

## Adaptation and pre-validation of verbal fluency test for Moroccan population

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### Abstract

This study aims to adapt and standardize the Cardebat & al. (1990) version of verbal fluency test on Moroccan population. The sample is made up of 348 neurologically intact Moroccan subjects who were separated into 4 age groups, in 3 levels of education and gender. Participants were asked to performe semantic fluency task (animals and fruits criterions) and literal fluency task (letters Bae and Rae) The duration of the test was 120 seconds for each criterion and each letter. We were able to obtain norms of the scores obtained by the participants at the level of verbal fluency test in Arabic, according to age, gender and level of education. The participants have shown a significant effect of education level on performance. Age has a positive effect on performance for subjects aged 18 to 59 years. However, this effect is negative for subjects over 60 years of age. Woman’s performances are better compared to man’s performances for fruit criterion. The semantic fluency scores are significantly higher compared to the literal fluency. The results of our study will allow neuropsychologists to situate the performance of Moroccan subjects compared to other normal subjects according to age, gender and educational level.

**Keywords:** Adaptation and pre-validation of verbal fluency; Moroccan population.

## Introduction

The verbal fluency test is administered in neuropsychological assessment to evaluate the semantic memory with regard to the integrity of the semantic stock and the executive functions involved in the recovery of words in memory. During verbal fluency tests, participants are asked to mention the maximum number of words meeting a criterion in a limited time (usually 60 seconds). The subject performing this type of task must therefore actively search for the words requested and inhibit the other words. According to this criterion, two types of verbal fluency can be distinguished:

- ❖ The literal or phonemic fluency: the participant evokes as much as possible words beginning with a given letter (S, P, R ...).
- ❖ The categorical or semantic fluency: the participant evokes as many names as possible belonging to a defined semantic category (fruits, vegetables, supermarket items ...).

This study was conducted in the Neurology A department of the Rabat specialty hospital in order to adapt and standardize the verbal fluency test for the Moroccan population.

Although the verbal fluency test is a test that is usually done orally, one of the first versions of the test was written. This is the Thurstone Word Fluency Test or otherwise known as the Chicago Word Fluency Test developed by Thurstone in 1938 to measure the symbolic verbal fluency of patients. The examiner asked patients to write as many words as possible starting with the letter "S" in five minutes, then to write the maximum number of words beginning with the letter "C" in four minutes. The total number of written words beginning with the letters S and C minus the number of errors (repetition, intrusions ...) gives the measure of symbolic verbal fluency in patients. In addition, fluency studies generally used oral versions that allowed subjects to be faster and more focused on memory research. One of these studies is that of Borkowski & al. (1967).

Borkowski, Spreen and Benton asked English-speaking subjects to perform literal fluency tasks for each of the letters of the alphabet except the letters X and Z, and categorical fluency tasks for several categories (animals, fruits, furniture, tools , supermarket items ...). The authors wanted to compare the performance and difficulty levels of the different letters and categories. For literal fluencys, they divided the letters of the alphabet (from the scores obtained) into three levels of difficulty:

- ❖ difficult letters: Q, J, V, Y, K, U.
- ❖ letters of medium difficulty: I, O, N, G, L, R.
- ❖ easy letters: H, D, M, W, A, B, F, P, T, C, S.

With regard to categorical fluency, the highest performances were obtained for the category of animals, something that was justified by the hypothesis of an over-learning of this semantic field from the earliest childhood in addition to that by the large number of semantic items and subfields that make it up.

Cardebat & al. conducted in 1990 a study of 168 Francophone subjects divided according to gender, age and socio-cultural level. The authors asked the subjects to perform literal fluency tasks for the letters P and R, and semantic fluency tasks for the animal and fruit criteria. They showed a significant difference between the performances for the animal semantic criterion and the letter P, but no difference between the letter R and the category of fruits. According to these authors, the level of performance for a given criterion would be proportional to the number of items available in the language. They also emphasize the special status of the animal criterion

for which the number of productions is significantly higher than the other criteria, whether semantic or literal, which is in line with the hypothesis of over-learning in the category of animals. In addition, Cardebat & al. have observed a significant effect of gender for the benefit of women for the categorical tests corresponding to the "furniture" and "fruit" criteria. They considered that these differences could correspond to social epiphenomena. The results showed an overall effect of the level of education characterized by higher performance in higher-level subjects. Thus, it is reasonable to think that the more extensive knowledge will make it possible to select words from a larger sample.

### **3- Methodology of the research**

#### **3-1- The Moroccan adaptation of the verbal fluency test**

##### **3-1-1- Basic version**

We based ourselves in the Moroccan adaptation of the verbal fluency test on the version of Cardebat & al. (1990) which was carried out among 168 Francophone subjects divided according to gender, age and socio-cultural level. For semantic fluency the authors asked participants to generate the maximum number of fruit and animal names. The instruction was: "Can you tell me in 2 minutes as many names as you know in the category of animal names without using names of the same family and without repetition".

For literal fluency, Cardebat & al. asked the participants to generate the maximum possible number of words beginning with the letters P and R. The instruction was: "Can you tell me in 2 minutes as many French words as nouns or verbs or adjectives, starting with the letter R (or P). Do not say words of the same family, proper names, and do not repeat yourself. For example, for the letter L you can tell me: moon, rise ... Did you understand correctly? ". The time was limited to 2 minutes for each criterion and the generated words were recorded in 30-second increments. At the end of each pass, the authors had to count the number of words generated for each criterion without taking into account intrusions and perseverations.

##### **3-1-2- Moroccan version**

Concerning the semantic fluency, we kept the same criteria as well as the same conditions of execution as those of the version of Cardebat & al. (1990). On the other hand, for the literal fluency, it was necessary to choose Arabic letters. For this purpose we first made a count of the number of words in the Arabic dictionary for each letter of the Arabic alphabet, then we determined according to this count the 8 letters that have the highest frequency of occurrence in the Arabic language. These letters are more or less frequent: Alif, mim, bae, tae, rae, hae, noun, ain. Then we chose the two letters: Mim and Bae among the first four letters, and the two letters: Rae and Noun among the last four letters.

Afterwards, a pre-test test was necessary on the one hand, to check if the instructions would be well understood by the Moroccan participants of different ages and educational levels, on the other hand in order to choose two letters of the Arabic alphabet for which literal fluency tasks would be performed during the testing stage. We found during this pre-placement that since the two letters Mim and Noun are used as

prefixes in the Arabic language, the participants could take any radical and turn it into a word starting with one of these two letters, which prevents them from realizing a true task of literal fluency. Finally, we used the two letters Rae and Bae in our final version.

### 3-2- Standardization of Verbal Fluency Test

#### 3-2-1- Participants

The sample of this study is made up of 348 neurologically intact subjects aged at least 18 years old, having a level of education of at least 3 years and of which Morocco is the native country as well as a good command of Arabic language. . Anyone with a history of a psychiatric or neurological disorder (for example, those who have had a stroke) was excluded. People who have been educated in the fight against illiteracy have also been excluded. The subjects were recruited from cafés, public gardens, teachers' clubs, sewing clubs, homes and various social establishments (schools, associations ...) and they received no financial remuneration for their participation. An assessment of overall cognitive functioning was performed for each participant in the sample prior to the verbal fluency test. For this purpose, we administered the MMSE. The average of the scores obtained by the participants is 27.51 / 30 (ET: 2.03).

Participants were divided according to age (18 to 39, 40 to 59, 60 to 69 and 70 and over), gender and education (3 to 6 years of education, 7 to 10 years, 11 years and more). The average age is 51.5 (ET: 18.32), the average of the years of education is 9.22 (ET: 4). The male / female ratio is 192/156.

**Table 1. Distribution of participants by level of education, age and gender**

Age	Level of education	Gender	
		Male	Female
18 to 39 years	3 to 6 years	16	16
	7 to 10 years	16	16
	11 years and more	16	16
40 to 59 years	3 to 6 years	16	16
	7 to 10 years	16	16
	11 years and more	16	16
60 to 69 years	3 to 6 years	16	15
	7 to 10 years	16	12
	11 years and more	16	16
70 years and older	3 to 6 years	16	9
	7 to 10 years	16	5
	11 years and more	16	3
Total		192	156

#### 3-2-2- Procedure

Regarding the categorical fluency task participants were asked to generate as many names of animals and fruits as possible in a time limit of two minutes.

For the literal fluency we asked the participants to mention as many words as possible starting with the letters Bae and Rae in two minutes, stating that the proper nouns as well as the derived nouns of the same radical will not be accepted. Responses for the four criteria were raised by 30 seconds.

#### 4- Results and discussion

**Table 2. Normative data for phonemic Verbal Fluency Test in Moroccan subjects**

		Male		Female	
		Bae	Rae	Bae	Rae
18 to 39 years	3 to 6 years of education	7.18 (3.75)	7.12 (4.5)	8.87 (4.16)	8.31 (4.85)
	7 to 10 years of education	11.12 (3.28)	10.31 (5.44)	10.81 (4.1)	10.06 (5.39)
	11 years of education and more	14 (5.31)	16.62 (6.53)	13.81 (3.7)	13.37 (3.77)
40 to 59 years	3 to 6 years of education	8.12 (2.06)	6.43 (3.48)	9.06 (4.78)	9.06 (5.43)
	7 to 10 years of education	12.5 (6.66)	14.5 (10.13)	12.75 (2.86)	10.56 (3.82)
	11 years of education and more	17.31 (6.36)	17.68 (6.89)	15.18 (4.44)	14.5 (4.76)
60 to 69 years	3 to 6 years of education	6.62 (2.24)	6.68 (2.82)	7.13 (4.06)	5.93 (1.9)
	7 to 10 years of education	10.81 (5.57)	12.56 (7.58)	7.91 (3.87)	8.91 (4.69)
	11 years of education and more	15.06 (4.8)	13.8 (4.03)	10.25 (3.56)	11.87 (4.42)
70 years and older	3 to 6 years of education	6.75 (2.84)	6.25 (3.13)	7.66 (3.77)	7.44 (4.44)
	7 to 10 years of education	8.87 (4.22)	9 (4.28)	8.8 (1.53)	9 (3.03)
	11 years of education and more	12.25 (5.11)	13.06 (4.34)	9.66 (2.51)	10 (3.46)

**Table 3. Normative data for semantic Verbal Fluency Test in Moroccan subjects**

		Male		Female	
		Animals	Fruits	Animals	Fruits
18 to 39 years	3 to 6 years of education	15.56 (5.47)	13.56 (4.3)	17.93 (5.56)	15.62 (4.3)
	7 to 10 years of education	20.62 (5.42)	15.56 (3.28)	21.56 (8.03)	16.93 (4.31)
	11 years of education and more	25.87 (7.23)	17.25 (4.9)	27.37 (5.29)	18.87 (4.16)
40 to 59 years	3 to 6 years of education	17.87 (5.17)	14.62 (2.8)	19.18 (16.03)	16.81 (4.18)
	7 to 10 years of education	19.43 (4.8)	15.56 (3.57)	20.75 (5.97)	17.18 (5.64)
	11 years of education and more	20.06 (6.42)	18.06 (4.32)	24.06 (7.34)	19.31 (4.17)
60 to 69 years	3 to 6 years of education	15.75 (5.19)	12.68 (3.85)	19.2 (5.54)	15.6 (5.06)
	7 to 10 years of education	19.31 (8.29)	13.18 (4.46)	17.25 (6.81)	15.25 (5.08)
	11 years of education and more	20.56 (5.34)	19.25 (5.4)	20.06 (6.31)	17.12 (4.75)

70 years and olders	3 to 6 years of education	15.75 (5.85)	11.62 (3.61)	17 (4.3)	12 (3.9)
	7 to 10 years of education	18.75 (4.98)	14.62 (2.62)	19 (5)	15.2 (3.58)
	11 years of education and more	21.37 (6.53)	15.06 (4.58)	18.33 (4.04)	15.66 (4.04)

### 2-5-1- The effect of education level

Overall, we found a positive effect of instructional level on performance in terms of semantic and phonemic fluency.

#### ❖ From 18 to 39 years old:

The differences between the means of the subjects' scores according to their level of education are statistically significant at the level of the categorial fluency: animals ( $F = 20.25$ ,  $p = 0.0001 < 0.01$ ), fruits ( $F = 5.31$ ,  $p = 0.007 < 0.01$ ), and at the level of the literal fluency: "Bae" ( $F = 17.13$ ,  $p = 0.0001 < 0.01$ ), "Rae" ( $F = 16.39$ ,  $p = 0.0001 < 0.01$ ).

The differences between the 3 levels of instruction are statistically significant at the semantic fluency level: Animals ( $F = 10.43$ ,  $p = 0.0001 < 0.01$ ), fruit ( $F = 4.34$ ,  $p = 0.016 < 0.05$ ), and phonemic fluency: "Bae" ( $F = 20.36$ ,  $p = 0.0001 < 0.01$ ), "Rae" ( $F = 14.09$ ,  $p = 0.0001 < 0.01$ ).

#### ❖ From 60 to 69 years old:

For semantic fluency, no significant differences were found between the three levels for the category of animals ( $F = 1.69$ ,  $p = 0.18 > 0.05$ ). On the other hand, these differences are significant for the fruit category ( $F = 7.4$ ,  $p = 0.001 < 0.01$ ), as well as for the literal fluency: "Bae" ( $F = 13.48$ ,  $p = 0.0001 < 0.01$ ), "Rae" ( $F = 16.13$ ,  $p = 0.0001 < 0.01$ ).

#### ❖ 70 years and over:

The differences between the three levels of education are statistically significant. Categorial fluency: Animals ( $F = 5.57$ ,  $p = 0.006 < 0.01$ ), fruits ( $F = 7.96$ ,  $p = 0.001 < 0.01$ ). Literal fluency: "Bae" ( $F = 11.67$ ,  $p = 0.0001 < 0.01$ ), "Rae" ( $F = 4.08$ ,  $p = 0.02 < 0.05$ ).

Verbal fluency performance improves as the level of education is high. This effect of the level of instruction on semantic and phonemic verbal fluency tasks is statistically significant for all participants in the sample studied.

### 2.5.2 The effect of age

The effect of age on performance does not appear to be the same by comparing the scores of participants in different age groups. These performances tend to improve with the increase in age between the first two age groups. However, we observed the inverse effect of age on performance between the last three age groups. A statistical analysis of this effect was indispensable.

#### ❖ Comparison of age groups: 18 to 39 and 40 to 59 years:

We did not observe large differences between the averages for category fluency. For the literal fluency, we noticed an improvement of the performances in parallel with the

increase of the age. This effect is statistically significant for the letter "Bae" ( $F = 4.45$ ,  $p = 0.03 < 0.05$ ), while it is not significant for the letter "Rae" ( $F = 1.73$ ,  $p = 0.18 > 0.05$ ).

❖ Comparison of age groups: 40 to 59 and 60 to 69:

Between these two age groups, performance tends to decrease with increasing age. Statistical analysis does not reveal any significant differences between the participants' means by age for semantic fluency. On the other hand, these differences are significant for the literal fluency: "Bae" ( $F = 11.93$ ,  $p = 0.001 < 0.01$ ), "Rae" ( $F = 5.01$ ,  $p = 0.02 < 0.05$ ).

❖ Comparison of age groups: 60 to 69 and 70 and over:

Generally, between these two age groups, there is a slight decrease of the performances for the animal criteria, "Bae" and "Rae" with the increase of the age. This decrease is more marked for the fruit criterion, in addition to being statistically significant ( $F = 5.87$ ,  $p = 0.017 < 0.05$ ).

For the sample studied, verbal fluency performance improves with increasing age for participants between 18 and 59 years of age. However, from age 60, age begins to have a negative effect on these performances. These differences in age-related performance are not significant for all the criteria studied.

### 2-5-3-The effect of sex:

❖ Semantic fluency:

The men obtained a general average of scores of 19.74 (S.D: 6.71) for the animal criterion and 15.08 (S.D: 4.49) for the fruit criterion. The average of the scores obtained by the women is 20.59 (ET: 6.7) for the animal criterion and 16.65 (ET: 4.77) for the fruit criterion. These differences are significant for the fruit category ( $F = 9.88$ ,  $p = 0.02 < 0.05$ ) and not significant for the animal category ( $F = 1.38$ ,  $p = 0.24 > 0.05$ ).

❖ Phonemic fluency:

The men obtained a general average score of 10.88 (S.D: 5.55) for the letter "Bae" and 11.17 (S.D: 6.75) for the letter "Rae". The average of the scores obtained by the women is of 10.48 (S.D: 4.57) for the letter "Bae" and 10.14 (S.D: 4.95) for the letter "Rae". These differences are not significant: "Bae" ( $F = 0.51$ ,  $p = 0.47 > 0.05$ ), "Rae" ( $F = 2.55$ ,  $p = 0.11 > 0.05$ ).

The statistical analysis of the scores does not reveal significant differences between the performances of men and women for the animal criteria, Letter "Bae" and letter "Rae". On the other hand, there is performance at the fruit category, which is significantly higher in women than in men.

### 2-5-4-The effect of the fluency task

The total average of the scores obtained by the subjects for the semantic fluency is 17.95 (ET: 6.17). For the literal fluency, this average is 14.70 (ET: 5.59). This difference is statistically significant ( $F = 526.44$ ,  $p = 0.0001 < 0.01$ ).

The performances at the level of the semantic fluency are significantly superior to those obtained at the level of the literal fluency.

## Discussion

The first goal of this research was to establish standards of verbal fluency performance in the form of averages with standard deviations depending on age, socio-cultural level and gender of normal Moroccan subjects. The clinical usefulness of these standards is that they will increase the ability of practitioners in the field of language assessment in Morocco to place the performance level of verbal fluency test of patients evaluated compared to normal performance, which allows them to understand the semantic and executive system in these patients. The evaluator must consider two factors when using current standards. First, these standards are only applicable when the animal and fruit categories and the letters Bae and Rae are used. Indeed, a big difference exists between the number of words generated to different letters of the alphabet and to different categories. Secondly, these standards are only applicable to Moroccan subjects who speak Arabic fluently. This means that we can not take into account Amazigh patients who do not master Arabic well, because we might conclude to a cognitive deficit while the decline in performance is related to the lack of knowledge of the Arabic vocabulary. In addition, these norms can not be applied to subjects of other Arab countries or even Maghreb, because each socio-cultural context has its specificities according to the habits and the type of education of the subjects belonging to this context.

The second objective of our study was to verify the influence of age, education and gender on verbal fluency task performance. We found that the effect of education on fluency tasks is significant for all age groups. Several other studies have shown that education plays a major role in performance in verbal fluency tasks (Cardebat & al., 1990, Tombaugh & al., 1999, Feggy Ostrosky-Solis & al., 2007).

By comparing the average scores between each two age groups, we found dissociation in the effect of age on performance. This effect is positive for younger subjects (18 to 59 years old), whereas it is negative for older subjects (60 years and older). The statistical analysis did not show that these two effects are significant for the four criteria evaluated. These results are consistent with other studies that have found that age has a weak influence on verbal fluency tasks in relation to the influence of educational attainment (Tombaugh & al., 1999, Feggy Ostrosky-Solis & al., 2007). We also verified the effect of gender on performance for the four criteria evaluated. A significant difference was observed for the fruit category, where women's performance is significantly higher than that of men. This result is in line with Cardebat & al. (1990) who found a significant gender effect for women in the furniture and fruit categories. The same result for this last criterion was also observed by Capitani & al. (1999). According to these authors, the hypothesis of different autobiographical experiences characterized by greater exposure to one category or another, would explain these differences.

Concerning the effect of the fluency task, we found a significant difference between the performances in phonemic fluency and those in semantic fluency, the latter being the best ones. This result may be due to the high sensitivity of phonemic fluency tasks at the instructional level. A study by Ratcliff & al. (1998) has shown an effect of higher education level in literal fluency than in semantic fluency. The performance in the literal fluency task would be more directly related to the level of study by the implication of literacy in phonemic segmentation processes.

One of the limitations of our study is that it does not allow to verify the qualitative analysis taking into account the "Clustering" and the "Switching" which are mechanisms very involved in verbal fluency tests. We have been forced to choose



between qualitative and quantitative analysis because each of the two methods requires a specific data processing procedure. In addition, for clinical reasons, we have more need in Morocco to have standards for the number of words generated for semantic and literal verbal fluency criteria than the number of "Switching" and "Clustering" standards that are generally analyzed by the clinician second after analyzing the scores obtained when administering the verbal fluency test.

The analysis of the results obtained from this research puts us in front of several problems concerning the specificities of the socio-cultural context of Morocco and the characteristics of the linguistic situation in this context. Future research will have to address these issues and also highlight other factors that may influence verbal fluency performance in Moroccan subjects.

### **Conclusion**

This study allowed us to obtain norms of performance of a Moroccan population according to the level of education, age and gender. These norms will help to facilitate the neuropsychological assessment of memory and executive functions in the Moroccan context. In addition, our study shows the importance of continuing research in our country concerning the verbal fluency test. Future studies may explore the mechanisms of "Switching" and "Clustering" in Moroccan subjects realizing verbal fluency tasks. We also need in our country to study the performance of illiterates on verbal fluency tasks. The characteristics of our socio-cultural context (bilingualism, diglossia, frequency of illiteracy, specificity of the Arabic language, etc.) show the need to multiply Moroccan studies that focus on verbal cognitive tests, which will have a positive effect on the relevance of neuropsychological investigations.

## References

- Cardebat D., Doyon B., Puel M., Goulety P., Jounette Y. (1990) Evocation lexicale formelle et sémantique chez des sujets normaux: Performances et dynamiques de production en fonction du gender, de l'âge et du niveau d'études: *Acta Neurologica Belgica*, 90, 207-217.
- Capitani, E., Laiacona, M., & Barbarotto, R. (1999). Gender affects word retrieval of certain categories in semantic fluency tasks. *Cortex*, 35, 273-278.
- Feggy Ostrosky-Solis, Azucena Lozano Gutierrez, Maura Ramirez Flores, Alfredo Ardila (2007). Same Or Different? Semantic verbal Fluency across Spanish- speakers from different Countries: *Archives of clinical Neuropsychology*, 22, 367-377.
- Gollan TH, Montoya RI, Werner G. (2002). Semantic and letter fluency in Spanish-English bilinguals. *Neuropsychology*, 16:562-576.
- Haugen E. The Norwegian language in America. *University of Pennsylvania Press* 1953.
- Hector M. González Dan Mungas, Mary N. Haan (2005). A semantic verbal fluency test for English- and Spanish-speaking older Mexican-Americans. *Archive of clinical neuropsychology*, 20, 199-208.
- Jos'e S. Portocarrero, Richard G. Burchrightm, Peter J. Donovan. (2007). Vocabulary and verbal fluency of bilingual and monolingual college students. *Archives of Clinical Neuropsychology*, 22, 415-422.
- Krashen S.D. (1982). Principles and Practice in Second Language Acquisition. *Oxford: Pergamon Press*, pp 10-32.
- Raoux N., Le Goff M., Auriacombe S., Dartigues J-F., Amieva H. (2010). Semantic and letter fluency tasks: Normative data in an elderly population of 70 years old and over from the PAQUID cohort. *Revue neurologique*, 166, 594-605
- Ratcliff R., Rouder JN. (1998). Modeling response times for two-choice decisions. *Psychological Science*, 9:347-356.
- Rosselli M., Ardila A., Araujo K., Weekes V.A., Caracciolo V., Padilla M. (2000). Verbal fluency and repetition skills in healthy older Spanish-English bilinguals. *Applied Neuropsychology*, 7, pp. 17-24
- Sunila J., Lavya M-J, and Rajashekar B. (2011). Qualitative Analysis of Clustering on Verbal Fluency in Young Adults. *LANGUAGE IN INDIA: Strength for Today and Bright Hope for Tomorrow*, 11, 11-21.
- Thurstone, LL and Thurstone, TG (1938). *Primary Mental Abilities*. Chicago: University of Chicago Press.
- Tom N., Tombaugh Carleton (1999). Normative Data Stratified by Age and Education for Two Measures of Verbal Fluency: FAS and Animal Naming. *Archives of Clinical Neuropsychology*, 14, 167-177.
- Troster A.I, Fields J.A., Esta J.A., Paul R.H., Blanco C.R., Hames K.A., Salmon D.P., Beatty W. (1998). Cortical and subcortical influences on clustering and switching in the performance of verbal fluency tasks. *Neuropsychologia*, 36, 295-304.
- Troyer A.K, Moscovich M., Winocur G. (1997). Clustering and switching as two components of verbal fluency: Evidence from younger and older healthy adults. *Neuropsychology*, pp. 138-146.