



Same or different? Semantic verbal fluency across Spanish-speakers from different countries

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Abstract

Several investigations have suggested that age, education and culture affect semantic fluency. To date, there is no research work indicating whether there are differences among speakers of the same language but from different countries. It has been proposed that despite having the same language, each Spanish-speaking country should have its normative data. The purpose of this study was to analyze the contribution of age, education and culture to semantic fluency in Spanish-speakers. Age and level of education are determining factors in semantic fluency performance. The differences found may be due to the variability in the administration and scoring of the tests, rather than to a cultural effect. A standardized method is proposed for the application of the test.

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1. Introduction

The verbal fluency test is one of the most frequently used tests in clinical and experimental assessment, due to its fast and easy administration. The task involves the generation of as many words as possible at a phonologic and/or semantic level. For the semantic task, the person is asked to generate words pertaining to a category, such as animals, fruits, clothes, transportation or verbs. The time provided to execute the task is 1 min (Bryan & Luszcz, 2000; Lezak, 1995).

Verbal fluency measures mainly the speed and ease of verbal production in addition to the evaluation of availability to start a behavior in response to a novel task (Parker & Crawford, 1992). Likewise, it assesses language functions (naming, extent of vocabulary), response speed, mental organization, search strategies, as well as short- and long-term memory (Ruff, Lighth, Parker, & Levin, 1997). It has also been proposed to involve executive functioning, attention and alertness, the lexicon or semantic storage, retrieval mechanisms and working memory (Auriacombe et al., 1993).

In the clinical scope, deficits in semantic verbal fluency (SVF) are caused by diverse etiologies. In particular, this has been seen in patients with frontal lobe damage (Herrmann, Ehrlis, & Fallgatter, 2003; Ravnkilde, Videbech, Rosenberg, Gjedde, & Gade, 2002), Parkinson's disease (Donovan, Siegert, & McDowall, 1999; Troyer, Moscovitch, & Winocur, 1998), schizophrenia (Chen, Chen, Chan, Lam, & Lie-Mak, 2000; Curtis et al., 1998), subcortical dementia (Testa et

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al., 1998), head injury (Axerold, Torner, Fisher, & Aharon-Peretz, 2001), Huntington's disease (Suhr & Jones, 1998), depression (Okada, Okamoto, Morinobu, Yamawaki, & Yokota, 2003; Radvin, Katzen, Agraval, & Relkin, 2003), vascular and Alzheimer type dementias (Troyer et al., 1998), as well as lateral amyotrophic sclerosis (Abrahmas et al., 2000), among others.

SVF has been used for the functional assessment of the temporal lobe; however, recent evidence has suggested that the number of words generated in this test is not necessarily sensitive to injuries in a particular region of the brain, but to diffuse damage (Troyer, Moscovitch, Winocur, Alexander, & Stuss, 1998).

Specifically, it has been found that demographic variables such as age, sex and level of education (da Silva, Petersson, Faisca, Ingvar, & Reis, 2004; Mathuranath et al., 2003; Ratcliff et al., 1998) influence SVF (Weiss et al., 2003). Ratcliff et al. (1998) report that the educational level has a greater influence on the phonologic than on the SVF, since participants with fewer years of education generate a smaller number of words. As shown by several researchers (Ardila, Ostrosky-Solis, Rosselli, & Gomez, 2000; Castro-Caldas & Reis, 2003; Marcopolus & McLain, 2003; Marcopolus, McLain, & Giuliano, 1997; Ostrosky-Solis, Ardila, & Rosselli, 1999; Ostrosky-Solis, Ardila, Roselli, López-Arango, & Uriel-Mendoza, 1998; Ostrosky-Solis et al., 2003; Ostrosky-Solis, Ramírez, Lozano, Picasso, & Vélez, 2004; Ramirez, Ostrosky-Solis, Fernandez, & Ardila, 2005), the educational level has a direct influence on several neuropsychological tests, as well as on the modification of the brain's functional organization that takes place when the subject is exposed to reading and writing (Castro-Caldas, Petersson, Stone-Elender, & Ingvar, 1998; Ostrosky-Solis, Arellano, & Pérez, 2004).

To date, most of the research work performed by using SVF fluency tests, has been focused on measuring the involvement of one of these variables, and the study of the interaction between age and level of education has been analyzed mostly in elderly adults (from 55 years on). Furthermore, reported studies have included very wide educational ranges, for example, participants with 0 to 8 years of education have been grouped within the same range.

Other studies have focused on the comparison between Hispanics and non-Hispanics (Rosselli et al., 2002), between bilingual English-Spanish-speakers (Bethlehem, de Picciotto, & Watt, 2003; de Picciotto & Friedland, 2001; Rosselli et al., 2000), as well as on different cultures (Bradley, Torner, Fisher, & Aharon-Peretz, 2001; González, Mungas and Haan, 2005; Kempler, Teng, Dick, Taussig, & Davis, 1998; Ramirez et al., 2005). Nevertheless, on few occasions, factors such as age and education have been controlled in the same study. On the other hand, there are no studies indicating whether there are differences between persons speaking the same language but from different countries.

The purpose of this study was twofold. First, performance on the SVF test in neurologically intact, adult, Spanish-speaking participants was analyzed in order to establish the contribution of age and education to total score on the SVF test. Second, a comparison among different studies on SVF in Spanish-speakers will be reviewed in order to determine whether any differences in variables like age, level of education and culture exist.

2. Method

2.1. Participants (Mexican sample)

The sample was selected during the standardization and normalization study of the NEUROPSI neuropsychological test battery (Ostrosky, Ardila, & Rosselli, 1997) and the NEUROPSI Atención y Memoria (Neuropsi Attention and Memory) (Ostrosky-Solis et al., 2003). A total of 2011 neurologically intact participants accepted to be evaluated (male = 794 and female = 1217). Sample age ranged from 16 to 96 years (mean age = 42.32, standard deviation = 20.68) and level of education ranged from 0 to 24 years (mean level of education = 6.79 years, standard deviation = 5.97).

Volunteers were recruited from urban areas of four different states of the Mexican Republic (Mexico City, Colima, Guadalajara and Zacatecas) over a 4-year period (1998–2002). Sources of participants included in the present analysis were as follows: regional medical facilities (medical and paramedical people and spouses, friends or relatives of patients who attended for medical check-ups; (5.8%); retirement community (33.2%); social community centers (19.5%); high-schools and university students (22.1%); volunteers and self-referred participants (19.4%).

The following inclusion criteria were used: (1) no neurological or psychiatric disorders (such as brain injury, cerebrovascular disease, epilepsy, Parkinson's disease, depression, psychiatric hospitalizations, and the like), according to a health history questionnaire; (2) absence of current and/or history of chronic alcohol and/or drug abuse; (3) normal or corrected-to-normal vision and hearing. All participants were non-paid volunteers. All participants were native Spanish-speakers and were active and functionally independent. Participants with questionable health histories

(e.g., those reporting history of traumatic brain injury, cerebrovascular disease, and/or subjects under medication for psychiatric and/or central nervous system disorders), were excluded.

The illiterate sample represented 18.6% of the total sample (141 men and 233 women). Age range was from 16 to 88 years (mean age = 49.89, standard deviation = 20.50). Illiterate participants included in this study were selected according to three criteria: (1) no school attendance during childhood due to lack of opportunity (lack of schools or socioeconomic reasons); (2) functionally independent in daily life activities according to the socio-cultural environment; and (3) inability to write their own name, for this purpose, all the participants were requested to write their names, only those persons unable to do so were included in the sample. All participants lived in urban areas, thus sharing a similar environment and cultural background.

2.2. Procedure

Normative data in a Mexican sample: total scores of SVF were taken from the Brief Neuropsychological Battery in Spanish, NEUROPSI (Ostrosky-Solis et al., 1997, 1999) and the NEUROPSI Attention & Memory battery (Ostrosky-Solis et al., 2003). Testing procedure for the semantic fluency task was carried out according to the standard administration, that is, the participant was asked to generate as many names of animals as he/she could remember within 1 min. Total score corresponds to the total number of names produced (excluding intrusions and perseverations).

2.3. Comparing different normative studies in a single language: Spanish

A search in the computerized MEDLINE, PsycINFO databases was carried out, as well as in the Internet and by direct communication with the authors. The purpose of the above was to identify published articles that included the following information: (1) standardized data in the SVF test using the “Animals” category; (2) assessment of neurologically intact, adult Spanish-speaking participants, whose primary language was Spanish, and (3) that the country of origin of the participants, where they were evaluated, had to be a Spanish-speaking country. In addition to those requirements, the following criteria were specified for their inclusion: (1) published between 1980 and 2004; (2) published in a journal or congress records; (3) containing mean and standard deviation; (4) comparing data by age range, and educational level; (5) providing the “n” at each cell; (6) participants from 15 to 90 years old; (7) participants with 0 to 20 years of education.

In some cases, the SVF test was part of a wider neuropsychological test battery, for example, in Mexico the Brief Neuropsychological Battery in Spanish, NEUROPSI was used (Ostrosky-Solis et al., 1997, 1999), as well as the Attention and Memory Neuropsi, 6 to 85 years of age (Ostrosky-Solis et al., 2003); In Spain, verbal fluency was part of the Barcelona test (Peña-Casanova, 1990).

In the Mexican sample, the test and clinical history were applied individually in all cases by previously trained examiners. The instruction was to generate the highest possible number of animals, with a time limit of 1 min. All the studies reported that the participation of the persons was voluntary with written and/or verbal consent in the illiterate participants. In order to assure quality control procedures the collected data were revised and scored by two different examiners.

2.4. Statistical analyses

Two sets of analyses were made for this study. First, a stepwise regression analysis was performed to obtain the contribution of both education and age to the SVF total score. Second, the general measurements from the studies published in different countries were compared through a T-test for independent samples to establish whether any difference existed between participants’ performance of each study. This analysis involved the comparison of each study by age range and level of education level provided by them. A significance level of $p < 0.01$ was established. Since the data from Ostrosky-Solis et al. (1997, 2003) were available according to age and education in a large sample ($n = 2011$) these data were chosen as a comparative sample to pair with the rest of the studies.

3. Results

3.1. Data on SVF test of the Mexican sample

Regarding the contribution of sex to the SVF score, an ANOVA was conducted in order to determine any influence. A principal effect of sex was found ($F = 3.473, p < .031$) as well as for age ($F = 2.795, p < .039$) and education ($F = 262.929$,

$p < .000$); but only the interaction between age and education was significant ($F = 8.367, p < .000$). Therefore, sex was not considered in the regression analysis

A stepwise regression analysis was performed to obtain the contribution of age and education to performance on the SVF test. Due to the differences observed in performance according to the level of education (Ostrosky-Solis et al., 1999), the sample was grouped in three educational ranges (0 to 4 years, 5 to 9 and >10 years of education). Age and education were entered as the independent variables and the total score was the dependent variable.

The percentage of variance explained by education ($\beta = .488, t = 2.684, p < .007$) in the 0–4 range was 2.6%, whereas age ($\beta = .047, t = 1.107, p > .269$) was excluded from the model (d.f. = [1,544], $F = 7.206, p < .007$; constant $\beta = 13.155, t = 29.173, p < .000$). The equation obtained was:

$$\text{SVF} = 13.155 + \text{education} (.488)$$

In the 5–9 educational range, level of education ($\beta = .621, t = 4.507, p < .000$) explained 4.2% percent of the variance; age contribution to the total score ($\beta = .021, t = .467, p < .641$) did not reached significance and was therefore excluded from the model (d.f. = [1,461], $F = 20.314, p < .000$, constant $\beta = 12.837, t = 13.130, p < .000$). The equation obtained was:

$$\text{SVF} = 12.837 + \text{education} (.621)$$

When the range of > 10 years was considered, age contributed 9% ($\beta = -.079, t = -7.938, p < .000$) and level of education provided 2.3% percent of the total variance ($\beta = .258, t = 4.020, p < .000$), the equation obtained from the model (d.f. = [2,631], $F = 40.086, p < .000$, constant $\beta = 21.093, t = 51.413, p < .000$) was:

$$\text{SVF} = 21.093 + \text{age} (-.079) + \text{education} (.258)$$

As can be seen, the effects of age and education are not similar when level of education is considered. It can be argued that performance is stable across different age ranges in the first two levels, whereas in the highly educated participants, performance is explained in terms of age rather than by the years of formal education. If a multiple regression is performed with the total sample, these differential contributions are not evident. The percentage of variance explained by both education and age was 33.6% (d.f. = [2,2007] $F = 510.68, \text{sig} = .000$, constant $\beta = 14.032 [t = 55.975, \text{sig} = .000]$, age $\beta = -.0018 [t = -3.831, \text{sig} = .000]$, education $\beta = .548 [t = 32.501, \text{sig} = .000]$). The equation obtained was:

$$\text{SVF} = 14.032 + \text{age} (-.0018) + \text{education} (.548)$$

3.2. Cross-cultural comparisons

A Meta-analysis was performed by using the means and standard deviations reported in the published articles (Schwarzer, 1994). Each sample was compared with the Mexican data through a T-test analysis.

A total of 10 studies were found, and only four of them met the inclusion criteria. Some articles were excluded because the data were presented as percentiles or in regression analyses, as well as in a small age range (i.e., 20 to 49 years of age), or because the data were not presented by age and level of education, which made the comparison difficult (i.e., Ardila, Rosselli, & Puente, 1994; Buriel, Gramunt, Böhm, Rodés, & Peña-Casanova, 2004; Carnero, Lendínez, Maestre, & Zunzunegui, 1999; Carnero, Maestre, Mola, Olivares, & Sempere, 2000; Pineda, Merchán, Rosselli, & Ardila, 2000).

The papers that comprised the study correspond to the publications by Ostrosky-Solis et al. (1997, 2003, 2004) in Mexico (pooled in a single study); Benito-Cuadrado, Esteba-Castillo, Böhm, Cejudo-Bolívar, and Peña-Casanova (2002), in Barcelona; Alamo, Mir, Olivares, Barroso, and Nieto (1999) in the Canary Islands in Spain; and Butman, Allegri, Harris, and Drake (2000) in Argentina. The total sample included data from 2788 participants, shown on Table 1. Please refer to the appendix for additional methodological information on each of the studies included.

The results of the first analysis presented in Table 2, show statistically significant differences ($p < 0.05$) between the studies. These data suggest that such differences may be due to the original culture of the participants. Therefore, the general average comparison might not be the best comparative.

Tables 3–5 show the results of analysis performed, taking into account the age and the educational level. Differences were found between the Mexican and the Barcelona sample. Table 3 shows the comparison between the studies by Ostrosky-Solis et al. (1997, 2003) in Mexico City and Benito-Cuadrado et al. (2002), in Barcelona, Spain, where

Table 1
Demographic characteristics of each research group included in the cross-cultural analysis

Author	Country	N	Age	Education	SVF (animals) × (S.D.)
Ostrosky-Solís et al. (2003)	Mexico	2009	16–90	0–24	16.97 (4.12)
Benito-Cuadrado et al. (2002)	Spain	445	18–92	1–20	19.13 (4.37)
Alamo et al. (1999)	Spain	68	15–90	0–12	17.68 (4.20)
Butman et al. (2000)	Argentina	266	16–86	4–13	18.75 (4.33)

x = mean, S.D. = standard deviation, SVF = semantic verbal fluency.

Table 2
Level of significance ($p < .05$ value) of the comparisons without taking into account age and level of education, between the four studies in a meta-analytic analysis with a T-test analysis

Studies compared	t	p
Mexico vs. Spain ^a	−9.5307	.000*
Mexico vs. Spain ^b	−1.3718	.170
Mexico vs. Argentina	−6.3356	.000*
Spain ^a vs. Spain ^b	2.6371	.008*
Spain ^a vs. Argentina	1.1284	.259
Spain ^b vs. Argentina	−1.8629	.063

The study of Mexico was the point of comparison, Mexico = Ostrosky-Solís et al. (2003); Argentina = Butman et al. (2000).

^a Spain = Benito-Cuadrado et al. (2002).

^b Spain = Alamo et al. (1999).

Table 3
Comparisons of SVF scores between the studies of Ostrosky-Solís et al. (2003) $n = 1937$ and Benito-Cuadrado et al. (2002) $n = 445$ taking into account level of education and age range

Education (years)	Age (years)	SVF Mexico × (S.D.)	n	SVF Spain × (S.D.)	n	t	p
0–4	18–56	13.80 (4.24)	481	16.95 (4.94)	23	−3.453	.059
	57–65	13.86 (4.88)	106	15.34 (5.64)	35	−1.495	.636
	>65	14.02 (4.35)	289	14.91 (4.62)	62	−1.445	.886
5–10	18–45	16.72 (5.11)	141	20.50 (3.93)	22	−3.316	.011
	46–56	17.35 (4.29)	84	17.84 (5.05)	33	−.5283	.749
	57–65	17.56 (4.84)	71	17.06 (4.87)	46	.5445	.634
	>65	17.31 (4.26)	185	17.04 (5.77)	65	.3987	.690
>10	18–25	22.71 (5.02)	140	28.90 (7.95)	31	−5.517	.000
	26–45	23.07 (5.13)	179	25.38 (5.71)	42	−2.569	.076
	46–57	21.12 (5.21)	97	22.64 (4.30)	31	−1.471	.300
	58–67	19.86 (4.67)	81	20.13 (6.46)	23	−.223	.304
	>67	18.39 (4.54)	83	19.13 (4.68)	32	−.776	.795

Level of significance ($p < .05$) and t value are included. x = mean, S.D. = standard deviation, SVF = semantic verbal fluency.

Table 4
Comparisons of SVF scores between Ostrosky-Solís et al. (2003) $n = 936$ and Alamo et al. (1999) $n = 75$ by level of education and age range

Education (years)	Age (years)	SVF Mexico × (S.D.)	n	SVF Spain × (S.D.)	n	t	p
0–6	60–90	14.82 (4.58)	482	16.33 (3.94)	37	−1.950	.156
	7–12	20.11 (5.02)	273	21.82 (3.84)	17	−1.378	.869
	60–90	17.94 (4.71)	181	16.36 (6.48)	14	1.174	.104

Level of significance and t value are included. x = mean, S.D. = standard deviation, SVF = semantic verbal fluency.

Table 5
Comparisons of SVF scores between Ostrosky-Solis et al. (2003) $n = 1211$ and Butman et al. (2000) $n = 266$ by level of education and age range

Education (years)	Age (years)	SVF Mexico \times (S.D.)	n	SVF Argentina \times (S.D.)	n	t	p
4–7	<45	15.4 (2.8)	145	16.5 (2.8)	7	–.455	.909
	46–55	16.6 (4.6)	54	18.7 (3.0)	20	–1.893	.149
	56–65	16.3 (4.4)	52	15.5 (3.9)	40	.925	.599
	66–75	16.8 (4.5)	104	15.4 (3.9)	47	1.842	.698
	>75	13.4 (3.9)	44	12.4 (2.9)	37	1.28	.200
8–12	<45	21.0 (4.9)	166	20.9 (5.6)	25	.093	.564
	46–55	18.8 (5.2)	70	22.4 (4.7)	29	–3.221	.171
	56–65	18.4 (4.7)	63	19.2 (5.2)	79	–.950	.282
	66–75	18.2 (3.8)	84	19.3 (5.1)	62	–1.493	.673
	>75	16.6 (4.8)	44	16.5 (2.3)	33	.110	.912
>13	<45	23.2 (5.2)	237	23.8 (6.2)	33	–.606	.455
	46–55	22.4 (4.7)	39	22.4 (4.8)	23	.000	1.000
	56–65	20.3 (4.6)	57	21.6 (5.4)	59	–1.393	.525
	66–75	20.1 (4.3)	40	19.5 (5.5)	63	.585	.866
	>75	16.9 (4.5)	12	15.1 (3.5)	25	1.333	.785

Level of significance and t value are included. x = mean, S.D. = standard deviation, SVF = semantic verbal fluency.

significant differences are observed in two cells: from 5–10 years of education with 18–45 years of age ($t = -3.316$; $p = .011$), and >10 years of education and 18–25 years of age ($t = -5.517$; $p = .000$).

4. Discussion

The first objective of this study was to determine the contribution of age and education to performance on the SVF test in a Spanish-speaking population. As can be seen from the regression analysis results, age and education do not equally affect performance. Many studies have pointed out that age is the main variable that explains an adequate performance on the semantic fluency task especially in persons older than 55 (Crossley, D’Arcy, & Rawson, 1997; Kempler et al., 1998). In accordance with this finding, age is the stronger predictor variable in highly educated persons (>10 years of education). However, in the 0 to 4 and 5 to 9 educational ranges the strongest variable is education with no significant contribution of age to semantic fluency total score. This effect may be due to the educational ranges which are included in most studies; which tend to merge participants with little or no education, with participants up to 8 years of formal education (Acevedo et al., 2000; Crossley et al., 1997; Kempler et al., 1998; Lucas et al., 1998). Thus, important characteristics in SVF performance among participants with low educational level might have been missed due to this merge.

It has been proposed that the lack of education has an impact on the development of cognition, that is, formal education promotes an alternative way in which information can be conceptually processed, thus enhancing the acquisition of specific abilities essential to the development of a number of cognitive strategies. It may be argued that learning to read and write promotes the practice and reinforces usage of these abilities and strategies. Ardila, Ostrosky-Solis, and Uriel-Mendoza (2000) showed that illiterates who are taught to read and write improve their neuropsychological test performance, including the semantic fluency task.

The second objective was to determine whether there were differences in standardized data in terms of SVF using the “animal” category generated by adult, neurologically intact, Spanish-speaking participants, and to see if there is an influence of culture, age and education.

In order to make a reliable comparison it was deemed important to have studies that reported the instructions, the characteristics of the sample, the number of participants and statistical data such as mean and standard deviation within a wide age range (15 to 90 years of age) and education level (0 to 20 years). After a search in MEDLINE, PsycINFO, and Internet computerized data, only four studies met the inclusion criteria. Some of the articles that were excluded contained modified instructions such as “mentioning 4-legged animals” (González et al., 2005); others reported data from the sample in general terms or in percentiles (Buriel et al., 2004). Despite the limited number of articles, this study included a Spanish-speaking population from three countries and four different research groups: Mexico (1

group), Argentina (1 group), and 2 research groups from different cities in Spain, Barcelona and the Canary Islands, this enabled the analysis of the effect of culture in the Spanish-speaking population.

The statistical analysis, without taking into account the age and educational effect, showed statistically significant differences between the five Spanish-speaking countries, which may suggest a cultural effect such as the one reported by Benito-Cuadrado et al. (2002) and Kempler et al. (1998). Nevertheless, while analyzing data considering age and education, only differences in very specific age and educational ranges were found (young participants with high education). No statistically significant differences were found between the rest of the different Spanish-speaking subject samples. If a true cultural effect existed, differences in all cases of this analysis would also be expected, nonetheless, this did not happen. The data obtained do not support what Benito-Cuadrado et al. (2002) suggested. Since they affirm that despite a common language, for example Spanish, it is necessary to generate different standards for different cultural groups.

Another factor to be considered in order to explain the differences found is the effects of bilingualism (early, late, and balanced). It is possible that in the Benito-Cuadrado et al. (2002) study, the population included was bilingual (Catalan-Spanish), however, such data were omitted. Several investigations have reported facilitating effects of bilingualism (Fabbro, 2001a,b); therefore, the high scores reported for their sample of young adults with high education could be related to the facilitation effects between languages.

The differences detected may also be due to variants in the administration and scoring. That is, the instructions for the administration and scoring of this test are not precise, particularly when using a Spanish-speaking population. For example, the instructions provided by several studies for this task and the scoring form are transcribed verbatim. In the Ostrosky-Solis et al. (2003) study, the instructions are: “I am going to ask you to tell me all the names of animals you remember; you will have one minute to perform this task”. The total number of reported words in the semantic category is recorded for the scoring. Only correct answers are scored. Duplicated names, derivative names (dog, doggie), supraordinated categories (bird, fish, insect, mammalian, etc.), or intrusions (pages 47–48) are not taken into account. In the Carnero et al. (1999) study the instructions are: “I want you to tell me all the names of animals that come to mind, whether there are sea, air, earth, domestic, or wild animals . . . All that come to mind” To score it: “all animals evoked during 1 min are accounted as valid; help was not offered during the test but there was encouraging; duplicated names, intra-species denomination variations (horse/mare, horse/colt), variations within the same species (German shepherd, greyhound, etc.) or supraordinated (bird, fish, etc.), were not counted if there was more than one representative of that class (pages 859–860). In the study by Alamo et al. (1999), participants were asked to generate as many names in this category as possible in one minute. However, prior to the start of the test, the participants were instructed to try to evoke animals belonging to any species” (page 8). Other studies do not report the instructions or the scoring criterion.

As can be seen, despite the fact that the SVF test in the “animal” category is very simple, the variation in instructions is evident, some are general; others, very specific and others provide extra help allowing the subject to exercise before the test. The way the tests are graded is also different, for example Carnero et al. (1999) do not take into account extinct animal categories (for example dinosaurs) others do not explain whether they eliminated diminutives or not.

Thus, differences detected may be due to the lack of specificity in the scoring criteria or the in help provided before or during the application of the test. Reaching a general consensus in Spanish-speaking countries in terms of the administration and scoring standards would make the data generated more reliable, and the doubts that arise now would be clarified.

In an attempt to unify the administration and scoring criteria the following instructions and scoring criteria are suggested. “I am going to ask you to mention all the names of animals that come to mind, you have 1 min, and I am going to tell you when to stop”. To score them: 1 point is scored for each correct word, under the following criteria: words that are an animal name will be valid, as well as extinct, imaginary or magical animals (i.e., dinosaur, unicorn, mammoth, dragon, etc.); those not belonging to a supraordinated category (i.e., fish, bird, insect, etc.); those that are not a different race of the same kind of animal (i.e., German shepherd, Dalmatian, etc.); those that are not an inter-species variation, or diminutives (i.e., rooster/hen, lion/lioness, horse/mare, cow/calf, duck/duckling) are excluded, if there is more than one representative of the same class. Perseverations will not be taken into account (repetition of the same word) or intrusions (a word that does not belong to the category), nor will proper nouns (i.e., pet names: “Odin”, “fluff”, etc.). Time should be measured from when the instruction is finished. Examples should not be provided. If the person stops before completing 30 s, he/she should be encouraged to continue by providing the following instruction: “What other animals you know?” only once. The test will be finished after 1 min.

In conclusion, the data in this study suggest that the SVF in the “animal” category can be used to assess Spanish-speaking participants from different countries. The factors that influenced performance are the educational level and the age, more than the country of origin. Future studies should take these two variables into account in addition to the type of instructions and scoring criteria used.

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Appendix A

The methodological information of the cross-cultural studies included in the meta-analysis was written as it appears in the original article or was translated as closely as possible to the original article. The study by Ostrosky et al., not included because it is detailed in the method section of this article.

A.1. Study 1. *Benito-Cuadrado et al. (2002)*.

A.1.1. Method

A sample of 445 subjects was chosen (44.6% male, 55.4% female), presenting different degrees of schooling (9.07 ± 5.44 ; range: 1–20) and with an age comprised between 18 and 92 years (57.34 ± 16.75).

Subject enrolment was from within the relatives of patients attending the Behavioral Neurology and Dementia section at the Hospital del Mar (Barcelona). Subjects were selected at random and in a proportional manner. All subjects presenting history of possible neuropsychological deficits, meningitis, epilepsy or severe head injury, were excluded. Alcohol and/or drug abuse as well as history of severe psychiatric illnesses (schizophrenia, major depression) or perceptible deficits were also excluded.

A.1.2. Procedure

The semantic verbal fluency test for animals was administered as part of the full Barcelona Test (Peña-Casanova, 1990). Examiners were given specific training before administering the test. Testing was done in accordance to the norms of the manual (Peña-Casanova, 1990). The whole test was administered in one session. Data concerning the semantic verbal fluency subtest were extracted from the database.

A.2. Study 2. *Alamo et al. (1999)*

A.2.1. Method

The sample was constituted by 75 subjects between 15–90 years old. All are residents in the Canary Islands, Spanish-speaking and monolingual. The level of education, scored as the number of years of formal education, has a range of 0–12 years. The group was subdivided into four groups of age (15–45, 46–60, 61–75 and 76–90 years old). None one of the participants had drugs and/or alcohol history abuse, psychiatric disorders or neurological disease. On the other hand, the participants had to have a score equal or superior to 22 in the MMSE (Folstein, Folstein, & MacHugh, 1975).

A.2.2. Procedure

The following tests were used: (a) mini-mental state examination (MMSE) (Folstein et al., 1975); (b) controlled oral word association test (COWAT, Benton & Hamsher, 1989); (c) test of semantic fluency (Animals). This test consists of generating as many names of some category as possible in one minute. Prior to administering the test, the subjects were instructed to remember animals belonging to any species. The tests were administered by a group of examiners with special individual training.

A.3. Study 3. *Butman, Allegri, Harris, and Drake (2000)*

A.3.1. *Material and method*

In the city of Buenos Aires 266 Spanish-speaking normal subjects were evaluated, with mean age of 54.9 ± 15.7 (range: 16 to 86 years old), and a level of formal education of 12.8 ± 4 . The exclusion criteria included: presence of neurological, psychiatric or pharmacological history that could affect the cognitive function.

Each participant was evaluated with an extended neuropsychological battery that includes the MMSE (Folstein et al., 1975), memory scale (Signoret & Whiteley, 1979), Boston naming test adapted to an Argentinean sample (Allegri, Mangone, Fernandez Villavicencio et al., 1997). All patients had a score equal or less than 2 in the Global Deterioration Scale (Reisberg, Ferris, De Leon et al., 1982) and were independent in daily living activities. In the semantic verbal fluency test, the subject was asked to evoke the names of animals in 1 min.

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