

The development of a speech and language screening test for Maltese older persons

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Abstract

Aim: To develop the first screening test for Maltese speaking older adults with acquired language difficulties based on normative data, referred to in the study as Language Screening Test for the Elderly (LeST).

Methodology: Normative data were collected from a representative sample of 77 elders living in the community, through cluster sampling from the five regions of Malta. Inclusion criteria: i) functional hearing abilities, ii) no history of neurological disorders, and iii) no cognitive impairment. Eighteen subjects were excluded. Factors taken into account: a) age (60 to 79 years and 80+ years), b) gender, c) educational background, d) literacy and e) bilingualism. A pilot study was carried out on 20 participants.

Data collection was carried out at day centres by four speech language pathologists (SLPs). The LeST was also administered on ten subjects with aphasia and results were compared to the normal population.

Results: Correlation and comparative statistical analysis of the data revealed that 1) scores were not affected by gender, age or locality, 2) *p*-values reach significance for factors related to bilingualism and literacy, and 3) the mean scores differ significantly between the control and test group. A cut-off point for receptive skills and one for expressive skills were also obtained.

Conclusion: The test is valid for the purpose of language screening and would serve to ensure early identification of language impairment.

Introduction

Communication disorder as a result of neurological insult is common. This may be a presenting feature both in the emergent and under-referred field of progressive aphasia as stated by Taylor *et al.*¹, as well as in the more familiar scenario of acute onset aphasia as noted by the Royal College of Physicians.² Aphasia is defined by Brookshire, Darley and Goodglass³ as “an acquired communication disorder caused by brain damage, characterized by an impairment of language modalities: speaking, listening, reading, and writing; it is not the result of a sensory or motor deficit, a general intellectual deficit, confusion, or a psychiatric disorder.” The interdependency of such multimodality underpins the impracticality of assessing isolated aspects of linguistic performance in individuals with disordered communication.

Early identification, diagnosis and treatment of language deficits are important steps in maximising rehabilitation gains. A routine screening test is an invaluable tool in the early identification and appropriate referral of individuals with possible underlying language problems.

Since screening tests that are tailor-made for the Maltese elderly population are not available, it is accepted practice locally, for Speech Language Pathologists (SLPs) to make use of adaptations of widely used tests developed for an English speaking population in order to reach a differential diagnosis of a presenting language disorder. However such tests can only be used informally and are therefore only of limited use. The aim of this research project was to create the first quantitative language screening test for the Maltese elderly population with acquired speech and language difficulties. A comprehensive literature search informed the procedure in creating this test.

Various tools were reviewed for informative purposes. These are the Frenchay Aphasia Screening Test (FAST) by Enderby *et al.*⁴, the Aphasia Screening Test (AST) by Whurr⁵ and the

Keywords

Screening, Maltese, elderly, aphasia

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Sheffield Screening Test for Acquired Language Disorders (SST) by Syder *et al.*⁶ A study by Al-Khawaja *et al.*⁷ compared the FAST to the SST and found that their predictive value for the screening and diagnosis of aphasia was similar. The SST was found to have the additional advantage of not requiring any special equipment or stimulus cards. It is also designed to screen for milder language deficits through subsections targeting higher language functions, such as abstract word-finding and verbal reasoning, rendering the test more sensitive. The SST presents a format that includes subtests which address expressive and receptive language skills separately. In the receptive skills (verbal comprehension) section we find verbal comprehension of single words, sequential and complex commands; recognition of differences in meaning between words and comprehension of a narrative. The expressive skills (verbal expression) section includes word-finding, abstract word-finding, sequencing, definitions and verbal reasoning. A similar format was kept for the design of the Maltese screening test as described in the Materials section below.

Methods

Materials

A recorder (Sony 1C ICD-P520) was used to carry out the word repetition test. Twenty high frequency words in Maltese were selected from the only available study for frequency counts in the Maltese language by Mizzi⁸, and recorded on this device. These words were then played back to each participant at the beginning of the test to screen for hearing acuity.

The output sound of the recording was measured to be within 72 to 86 dB using a sound level meter (CRL222, Cirrus Research Ltd.).

Modifications were made to the Mini Mental State Examination (MMSE) by Folstein *et al.*⁹ prior to commencement of data collection for the research project and following analysis of the pilot study results. This was done to make it more culturally friendly for the Maltese population. This adapted version was used solely for the purpose of including those subjects without cognitive difficulties.

The LeST

The screening test is made up of two main sections: receptive language and expressive language. The scores are given according to accuracy of response. Every successive task increases in complexity, even though one must bear in mind, that since this is an initial screening test, its purpose is to accurately identify persons for whom a more comprehensive assessment is required. Visual stimuli in the form of everyday objects are used for this test.

Receptive skills

This section includes the screening of the following:

- comprehension of simple commands - tests auditory comprehension through a request for an action.
- comprehension of single words using common objects – tests ability to identify the object to a verbal request.

- comprehension of simple and more complex sequential commands – tests auditory comprehension, increasing in complexity from 3 to 6 information carrying words. Initially, a straight sequential order is conveyed. Then, complexity of information to be processed, is increased by using a temporal marker ('before') and introducing the concept of exclusion ('all except for').
- recognition of differences in meaning between words - tests ability to select a semantically unrelated lexical item from a group of four heard words (odd-one-out type task).
- comprehension of narrative – tests auditory memory through ability to respond to questions about two narrated short stories. The information demanded in the second story is more specific, since it requires lexical retrieval related to the second item in a list.

Expressive skills

This section includes the screening of the following:

- object naming – tests ability to name a number of simple objects.
- definitions - lexical items including a concrete noun, a verb and an adjective were used, to be defined by the individual.
- verbal reasoning – tests ability to answer various problem solving situations.
- abstract word-finding – tests ability to access and retrieve words that are semantically related to a given non-imageable word.
- generative naming – tests the ability to name a category (animals) in a given time frame.
- sequencing - tests the ability to describe a sequence of events (preparing a cup of tea/coffee).

Selection and description of participants

A cluster sample of 77 elderly subjects was chosen from a total of 71,792 elderly Maltese citizens taken from NSO census of 2005¹⁰. The census sub-divides the Island into five districts (Southern Harbour, Northern Harbour, South Eastern Harbour, Western District and Northern District) and within each district the elderly population is divided into two categories: age (60 – 79 and 80+) and gender. These three variables (regional variation, age and sex) were utilised in order to draw up a representative sample. Maltese was required to be the first language of all participants. Eighteen eligible participants were therefore eliminated and a total of 77 healthy control participants were recruited. Participants were recruited from elders still living in the community attending Day Centres where the test was administered.

Inclusion criteria for the control group

For the purpose of collecting normative data, the researchers decided that participating elderly individuals would not have any neurological, psychiatric or sensory impairment. Cognitive impairment was screened as cited above in the materials section. Those who scored less than 23/30 were excluded from the study.

Maxim and Bryan¹¹, National Centre for Health Statistics¹² and Sindhusakea *et al*¹³ argue that hearing loss in the elderly is common. Not to have a hearing disability negatively affect performance on the screening test, the researchers felt the need to screen the hearing ability of the participants. Mizzi's⁸ word repetition test, consisting of a selection of 20 high frequency words in Maltese, was recorded on a digital recorder. This recording was played for each participant who had to listen and repeat each word correctly. Subjects with a score of <90% in the word repetition test were also excluded.

The experimental (aphasia) group

An experimental aphasia group was also identified. These included 6 males and 4 females, who all had acquired aphasia following a cerebro-vascular accident. This was determined using adaptations of aphasia tests, as described in the introduction. The experimental group was referred to the researchers by the SLPs within the community. With regards to age, location, education, language and literacy, the subjects chosen were within the same categories as the ones in the control group. No constraints were placed on the time post-onset at which they were seen, nor on the severity of language disturbance.

The MMSE was not administered on the 10 subjects. Due to possible expressive difficulties encountered by these subjects, (that will affect scoring on the MMSE), the researchers used the Butt Non-Verbal Reasoning Test (BNVR)¹⁴, which tests problem-solving abilities through a non-verbal response. This also includes a screening tool testing the perceptual skills required to complete this test. The second part includes 11 photographs of people with problems, that require a solution. For each problem, four pictures (target response, visual distractor, semantic distractor and unrelated distractor) are presented and a score is given when the correct response is shown.

The pilot study

Prior to commencing data collection, a pilot study was carried out on 20 healthy elderly individuals. These individuals were screened using the MMSE and the word repetition test. The screening test was subsequently administered and the necessary changes were carried out as shown in materials section above. Individuals participating in the pilot study were not included in the main study.

Procedure

Collection of normative data

Ethical approval and permission to collect data from the elderly in the community was obtained from the Director of the Department for the Elderly and Community Care. The purpose of the study was explained to each participant and their written consent was obtained. Four Speech-Language Pathologists (SLPs) were involved in the administration of this project.

Two SLPs screened the elderly attending the Day Centres, by administering the word repetition task and the adapted MMSE. The participants who successfully completed both tests and who had no prior co-morbid medical history were then screened by the other two SLPs who administered the LeST.

The answers are recorded on a score sheet. Each main section, as described above, contains six subtests with a maximum score of 18. Each subtest contains three questions, each of which carries a score of one.

During this research project, inter-rater reliability was verified through the pilot study, where, one person was testing and scoring and an observer was scoring simultaneously. There was 100% agreement between the raters, since no differences were noted in their observations. As an alternative, the correlation of ratings of the same single observer repeated on two different occasions was observed. During the actual project, different sections of the test were always carried out by the same tester, in order for there to be uniformity during data collection, as well as to score the responses consistently throughout all the subjects.

Various types of validity evidence were used to sum up validity judgment. In order to establish external validity, one needs to look at whether the conclusions in the study can be generalised to other persons, places or times. Since the sample used in this project was representative of the whole population, the screening tool can be generalised to the whole population. Haynes, Richard and Kubany¹⁵ argue that "content validity is the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose." The contents in the screening test were created following extensive literature review as described above. Haynes *et al*¹⁵, note that by using a panel of experts to review the test specifications and the selection of items the content validity of a test can be improved. Prior to commencing data collection, a group of SLPs were involved in reviewing the structure and content of the test in order to verify whether any amendments needed to be made. All amendments were then made before data collection was initiated. Anastasi¹⁶ states that "face validity pertains to whether the test "looks valid" to the examinees who take it, the administrative personnel who decide on its use, and other technically untrained observers." Face validity was verified through other SLPs administering the test, who reported no difficulties during administration. The pilot study was used to verify whether each section of the test required some sort of modification due to difficulties that may have been encountered by this sample. Modifications were then made prior to commencement of data collection for the research project *per se*. Statistical analyses and discussion of the relationships between the different test items has been carried out for this research project, and since a cut-off point was reached, this confirms construct validity of the test.

Results

A statistical analysis of all the data collected in the study was carried out using SPSS analytical software (Version 16). Each variable was analysed in relation to all the others as shown in the tables below. Total score refers to receptive language skills score plus expressive language skills score.

Variable analysed included:

1. Age and gender in relation to receptive language skills, expressive language skills and total score.

Table 1: Receptive, expressive and total scores in relation to age and gender

	Receptive skills score max. score: 18		Expressive skills score max. score: 18		Total score max. score: 36	
	Mean	p-value	Mean	p-value	Mean	p-value
1. Age and gender						
60-79 years (M. & F.)	15.25	0.605	16.52	0.212	0.490	
80+ years (M. & F.)	15.00		15.81		0.281	
60-79 years – Male					31.45	
60-79 years - Female					31.94	
80+ years – Male					29.75	
80+ years - Female					31.28	
Male					31.19	
Female					31.82	
					0.316	

2. Education and gender in relation to receptive language skills, expressive language skills and total score.

Table 2: Receptive, expressive and total scores in relation to education and gender

	Receptive skills score max. score: 18		Expressive skills score max. score: 18		Total score max. score: 36	
	Mean	p-value	Mean	p-value	Mean	p-value
2. Education						
Male	No education			28.00		
	8–11 yrs.			28.67		
	12–14 yrs.			32.17		
	15–22 yrs.			31.00		0.111
Female	No educ.			30.20		
	8–11 yrs.			31.23		
	12–14 yrs.			32.37		
	15-22 yrs.			32.33		0.254
Male & Female	No education	15.50	14.33	29.83		
	8–11 yrs.	14.44	16.36	30.81	0.054	0.108
	12–14 yrs.	15.52	16.79	32.31		
	15–22 yrs.	15.25	16.08	31.33		
			0.023			

Figure 1: Mean of the total scores throughout the five districts



3. Localities in relation to receptive language skills, expressive language skills and total score. Figure 1 below shows Districts 1 – 5 and the mean of the total score per district, $p=0.773$.

4. Monolingual/bilingual use of language in relation to receptive language skills, expressive language skills and total score.

Table 3: Receptive, expressive and total scores in relation to language

	Receptive skills score max. score: 18		Expressive skills score max. score: 18		Total score max. score: 36	
	Mean	p-value	Mean	p-value	Mean	p-value
4. Language						
Maltese speaking + understands english	15.10	0.984	16.45	0.187	31.55	
Maltese speaking only	15.08		15.46		30.54	
Bilingual (Maltese & English)	15.33			31.93		
Maltese speaking only	15.08	0.646	15.46	0.046	30.54	0.106

5. Reading abilities in relation to receptive language skills, expressive language skills and total score.

Table 4: Receptive, expressive and total scores in relation to reading

	Receptive skills score max. score: 18		Expressive skills score max. score: 18		Total score max. score: 36	
	Mean	p-value	Mean	p-value	Mean	p-value
5. Reading						
Maltese & English	15.11		16.62		31.73	
No	15.60	0.542	14.40	0.009	30.00	0.185
Maltese only	15.38		16.29		31.67	
No	15.60	0.746	14.40	0.070	30.00	0.170

6. Writing abilities in relation to receptive language skills, expressive language skills and total score.

Table 5: Receptive, expressive and total scores in relation to writing

	Receptive skills score max. score: 18		Expressive skills score max. score: 18		Total score max. score: 36	
	Mean	p-value	Mean	p-value	Mean	p-value
6. Writing						
Maltese & English	15.24		16.62		31.86	
No	15.00	0.672	14.78	0.009	29.78	0.044
Maltese only	15.40		16.54		31.94	
No	15.00	0.525	14.78	0.023	29.78	0.020

Discussion

Normative data collected were used to find out whether there was variation in scores across different ages, gender, educational abilities, habitation locality, bilingualism, reading and writing. Statistical significant difference was only noted in bilingualism and literacy.

With regards to bilingualism, comparisons were made in two ways: the first between subjects with Maltese as their first language and can only understand English, as opposed to subjects who understand and speak Maltese; the second was between subjects with Maltese as their first language and English as their second, as opposed to subjects who only understand and speak Maltese. No statistical significance was noted from the results of the first group, however, from the results of the second group, it was noted that $p < 0.05$, showing that with regards to expressive skills, bilingualism has an effect on the score and this factor should be kept in mind when conducting the test.

As regards literacy skills, categories that were analysed included subjects who are able to read and write in Maltese and English, those who are able to read and write in Maltese only and those who are unable to read and write. The researchers compared the scores of the subjects who are able to read and write in Maltese and English, as opposed to those subjects who are unable to read and write. With regards to reading, the results show that a statistical significance exists in the expressive skills score of subjects who are able to read Maltese and English, as opposed to those who cannot. The scores of the subjects who are able to read Maltese only, as opposed to those who are unable to read, were also compared and the difference between the results of the expressive skills as shown in the table, may indicate that the subjects' ability to read English may be affecting their ability to express themselves even in Maltese. With regards to

writing, the scores show that ability to write may be affecting one's ability to score better in the test, especially with regards to expressive skills. The clinical implications of these findings require, that before conducting the screening test, the assessor needs to establish whether the client is able to read and write in Maltese and English.

The fact that there was no difference in scoring across the different ages, gender, educational abilities and habitation localities also has important clinical implications. The assessor should not take these into account prior to conducting the screening test, so that no bias exists across these variables.

The LeST was also administered on an experimental aphasia group (Figure 2). The researchers compared all scores of the normal population with those of persons with aphasia. In all instances, $p < 0.05$ and the mean scores also differ significantly between the two groups. The upper bound scores for the aphasic groups in all three areas (receptive, expressive and total scores) are lower than the lower bound scores of the normal population (Figure 2), confirming the validity of the test for the purpose of language screening.

The researchers agreed that the test should have a cut-off point for receptive skills and one for expressive skills. With regards to receptive skills, the lower bound score for the normal elderly (with 95% confidence interval) is 14.85, whereas the upper bound score for the aphasic subjects is 12.30. From all the data collected, comparing the highest score of the lower bound and the lowest score of the upper bound, it was concluded that a score of 13 would be the cut-off point whereas scores from 12 to 14.5 would be considered as the grey areas for receptive skills. With regards to expressive skills, the lower bound score for the normal elderly (with 95% confidence interval) is 15.98, whereas the upper bound score for the aphasic subjects is 10.80. The

Figure 2A: Comparison of receptive skills scores between the two groups

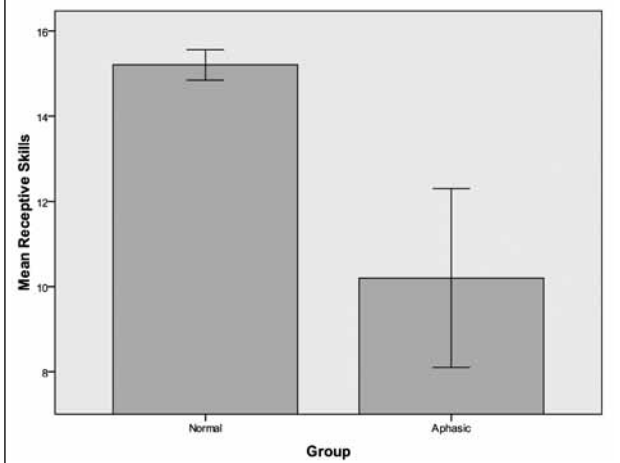


Figure 2B: Comparison of expressive skills scores between the two groups

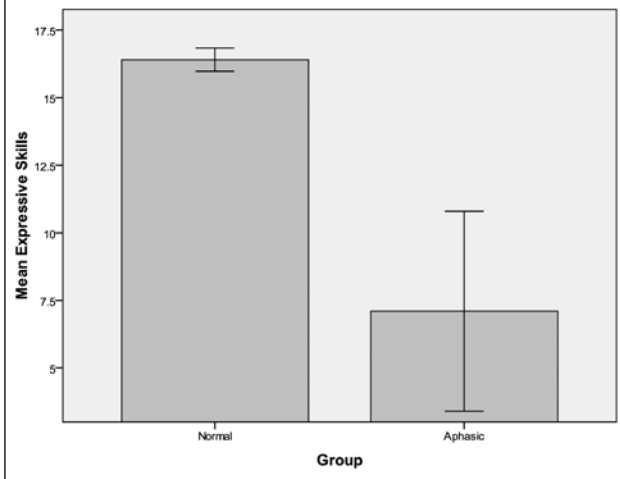
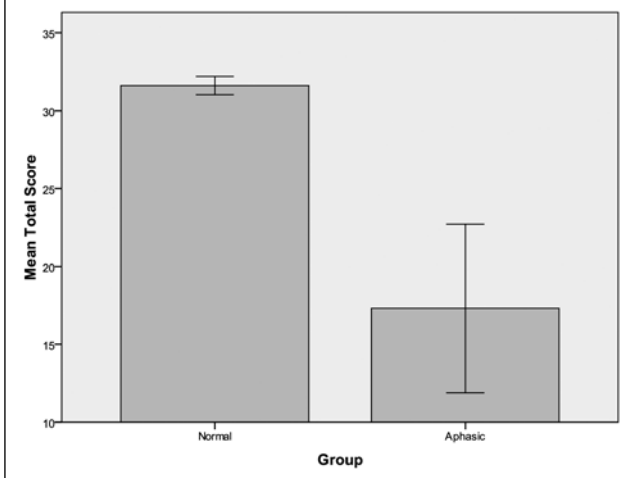


Figure 2C: Comparison of total scores between the two groups



same was done as previously described and it was concluded that a score of 14 would be the cut-off point whereas scores from 12 to 15.5 would be considered as the grey areas for expressive skills. When a subject's receptive and/or expressive skills fall within a grey area, this would mean that the particular area may require a more detailed assessment, even though the score may be above the cut-off point. The intention with regards to this is to minimise false positives and false negatives as much as possible. The researchers recommend that if an individual falls between the scores of the grey areas mentioned above, the SLP should consider the variables of bilingualism and the literacy skills prior to further investigation.

Recruitment of participants was carried out in a place where there is good attendance by the elderly. Day centres were used since all the elderly population have equal opportunity to attend there. A limitation was encountered in the fact that not all the elderly population frequent day centres and this caused a degree of bias with regards to literacy. However, the researchers noted that the pilot study included a significant proportion of literate subjects whose results did not differ from those obtained from illiterate subjects. Hence the potential bias was not found to affect the scores obtained in the test. With regards to education, some participants were uncertain about the exact number of years they attended school, mainly due to interruption of schooling during WW2 and legislation regulating compulsory schooling. Therefore, some inaccuracies were recorded in the data.

The impetus for the LeST development was to acquire a Maltese screening test for elderly individuals. This is believed to be the first stepping stone in the direction towards creating a more comprehensive assessment in Maltese.

Acknowledgment

The work was carried out for the Speech Language Department under the supervision of the manager SLD, Dr Rita Micallef.

Special thanks also go to Dr. L. Camilleri for his invaluable contribution in the statistical analysis of the study.

Table 6: *The Language Screening Test for the Elderly (LeST)*

Test items

Receptive Language

- *Section A: Simple Commands*
The individual is given a command, to which a response is required. Eg. 'raise your arm'.
- *Section B: Object Identification*
The individual is asked to identify named common objects laid out in a row on a contrasting plain background, in this order - toothbrush, comb, teaspoon, pen, tissue, key.
- *Section C/D: Simple and complex Sequential Commands*
The individual is asked a series of commands, increasing in difficulty by the use of temporal markers and linguistic complexity. Eg. 'before putting the teaspoon on the tissue, give me the key'.
- *Section E: Differences in Meaning*
The individual is given four lexical items and is required to choose the one that is not semantically related to the others. Eg. cat, dog, pen, horse.
- *Section F: Narrative*
The individual listens to two short stories and needs to answer a series of questions. The first story requires little inferential thinking in the answers, whereas the second one requires lexical retrieval related to a specific item.

Expressive Language

- *Section G: Object Naming*
The individual is required to name the objects used in the receptive language section.
- *Section H: Definitions*
The individual is asked to give a definition of three lexical items: a noun, a verb and an adjective, selected along psycholinguistic principles of imageability and frequency.
- *Section I: Verbal Reasoning*
The individual is given situations that require verbal reasoning to solve. Eg. What would you do if it is raining and you need to go out?
- *Section J: Abstract Word-Finding*
The individual is asked to give a synonym in Maltese for a given number of words. Eg. happy – content
- *Section K: Generative Naming*
The individual is given one minute in which to name as many different animals as he can, without repetition.
- *Section L: Sequencing*
The individual is asked to describe in detail how to prepare a cup of tea/coffee.

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