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A SET OF 400 PICTURES STANDARDIZED FOR FRENCH: NORMS FOR NAME AGREEMENT, IMAGE AGREEMENT, FAMILIARITY, VISUAL COMPLEXITY, IMAGE VARIABILITY, AND AGE OF ACQUISITION

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Short title: Pictures standardized for French.

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ABSTRACT

The present article provides French normative measures for 400 line drawings taken from Cycowicz, Friedman, Rothstein, and Snodgrass (1997), including the 260 line drawings that were normed by Snodgrass and Vanderwart (1980). The pictures have been standardized on the following variables: name agreement, image agreement, familiarity, visual complexity, image variability, and age of acquisition. These normative data also include word frequency values and the first verbal associate (taken from Ferrand & Alario, 1998). The six variables obtained are important because of their potential effect in many fields of psychology, especially the study of cognitive processes such as visual perception, language and memory.

In recent years, experiments employing pictures of objects have proliferated. However, little standardization of line drawings exists. To date, each investigator has been forced to develop his or her own set of pictures, which are necessarily highly idiosyncratic (Snodgrass, Levy-Berger, & Haydon, 1985). One exception is the pioneering work of Snodgrass and Vanderwart (1980). These authors have provided a set of 260 pictures (black and white line drawings) that have been standardized on four variables of relevance to experimentation in visual perception, language, and memory. The four variables collected were name agreement (the degree to which subjects agree on the name of the picture), image agreement (the degree to which images generated by subjects to a picture's name agree with the picture's appearance), familiarity (the familiarity of the concept depicted), and visual complexity (the amount of lines and details in the drawing). These normative data for pictures were collected in American English for young adults.

Since then, other normative data for pictures have been collected by Berman, Friedman, Hamberger, and Snodgrass (1989) for 5- and 6-year-old children, and by Cycowicz, Friedman, Rothstein, and Snodgrass (1997) for 8- to 10-year-old children. More recently, these normative data have also been collected for adults in British English (Barry, Morrison, & Ellis, 1997; Vitkovitch & Tyrell, 1995), in Spanish (Sanfeliu & Fernandez, 1996) and in Dutch (Martein, 1995). However, to our knowledge, there is no such normative database available in French. Because it is vital for the experimenter to have as much control of the experimental situation as possible, careful selection of stimuli is necessary. The present article provides normative measures for 400 line drawings and their corresponding names viewed by French-speaking young adults.

When available, these normative studies have been extremely useful in many fields of psychology, including memory and language throughout the use of different subjects domains (e.g., children, adults, and pathological cases). Concerning the study of language for instance, these database have been used to study the processes involved in picture naming (e.g., Ferrand, Grainger, & Segui, 1994; Ferrand, Humphreys, & Segui, 1998; Humphreys, Lamote, & Lloyd-Jones, 1995; Johnson, Paivio, & Clark, 1996; Snodgrass & Yuditsky, 1996) and, more generally, in speech production (e.g., Ferrand & Segui, 1998; Ferrand, Segui, & Grainger, 1996).

These normative data have also been very useful in the field of perceptual identification and recognition (e.g., Kroll & Potter, 1984; Snodgrass & Poster, 1992) and implicit memory (e.g., Feenan & Snodgrass, 1990; Hirshman, Snodgrass, Mindes, & Surprenant, 1990; Snodgrass & Feenan, 1990; Snodgrass & Surprenant, 1989; Snodgrass, Smith, Feenan, & Corwin, 1987).

The motivation for the present study was to obtain a normative database for pictorial material that will be useful for future studies with French-speaking subjects. We conducted a study in which the stimuli were the 400 pictures used by Cycowicz et al. (1997), including the 260 line drawings that were normed by Snodgrass and Vanderwart (1980). Closely following Snodgrass and Vanderwart's procedure, norms for name agreement, image agreement, picture familiarity, visual complexity, image variability, and age of acquisition were collected. The normative database also include the most common name given to each of the 400 concepts (modal name), word frequency (taken from Content, Mousty, & Radeau, 1990), and the first verbal associate of the names of the pictures (taken from Ferrand & Alario, 1998).

In what follows, we briefly discuss empirical findings related to each variable.

Name agreement. It refers to the degree to which subjects agree on the name of the picture. This information is important for naming latency studies, picture-name matching studies, recall memory studies and recognition studies in which verbal encoding is manipulated. Name agreement is measured by the number of different names given to a particular picture across subjects. Pictures that elicit many different names have lower name agreement than those eliciting a single name. Name agreement is a robust predictor of naming difficulty. Pictures with a single dominant response are named more quickly and accurately than those with multiple responses (Barry et al., 1997; Lachman, Shaffer, & Hennrikus, 1974; Paivio, Clark, Digdon, & Bons, 1989; Vitkovitch & Tyrrell, 1995). More importantly, name agreement affects naming independently of the effects of correlated attributes such as word frequency and rated age of name acquisition (Lachman et al., 1974).

Image agreement. It refers to the degree to which images generated by subjects to a picture's name agree with the picture's appearance. Barry et al. (1997) showed that pictures with higher ratings of image agreement were named faster than were those with lower ratings. They suggest that image agreement has its influence at the level of object recognition, such that the closer a picture is to one's mental image of an object, the faster the naming time for that item will be.

Familiarity. It refers to the familiarity of the concept depicted. Familiarity has been shown to have important effects on various memory and and cognitive processing tasks (e.g., Gernsbacher, 1984). In particular, Snodgrass and Yuditsky (1996), and Feyereisen, Van der Borght, and Seron (1988) showed that rated familiarity is an important predictor of picture naming latencies such that the more familiar a concept is, the faster the naming time for that item will be.

Visual complexity. It refers to the amount of lines and details in the drawing. It is supposed to determine the ease of processing at or before the structural stage of object recognition. Visual complexity may affect such variable as naming latencies, tachistoscopic recognition thresholds and memorability. Early research using pictorial stimuli has established that when complexity is manipulated, more complex stimuli are more difficult to process than simple stimuli (Attneave, 1957; Ellis & Morrison, 1998; Long & Wurst, 1984). However, other investigators showed that complex objects are identified and named as readily as simple objects (Biederman, 1987; Paivio, Clark, Digdon, & Bons, 1989; Snodgrass & Corwin, 1988; Snodgrass & Yuditsky, 1996).

Frequency and Age of Acquisition. Picture naming latencies decrease as name frequency increase (Oldfield & Wingfield, 1965) and increase as age of word acquisition increase (Carroll & White, 1973; Ellis & Morrison, 1998). It is possible that the influence of word frequency on learning, memory, and perception depends on another attribute such as the age at which the particular word was first learned. Some investigators (Carroll & White, 1973; Ellis & Morrison, 1998; Morrison, Ellis, & Quinlan, 1992; Morrison et al., 1997) suggest that age of acquisition is a more important variable than frequency in print. However, Barry et al. (1997) and Snodgrass and Yuditsky (1996) found that the time taken to name a pictured object correctly was affected both by rated age of acquisition and by the frequency of the name (in accord with Lachman, 1973; Lachman et al., 1974). Interestingly, Barry et al. (1997) showed that the age of acquisition effect interacted with frequency, the age of acquisition effect being more pronounced for pictures with low-frequency names.

METHOD

Subjects. A total of 173 students from introductory courses in Psychology from the Ecole des Psychologues Praticiens and from Université René Descartes in Paris participated in the study. Different subjects participated in each of the six tasks. They were 28 in the name agreement task, 30 in the image agreement task, 30 in the familiarity task, 29 in the visual complexity task, 30 in the image variability agreement task, and 26 in the age of acquisition task. All the subjects were native French speakers and participated voluntarily as a course activity. Subjects were run in groups of from 26 to 30 in a classroom.

Materials. The pictures were the 400 black and white line drawings of common objects taken from Cycowicz et al. (1997). These pictures were downloaded from the following Internet address: http://www.nyspi.cpmc.columbia.edu/nyspi/respaprs/picnorm.htm. Some of the original line drawings (n=7) were replaced for obvious reasons: pictures had been selected in the American context (things like a baseball bat, a football helmet, a pretzel are more familiar to English speakers in America than to French speakers in France). In particular, we replaced the following drawings (a baseball bat, a football, a football helmet, a fishing-reel, a grocery bag, a baseball glove, and a pretzel) by drawings of objects more common in the French speakers realm of experience (a ski, a French croissant, a motorbike helmet, a swimming costume, a rugby ball, a fishing rod and a supermaket caddie). These 7 pictures were adapted from two French books of pictures (L'imagier du Père Castor, 1991; Des mots en images, 1988; they are available upon request).

Procedure. The procedure closely followed the steps described by Snodgrass and Vanderwart (1980), and by Morrisson, Chappell, and Ellis (1997; for age of acquisition) both in terms of the tasks performed and in the way the tasks were done.

The name agreement task, the image agreement task, the familiarity task and the complexity task were run in a similar way. However, for the image variability task and the age of acquisition task, the modal name of the object (instead of the object itself) was presented to the subjects. The 400 pictures were projected sequentially on a large white screen at the front of a slightly darkened room using a overhead projector. At the beginning of each task, subjects were read the instructions and encouraged to answer carefully and consistently. They were given individual answer sheets and instructed to respond to every drawing. They were informed of the general nature of the pictures, that is, that they were relatively simple black-and-white outline drawings. Each slide was presented for a period of 5 sec. Halfway through the slides, the subjects were given a 15-min rest period. The total amount of time was about 1 hour and a half.

In the name agreement task, subjects were instructed to identify the drawing with the first name that came to mind and write the name on the answer sheet. They were told that a name could consist of more than one word. If that was not possible, they had to indicate whether the reason was "don't know the object" (DKO), "don't know name" (DKN) or "tip of the tongue" (TOT).

In the image agreement task, subjects were asked to judge how closely each picture resembled their mental image of the object. Prior to presenting each picture, the experimenter called out the picture's most common name, waited from approximately 5 sec, and then projected the picture on the screen. During the 5-sec period, subjects looked at the blank screen and formed their mental image of the named object. Following the appearance of the picture on the screen, subjects rated the degree of agreement between their image and the picture using the 5-point scale. A rating of 1 indicated low agreement, that the picture provided a poor match to their image, and a rating of 5 indicated high agreement.

In the familiarity task, subjects were asked to judge the familiarity of the concept of each picture "according to how usual or unusual the object is in your realm of experience." Familiarity was defined as "the degree to which you come in contact with or think about the concept." They were told to rate the concept itself, rather than the way it was drawn. Their answer to each item was again a whole number from a 5-point scale (1 = a very unfamiliar object, 5 = a very familiar object). Subjects were encouraged to employ the full range of scale values throughout the set of pictures.

The visual complexity task required the subjects to rate the complexity of each drawing, rather than the complexity of the object it represented. They also had to provide ratings from a 5-point scale (1 = drawing very simple, 5 = drawing very complex). Complexity was defined as the amount of details or intricacy of lines in the picture.

The two remaining tasks (image variability and age of acquisition) consisted of judgments on the names of the pictures. No overhead projector was used here. Subjects were given a four-page booklet with the 400 names of the pictures. In the image variability task, they were instructed to rate on a 5-point scale (1 = few images, 5 = many images), whether the name evoked few or many different images for that particular object. In the age of acquisition task, subjects were asked to estimate the age at which they thought they had learned each of the names, in its written or oral form. We altered the scale used by Morrison et al. (1997) from 7 points to 5 points, where 1 = learned at 0-3 years and 5 = learned at age 12+, with 3-year age bands in-between. For this specific task, 17 words were repeated to provide a reliability check. The correlation between these repeated ratings was .94 and the means were not significantly different (2.68 vs. 2.56, $t(16)=0.11$).

Concerning verbal association measures, we report Ferrand and Alario's results (when available for the present stimuli). Overall, 263 associations were available out of the 400 stimuli. These free association norms were collected by presenting a large group of French-speaking subjects (n=89) with a written stimulus word and asking them to respond the first word they think of, as quickly as they can (for details, see Ferrand & Alario, 1998).

RESULTS AND DISCUSSION

A summary of the rating data obtained from our sample of French-speaking subjects is presented in Appendix A. To allow for easy reference and data comparison, entries are listed according to the identifying numbers originally assigned to each drawing by Cycowicz et al. (1997). Moreover, a computer file (Excel format or ASCII format) with all the data is available upon request for research facilities. For each picture, the following information is presented: (1) most frequent name given in French (with an English translation); (2) two measures of name agreement, the statistic H (taken from Snodgrass & Vanderwart, 1980) and the percentage of subjects producing the most common name; (3) the means and standard deviations for image agreement, familiarity, visual complexity, image variability, and age of acquisition. Along with the ratings obtained for French-speaking subjects, Appendix A presents the frequency of the single-name (taken from Content et al., 1990), as well as the first verbal associate (obtained by Ferrand & Alario, 1998). Appendix B lists the alternate names given to each drawing, with an indication of their frequency. A frequency of zero indicates that the single-word name did not occur in the Content et al. (1990) corpus. Because the Content et al. corpus does not provide counts for names of more than one word, these unavailable frequencies are indicated by a dash. Failures in the naming task are listed as DKN (don't know

name), DKO (don't know object), and TOT (tip of the tongue). All nondominant names given for each concept are listed and accompanied by their frequencies (when available).

Following Snodgrass and Vanderwart (1980), we used a strict criterion for counting different instances of names when computing H values. In many cases, the name given by a subject was similar to but not identical to an established name category. A picture that elicited the same name from every subject in the sample who was able to name it has an H value of .00. Increasing H values indicate decreasing name agreement and, generally decreasing percentages of subjects who all gave the same name. According to Snodgrass and Vanderwart (1980; p. 184), "the H value captures more information about the distribution of names across subjects than does the percentage agreement measure. For example, if two concepts both are given their dominant name by 60% of the subjects, but one is given a single other name and the second is given four other names, both concepts will have equal percentage agreement scores, but the first will have a lower H value."

Table 1 presents summary statistics for the following indices: H (reflecting name agreement), percentage of subjects producing the modal names, image agreement, familiarity, complexity, variability, age of acquisition and frequency. Although H and percentage are two measures of name agreement, following Snodgrass and Vanderwart's arguments, we will use H as the measure of name agreement. The 25^{th} (Q1) and the 75^{th} (Q3) percentiles are shown to facilitate selection of concepts from the extremes of the distribution. The distribution of H values has a low mean and is positively skewed, reflecting the fact that many concepts show high name agreement.

<Insert Table 1 about here>

Table 2 presents summary statistics for the following indices: H, image agreement, familiarity, and complexity. This table contains the summary for the French samples of the current study, the Spanish-speaking samples reported by Sanfeliu and Fernandez (1996), as well as the English-speaking samples reported by Snodgrass and Vanderwart (1980). As can be seen on this table, there were small differences for image agreement, familiarity and complexity. There was a larger difference when the H value is considered. The English-speaking sample had bigger H values than did the French and the Spanish ones. It seems to indicate that the French-sample and the Spanish sample showed less variability in the number of names applied to objects than did the English-speaking sample.

<Insert Table 2 here>

Correlations among the measures

We performed two correlational analyses on the data. The first one correlated (1) the data providedby Snodgrass and Vanderwart (1980) with the data obtained in the present study (for the 253 drawings common to both studies) for H, image agreement, familiarity and visual complexity, and (2) the data provided by Sanfeliu and Fernandez (1996) with the data obtained in the present study for the same variables. As shown in Table 3 and 4, there were fairly high and significant correlations for all variables. Correlations were higher for familiarity and complexity (both for French-English and French-Spanish) than for name agreement (H and %) and image agreement.

<Insert Table 3 and Table 4 about here>

The second correlational analysis concerned the data obtained in the present study for the 400 line drawings taken from Cycowicz et al. (1997). To determine the degree of relationship among our measures, and between them and some important measures already

available, we computed the interitem correlations among all attributes presented in Appendix A (following Snodgrass & Vanderwart, 1980). Table 5 shows the matrix of correlations for all concepts with the significant correlation coefficients marked with an asterisk. Because frequency measures (taken from Content et al., 1990) were available for only 355 of the 400 concept names, a separate set of correlations was computed for this subset.

<Insert Table 5 about here>

As expected, the two measures of name agreement (H and %) show a high negative correlation (-.952 in Table 5). The correlations among the other measures collected in the present study (familiarity, complexity, image agreement, image variability and age of acquisition) are all relatively small in magnitude, suggesting that the measures represent independent attributes. Overall, these correlations are similar to the ones obtained by Snodgrass and Vanderwart (1980), and by Cycowicz et al. (1997).

Familiarity is negatively correlated with age of acquisition (-.578), suggesting that names of concepts that are familiar tend to be learned at an early age.

As shown in Table 5, familiarity is positively correlated with frequency (.360). The correlation between age of acquisition and frequency, although modest (-.367), is also significant. Of the correlations among our own measures, name agreement and image agreement are negatively correlated (-.343), suggesting that concepts that have many names also evoke many different images. The correlation between age of acquisition and name agreement (.453) suggests that for concepts acquired at an early age the level of agreement is high. The fact that French speakers's name agreement correlates less with word frequency than with age of acquisition is similar to the finding that for American and English speakers, age of acquisition has a greater influence on picture naming than other variables (Caroll & White, 1973; Ellis & Morrison, 1998). The correlations between image variability and both age of acquisition (-.654) and familiarity (.616) suggest that early learned concepts evoke more images than late learned concepts. Finally, visually complex pictures tend to be rated as unfamiliar (significant correlation of -.391).

CONCLUSION

The main goal of the present research was to collect normative data for pictorial stimuli that could be used in research with French-speaking samples (see Sanfeliu & Fernandez, 1996, for the same approach in Spanish). Descriptive ratings for a number of picture attributes of the drawings previously presented by Cycowicz et al. (1997), and Snodgrass and Vanderwart (1980) with American English-speaking subjects are now available for French-speaking subjects. We believe that these normative data will be particularly useful for French researchers interested in memory, language, and other cognitive processes.

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TABLE 1
Summary Statistics for All Variables

	Name Agreement		Image Agreement	Familiarity	Complexity	Image Variability	A-A	F
	H*	%						
M	0.36	84.63	3.44	2.72	3.09	2.76	2.56	29.82
SD	0.43	20.31	0.78	1.19	0.92	0.63	0.79	78.96
Median	0.15	96	3.57	2.42	3.07	2.60	2.51	7.04
Range	1.87	82	3.90	3.94	4	3.50	3.65	892
Min	0	18	1	1.03	1	1.20	1.12	0
Max	1.87	100	4.90	4.97	5	4.70	4.77	892
Q1	0	75	2.97	1.73	2.38	2.30	1.95	1.61
Q3	0.65	100	4	3.77	3.74	3.17	3.08	21.88
IRQ	0.65	25	1.03	2.04	1.36	0.87	1.13	20.27
Skew	3.33	0.19	0.72	1.98	0.97	1.90	1.02	2.74

Note. H = name agreement; F = frequency (taken from Content et al., 1990); A-A = age of acquisition; Q1 = 25^{th} percentile; Q3 = 75^{th} percentile; IRQ = interquartile range; Skew = (Q3 - Median) / (Median - Q1); >1 is positively skewed.
* Increasing H values indicate decreasing name agreement.

TABLE 2

Summary Statistics for Four Variables: U.S.A., Spanish and French Samples (for Snodgrass and Vanderwart Pictures).

	Name Agreement (H)			Image Agreement			Familiarity			Complexity		
	U.S.A.	Spain	France	U.S.A.	Spain	France	U.S.A.	Spain	France	U.S.A.	Spain	France
M	0.56	0.27	0.28	3.69	3.71	3.46	3.29	3.12	3.06	2.96	2.67	3.00
SD	0.53	0.41	0.36	0.58	0.60	0.78	0.96	1.11	1.21	0.89	0.93	0.96
Median	0.42	0.12	0.15	3.72	3.84	3.60	3.32	3.06	2.92	2.93	2.52	2.95
Range	2.55	2.19	1.41	2.68	3.03	3.73	3.72	3.67	3.90	3.78	3.68	4
Min	0	0	0	2.05	1.74	1.17	1.18	1.27	1.07	1	1.05	1
Max	2.55	2.19	1.41	4.73	4.77	4.90	4.9	4.94	4.97	4.78	4.73	5
Q1	0.12	0.04	0	3.27	3.29	2.93	2.49	2.16	1.97	2.28	1.98	2.28
Q3	0.87	0.28	0.47	4.15	4.16	4.05	4.09	4.08	4.17	3.59	3.39	3.71
Skew	1.5	2.39	2.13	0.96	-0.71	0.67	0.93	0.01	1.32	1.02	0.28	1.13
Valid cases	260	254	256	260	245	256	260	254	256	260	254	256

Note. H = name agreement; Q1 = 25th percentile; Q3 = 75th percentile; IRQ = interquartile range; Skew = (Q3 - Median) / (Median - Q1); >1 is positively skewed.

* Increasing H values indicate decreasing name agreement.

TABLE 3

Significant Correlations Among the Measured Variables in the French and U.S.A. Samples (for Snodgrass and Vanderwart Pictures)

	U.S.A. Sample (Snodgrass & Vanderwart, 1980)				
Variable	NA (H)	%	IA	Fam	Comp
French Sample					
Name agreement (H)	.428				
Name agreement (%)		.429			
Image Agreement			.498		
Familiarity				.913	
Visual complexity					.945

Note- NA, name agreement; IA, image agreement; Fam, familiarity; Comp, visual complexity; All listed correlation coefficients for the current study and the Snodgrass and Vanderwart (1980) study are significant at $p<.01$.

TABLE 4
Significant Correlations Among the Measured Variables in the French and Spanish Samples (for Snodgrass and Vanserwart Pictures)

	Spanish Sample (Sanfeliu & Fernandez, 1996)				
Variable	NA (H)	%	IA	Fam	Comp
French Sample					
Name agreement (H)	.313				
Name agreement (%)		.506			
Image Agreement			.524		
Familiarity				.778	
Visual complexity					.727

Note- NA, name agreement; IA, image agreement; Fam, familiarity; Comp, visual complexity; All listed correlation coefficients for the current study and the Sanfeliu and Fernandez (1996) study are significant at $p<.01$.

TABLE 5

Correlations Among the Measured Variables in a French Sample for Cycowicz et al. (1997) Pictures.

Variable	NA	%	IA	Fam	Comp	I-Var	A-A	Freq†
Name agreement (H)	1.000							
Name agreement (%)	-.952*	1.000						
Image agreement	-.343*	.370*	1.000					
Familiarity	-.183*	.215*	-.035	1.000				
Visual complexity	.081	-.081	-.009	-.391*	1.000			
Image-variability	-.255*	.317*	-.097	.616*	-.210*	1.000		
Age of Acquisition	.453*	-.524*	-.140*	-.578*	.214*	-.654*	1.000	
Frequency†	**-.140***	**.151***	**-.005**	**.360***	**-.136***	**.340***	**-.367***	1.000

Note-All listed correlation coefficients with an asterisk are significant at $p<.01$. NA, name agreement; IA, image agreement; Fam, familiarity; Comp, visual complexity; I-Var, image variability; A-A, age of acquisition; Freq, frequency (taken from Content et al., 1990).

† Concerning the Frequency variable, correlations among all measured variables were obtained for a sample of 355 concepts only for which frequency values were available.

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