5.15	1.309	0.262	-0.775	5
170	Pepper	3.10	Pimiento	6.00	1.622	1.113	-0.247	7
171	Piano	2.25	Piano*	3.45	2.089	0.409	0.982	7
172	Pig	1.85	Cerdo	4.30	2.203	-0.748	0.429	8
173	Pineapple	2.85	Piña	5.95	2.743	-1.538	-0.180	7
174	Pipe	2.40	Pipa	5.40	1.273	2.517	0.843	6
175	Pitcher	3.85	Jarra	4.45	1.504	1.214	0.055	7
176	Pliers	6.25	Alicates	4.45	1.356	-0.889	0.047	5
177	Plug	3.90	Enchufe	5.35	1.496	0.041	-0.987	5
178	Pocketbook	5.20	Bolso*	3.75	1.482	-0.399	-0.168	5
179	Pot	2.80	Cazo	5.30	1.174	-0.369	-0.654	4
180	Potato	3.15	Patata*	3.55	1.234	-0.315	0.805	4
181	Pumpkin	3.00	Calabaza	3.75	1.118	-1.360	-0.204	3

APPENDIX (Continued)

ID	English	Threshold	Spanish	Threshold	SD	Kurtosis	Skewness	Range
182	Rabbit	3.90	Conejo*	2.10	1.210	0.189	0.979	4
183	Raccoon	3.35	Mapache	5.35	0.813	-0.406	-0.113	3
184	Record player	5.90	Tocadiscos	4.10	1.210	-0.621	-0.012	4
185	Refrigerator	2.60	Frigorífico	6.05	1.317	2.564	-0.716	6
186	Rhinoceros	5.50	Rinoceronte	4.55	1.731	0.668	0.853	7
187	Ring	1.85	Anillo	6.25	2.197	-0.854	-0.750	7
188	Rocking chair	4.55	Mecedora	4.25	1.618	-0.706	0.378	5
189	Roller skate	3.75	Patín	5.65	1.226	3.099	0.947	6
190	Rolling pin	5.75	Rodillo	5.85	0.875	1.437	-1.255	3
191	Rooster	2.55	Gallo	3.60	0.940	0.976	0.945	4
192	Ruler	3.50	Regla*	5.50	1.318	1.041	-0.766	5
193	Sailboat	5.70	Velero	7.00	0.324	9.500	0.000	2
194	Salt shaker	5.80	Salero	4.30	1.031	0.282	-0.038	4
195	Sandwich	2.55	Sandwich	4.60	1.046	0.168	0.319	4
196	Saw	3.55	Sierra*	6.35	0.671	0.736	0.613	3
197	Scissors	4.25	Tijeras	4.05	1.191	-0.925	0.310	4
198	Screw	3.30	Tornillo	2.80	1.281	-0.828	0.580	4
199	Screwdriver	5.95	Destornillador	4.25	1.333	-0.085	-0.213	5
200	Seahorse	5.15	Caballito de mar	5.80	1.704	0.170	-0.434	7
201	Seal	4.20	Foca	5.10	1.683	-0.263	-0.763	5
202	Sheep	4.65	Oveja	3.15	1.927	-0.781	0.696	6
203	Shirt	4.00	Camisa*	2.50	0.761	-0.037	0.398	3
204	Shoe	3.70	Zapato*	2.75	1.372	0.085	0.773	5
205	Skirt	4.00	Falda	4.65	2.059	-1.378	-0.238	6
206	Skunk	4.80	Mofeta	4.65	1.089	-1.125	-0.292	3
207	Sled	5.70	Trineo	5.60	1.142	4.286	-1.449	5
208	Snail	2.30	Caracol	3.90	2.404	-1.700	0.156	6
209	Snake	3.30	Serpiente*	5.25	1.410	1.848	0.634	6
210	Snowman	3.60	Muñeco de nieve	7.05	1.959	-0.937	-0.590	6
211	Sock	3.00	Calcetín	3.10	0.912	0.154	0.713	3
212	Spider	6.15	Araña	4.70	3.097	-1.411	0.525	8
213	Spinning wheel	-	Rueca	7.60	1.789	2.155	-1.775	6
214	Thread	4.50	Bobina	4.05	1.050	-0.360	0.801	3
215	Spoon	3.35	Cuchara	4.60	0.681	0.362	-0.401	3
216	Squirrel	3.70	Ardilla	4.35	1.268	-0.696	-0.400	4
217	Star	3.70	Estrella*	5.80	0.768	-1.131	0.372	2
218	Stool	3.30	Taburete	3.25	1.118	-0.528	-0.047	4
219	Stove	5.20	Cocina*	4.45	0.999	0.723	-0.376	4
220	Strawberry	4.15	Fresa	3.95	2.544	-0.956	0.574	8
221	Suitcase	3.05	Maleta	4.85	1.694	-1.652	-0.245	5
222	Sun	2.55	Sol*	3.05	1.317	-0.232	0.360	5
223	Swan	5.15	Cisne	3.35	1.725	-1.402	0.350	5
224	Sweater	3.20	Jersey	5.75	1.020	-0.755	-0.435	3
225	Swing	4.05	Columpio	5.10	1.483	-0.093	0.026	6
226	Table	4.30	Mesa*	4.45	1.099	5.034	1.594	5
227	Telephone	3.35	Teléfono*	3.05	1.395	2.194	1.325	6
228	Television	4.10	Televisor	5.95	1.356	3.799	-1.729	6
229	Tennis racket	3.50	Raqueta	4.20	1.473	-1.204	-0.273	4
230	Thimble	5.35	Dedal	4.15	0.933	4.408	1.833	4
231	Thumb	3.10	Pulgar	4.20	1.105	0.069	-0.437	4
232	Tie	6.60	Corbata*	4.40	1.142	0.826	0.508	5
233	Tiger	1.95	Tigre	6.10	1.447	-0.168	0.618	5
234	Toaster	4.00	Tostador	5.85	1.226	0.104	-1.019	4
235	Toe	3.75	Uña*	4.35	3.249	-1.352	0.695	8
236	Tomato	3.50	Tomate	4.15	1.137	1.140	0.632	5
237	Toothbrush	5.00	Cepillo de dientes	6.85	1.309	3.334	-1.103	6
238	Top	3.45	Peonza	3.50	1.469	-0.634	0.775	4
239	Traffic light	-	Semáforo	3.50	1.235	-0.896	0.372	4
240	Train	3.40	Tren*	4.75	1.997	-0.709	-0.807	6
241	Tree	3.45	Arbol	2.20	1.322	1.128	1.416	4
242	Truck	4.75	Camión	5.75	1.020	0.047	0.228	4
243	Trumpet	2.40	Trompeta	4.65	1.309	0.587	-0.208	5
244	Turtle	-	Tortuga	4.60	1.273	1.923	0.687	6
245	Umbrella	5.10	Paraguas	3.05	1.191	1.186	0.518	5
246	Vase	2.15	Jarrón	3.80	1.963	-1.333	0.124	6
247	Vest	2.40	Chaleco	6.30	0.801	-0.267	0.055	3
248	Violin	3.75	Violín	3.80	2.067	-0.995	0.337	6
249	Wagon	3.85	Carro*	4.55	1.638	1.355	0.820	7
250	Watch	4.45	Reloj de pared	5.85	1.694	-0.495	0.476	6

APPENDIX (Continued)

ID	English	Threshold	Spanish	Threshold	<i>SD</i>	Kurtosis	Skewness	Range
251	Watering can	5.20	Regadera	5.90	1.071	2.174	-1.496	4
252	Watermelon	2.85	Sandía	5.60	1.698	0.825	-0.585	7
253	Well	—	Pozo	4.05	1.986	-1.371	-0.345	6
254	Wheel	5.80	Rueda*	4.40	1.536	-0.195	-0.372	6
255	Whistle	4.15	Silbato	5.95	0.826	0.534	0.722	3
256	Windmill	—	Molino*	4.15	1.387	0.032	-0.691	5
257	Window	4.55	Ventana*	5.00	0.725	-0.931	0.000	2
258	Wineglass	4.90	Copa	6.15	0.988	0.321	-1.056	3
259	Wrench	3.25	Llave fija	6.90	1.334	10.194	-2.609	7
260	Zebra	—	Cebra	4.90	2.049	0.284	-0.503	8
	Mean	3.98		4.52	1.41	0.45	0.14	5.06
	Min	1.20		1.80	0	-2	-3	2
	Max	7.05		7.60	3	10.19	3	8
	<i>SD</i>	1.19		1.12	0.46	1.83	0.77	1.50

Note—The ID is the identifying number of the picture named by the word from Snodgrass and Vanderwart (1980).

(Manuscript received October 23, 2000;
revision accepted for publication December 15, 2001.)