



## Socio-cultural adaptation and standardization of Dubois' five words testing in a population of normal subject in Mali, West Africa



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### ABSTRACT

**Introduction:** Dubois' five words testing (5WT) is a verbal memory test that depends on many parameters. The aim of this study is to adapt Dubois' 5WT to the Malian socio-cultural conditions to (i) determine performances of normal subjects to the 5WT and (ii) provide reference scores of the 5WT.

**Methods:** A sample of 276 normal subjects aged  $\geq 50$  years (154 males and 122 females; 144 literates and 132 illiterates) were enrolled from February 2008 to January 2009. Subjects with a history of symptoms likely to modify cognitive functions and those who were found disabled under Lawton's four simplified item test were excluded.

**Results:** The learning score in illiterates was 1.51 in Dubois' 5WT and 4.90 in the modified 5WT. The mean value of the modified 5WT total score was 9.71. Majority (90.22%) of the subjects scored the maximum (10). The modified 5WT reduced with both the age ( $p < 0.006$ ) and education level ( $p < 0.04$ ).

**Conclusion:** Our results show that Dubois' 5WT is influenced by culture and the socio-educative level in French. Its adaptation to the socio-cultural context could prove useful and efficient in countries with a low literacy rate and a diverse cultural background.

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## 1. Introduction

Dementia constitutes a real public health issue in Europe where and the number of incidences are high after age 65 [8,18]. This is a global concern with approximately 37 million affected individuals [23] because the number of aged people is increasing worldwide. In fact, the remarkable progresses realized in the field of health, economics, and technology contributed to the improvement of life expectancy. According to the World Health Organization [24], the majority of people on the planet live beyond 50 years. Worldwide, the population of individuals beyond 65 years of age increases by 750,000 individuals a month and is expected to reach 800 million by 2025. Two-thirds of these individuals will be from developing countries. In Mali, the population in 2009 was about 12,666,987 [21]. In 2025, the population will be about 24 million, and individuals aged 65 and beyond will be more than 1,000,000.

Alzheimer's disease (AD) is the most frequent etiology of dementia in people aged 65 and beyond, representing two-thirds of all dementia cases [4]. In France its prevalence is estimated at 860,000 with an incidence of 175,000 cases a year [20]. On the contrary studies on AD are rare in Africa. From the few investigations, it is reported that the incidence of AD in Yoruba population of Ibadan in Nigeria is estimated to be 1.4% [16] and in Mali the prevalence of probable AD in rural areas is estimated to be 1.85% [2].

The diagnosis of AD necessitates the availability of adapted and validated neuropsychological tools. In Mali, many neuropsychological tests have been used to assess cognitive decline in people affected by AD; these are the Mini Mental State [14], the Hodkinson's Abbreviated Mental Test [17], the Scales of cognitive complaints (McNair and Khan), Questionnaires of cognitive testing of aged subject (ECAQ), and simplified items of IADL [19]. Some items of these tests were not used because the majority of subjects were illiterates. Specific tools exist to assess amnesic problems of AD: Grober and Bushke test [5,15] and the Bruno Dubois' five words test (5WT). These tests have very good psychometric qualities with a good specificity and sensitivity.

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Bruno Dubois suggests using the 5WT to rapidly assess the verbal episodic memory during AD diagnosis. It is a very useful tool that is easily applicable during a non-specialized visit [12]. It was validated in France in a sample of patients visiting specialized centers of memory, research, and resources (CMRR) [10].

All these tools were conceived based on local culture and in the local language, making them difficult to use in populations with different background. Thus, for a better assessment of memory in a population, there is a need to develop or adapt existing tools to encompass local, social and cultural realities.

In Mali there is no adapted and standardized testing to assess the episodic memory in AD. Thus, the aims of this study were to adapt Dubois' 5WT test to the Malian socio-cultural and educative contexts and determine performances of normal subjects in the 5WT.

## 2. Material and methods

The study was approved by the Ethical Committee of the Faculty of Medicine and Dentistry of Bamako. The study included randomly selected subjects from urban families who were 50 years and older. All subjects with cognitive, visual or hearing impairment, and disabled for Lawton's four simplified items of disabilities of life [19], and all subjects on treatments susceptible to modify cognitive functions were excluded. We also did not include subjects with a history of neurological or psychiatric disorders or head injury. The subjects were classified in two groups:

**Literates:** subjects who attended conventional school up to baccalaureate and can read and write in French.

**Illiterates:** subjects who did not attend conventional school and cannot read or write in French.

### 2.1. Sampling

The technique of sampling was based on the random method. Subjects were enrolled during home visits (door to door) in the geographical area of the 4th district. The starting point was the road along the river; we entered in each adjacent street to enroll all the seventh homes located on the right side of the street. Thus, during sampling, we visited homes with no eligible subject and others with more than one eligible subject. However, the majority of subjects who were not present during our first round were interviewed in their homes after an appointment was made.

### 2.2. Interviews

Data were collected by four interviewers, each having two years of post-baccalaureate education and completed training on how to administer the tests. In addition, interviewers were supervised by a final year medical student. Interviewers met with subjects and questioned them using both tests (Dubois' 5WT and the modified 5WT). Before proceeding with questioning, informed consent was obtained from the participant and sometimes his/her guarantor, and the investigators explained items with the highest level of respect. Data were then collected from each individual.

### 2.3. Population

We enrolled 276 normal subjects of age 50 and beyond (154 males and 122 females; 144 literates and 132 illiterates) between February 2008 and January 2009. Information gathered during interviews and their clinical interpretations were confidential and used only for the purpose of this study.

### 2.4. Material

Two tests were used: Dubois' 5WT and the modified 5WT. Each test comprises of a list of five words. Each word belongs to a different semantic category and is not prototypical of its category.

The list of Dubois' 5WT consists of: museum, lemonade, grasshopper, strainer and truck, which referred to the following semantic categories: building, drink, insect, kitchenware and transportation.

The list of modified 5WT was elaborated by experts at the National Directorate of Functional Literacy and Applied Linguistics. The choice of words was based on words suggested by volunteers. Therefore, of all suggested words, the most frequent and rare were dropped. Hence, a list containing five words in Bambara (the national and most spoken language in Mali and spoken in seven West African countries) were considered: Tominji, Mangalani, Nintin, Bulonba and Wotoro with following semantic categories: Minfen, Bagan, Gandominen, So, and Bolifen. The morphemes of these words are:

Tominji: tamarind juice Tomin: tamarind ji: drink.

Mangalani: doe Mangala: deer Ni: diminutive.

Bulonba: big entrance hall Bulon: entrance hall (vestibule) Ba: enhancement.

Nintin: strainer.

Wotoro: cart.

The linguistic characteristics of words (number of letters, phonemes and syllables) are comparables. Thus, the average number of letters of Dubois' 5WT is 7.4 and 8 for Croisile [7] and the modified 5WT. The average number of phonemes is 5.6 in Dubois' 5WT and Croisile et al., and 5.8 in the modified 5WT. The average number of syllables of Dubois' words is 2.8, and 3 for Croisile et al. and the modified 5WT.

### 2.5. The procedure of the 5WT

The procedure of the 5WT [12] is done by submitting a list of five words written on a sheet belonging to each semantic category. Interviewers ask: "Please read this list of five words loudly and try to memorize them because I will ask you to repeat them shortly". After reading, interviewers ask: "By looking at the sheet, can you re-read the word corresponding to each semantic category?"

Interviewers turn the sheet over and ask: "Can you tell me the five words?" For the words not remembered interviewers ask: "What was the name of (by giving the corresponding hint, for example: drink if the patient did not remember the word lemonade)? If the score of immediate recall is 5, interviewers can plan the test of delayed recall 3 min later. If the score is less than 5, the interviewer goes through the list and point to the words not remembered by reminding the word with its hint. Interviewers then ask them again to recall each word in response to its hint. The interviewers ensured that the patient has recorded all the words before assessing their ability to memorize. For 2 to 5 min the patient is distracted with an interfering test. We have chosen the story of the Lion of Barbizet [1]. The interviewer then asks: "Can you give me back the five words?" For not recalled words, the corresponding hint is provided. Correct responses are direct and cued responses. This cued learning is very important since patients with AD suffer from a major deficit of the delayed recall and are poorly helped with the hints of recuperation [11,13,22].

The procedure of 5WT allows obtaining four basic scores and one total score. The four basic scores are as follows: the free immediate recall (RImL, on 5), the cued immediate recall (RImInd), the free delayed recall (RDL, on 5), and the cued delayed recall (RDInd). The sum of these four basic scores (total maximum of 10) will give the total score (TS).

We calculated other scores including the total of immediate recalls (TRIm or training score), the total of delayed recalls (TRD) or memory score (RDL + RDInd), and the balanced total score (BTS) [6]. It increases the weight of free responses:  $2 \times$ . Free Immediate Recall + Cued

**Table 1**  
Word identification and mean learning score in Dubois' and the modified 5WT.

The five word testing	Identified	Mean learning score
Dubois' 5WT in illiterates n = 132	6.9%	1.51
Dubois' 5WT in literates n = 144	97.9%	4.75
Modified 5WT in illiterates, n = 132	96.9%	4.90
Modified 5WT in literates, n = 144	97.9%	4.81

Immediate Recall + 2 × Free Delayed Recall + Cued Delayed Recall. This score varies from 0 to 20.

### 2.6. Statistical analysis

Statistical analysis was completed using the SAS version 9.1 software. Chi square was used for values in proportions and the Student's *t*-test to evaluate association between the 5WT and age and education level. A *p* value ≤ 0.05 was considered to be statistically significant.

### 3. Results

Table 1 describes the identification of words in Dubois' and the modified 5WT among enrolled literate and illiterate subjects. Thus, only 6.9% of illiterate subjects identified all five words of Dubois' test. However, 96.9% of illiterate subjects identified all five words of the modified test. The training score of illiterate subjects in Dubois' 5WT is estimated to be 1.51. Interestingly, this score increased to 4.90 with the modified 5WT (Table 1).

Mean values of TS and BTS were 9.71 and 17.45, respectively. The maximum score of 10 was obtained for the TS by 249 subjects representing 90.22% and 9 by 16 subjects representing 5.79%.

The maximum score of 20 was obtained for the BTS by 78% (28.2%), and a score between 17 and 20 was obtained by 188 subjects.

Table 2 shows normal values of TS and BTS of the modified 5WT. The mean values of the different scores in literates are better than those of illiterates, except for the training score.

Performances of the TS and BTS of the modified 5WT are associated with age (Table 3). Therefore, while the BTS in subjects of 50–60 years was 17.80, it was 15.20 in subjects of age 80 and beyond. The modified 5WT decreases with age ( $p < 0.006$ ).

Performances of TS and BTS decrease with education for both 5WT ( $p < 0.04$ ) and for the modified 5WT ( $p < 0.0001$ ) (Table 4).

No intrusion was found in the 276 subjects during immediate recall as well as delayed recall.

### 4. Discussion

The availability of a memory test improves the diagnosis of AD. It is a tool developed to find disturbances in information encoding, storage, and retrieval [12]. Its use in Mali, where the majority of the population is illiterate necessitates a socio-cultural adaptation. Our results show that Dubois' 5WT is influenced by culture and the socio-educative level in French. The modified 5WT presents performances adapted to the Malian socio-cultural context. Dubois' 5WT training score in illiterates is very low (1.51). Only 9 subjects (6.8%) were able to identify all words. Dubois' 5WT is therefore not adapted for training illiterate subjects. The training score of the modified 5WT was 4.90, and 128

**Table 2**  
Values of TS and BTS of the modified 5WT.

Mean of modified 5WT scores	Literates	Illiterates
Learning score	4.81	4.90
Memory recall score	4.88	4.64
Total score	9.77	9.69
Balanced total score	18.31	16.50

**Table 3**  
Mean value of total and balanced score of modified 5WT according to age ranges.

Modified 5WT	Age ranges			
	50–60	60–70	70–80	>80
	N = 131	N = 98	N = 42	N = 5
Total score	9.69	9.76	9.64	10
Balanced total score	17.80	17.52	16.45	15.20

subjects (96.8%) identified all words. Therefore, it is a test adapted to the training of illiterate subjects.

The mean value of the total score of the modified 5WT is 9.71. The maximum score of 10 was obtained in 90.22% of subjects while Croisile et al. obtained in only 80.4% of the study population [7]. A TS less than 10 was considered as pathologic with diagnostic sensitivity of 91% and a specificity of 87% [12] or a sensitivity of 63% and a specificity of 91% [6]. The average BTS in the modified 5WT is 17.45. This BTS allows net improvement of the sensitivity [6] and confers the important quality of a diagnosis tool to the 5WT. In an earlier study [6], the level defined was 17, which is identical to that of our study.

Performances of the modified 5WT, like most neuropsychological tests, are sensitive to the socio-educative level [22]. However, the influence of the socio-educative level was not found in Croisile's study [7]. Beckmann [3], suggested that the influence of the level of literacy in the performance of a neuropsychological test could be related to the fact that low literacy level itself constitutes a risk factor of dementia or, on the other hand, subjects with low literacy level perceive the situation of test administration as scholarly, decreasing their involvement when they undergo the test.

In this study, we did not register any intrusion as seen in Croisile's study [7]. According to Desgranges et al., intrusions give rise to numeric control and meta-memory impairment, i.e. the knowledge that a subject has of his memory and his performances [9]. The presence of an intrusion is suggestive of a pathologic process. The TS of the modified 5WT obtained by the age range of 80 and beyond is more than those of the three other age groups. However, individuals in this age group are the most susceptible to AD. These aged subjects' performances distorts the relevance of the findings of this test. Nevertheless, the average BTS in subjects of age 80 and beyond is 15.20, less than the mean value of 17. However, it is difficult to draw conclusions because of the low number of subjects older than 80 years of age (5).

In summary, the results of this study would suggest that a value of TS < 10, the BTS < 17, and the presence of intrusion would strongly elicit a pathological process during the testing of the modified 5WT. We surmise that future studies that would include patients with dementia and those with no cognitive disorders would better elucidate this hypothesis.

### 5. Conclusion

Our results showed that the use of standard Dubois' 5WT is inefficient across cultures, and that countries with diverse social and cultural backgrounds such as in Africa should modify existing tools to adapt to the local needs and realities for reliable testing. The modified 5WT is a simple test complying with the Malian socio-cultural realities. The

**Table 4**  
Mean of total and balanced total score in Dubois' and the modified 5WT.

5WT	1st–7th grade		7th grade to baccalaureate		Baccalaureate and more	
	Total score	Balanced total score	Total score	Balanced total score	Total score	Balanced total score
Dubois' 5WT	8.53	15.69	9.83	17.04	9.97	17.92
Modified 5WT	9	15.83	9.75	18.24	10	18.75

performances of the test are identical to those reported classically on normal subjects. The use of the modified 5WT allows an improvement of the diagnosis of AD. It is therefore recommended for the screening of AD in Mali and in other countries where Bambara is spoken.

### Conflict of interest

The authors declare that there are no conflicts of interest.

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