

SMAAV: A neuropsychological battery for assessing semantic memory impairment on action verbs

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Objective

The poster presents the structure and the norms for cognitively intact adults of the SMAAV neuropsychological test ("Semantic Memory Assessment on Action Verbs"). The battery was designed to be used to assess the lexical retrieval skills and conceptual knowledge deterioration exploiting the semantic properties of action verbs.

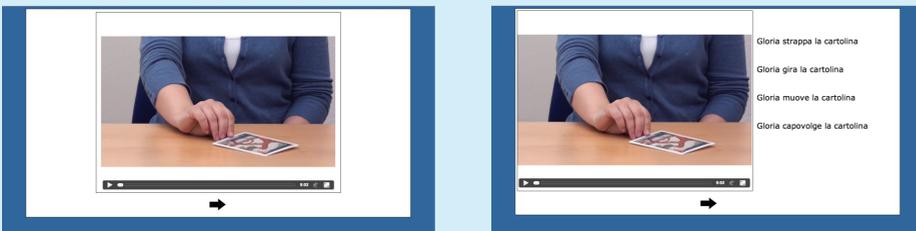
The battery

The test was made from a selection of data belonging to the IMAGACT interlinguistic ontology of action [Moneglia et al., 2014]. The items were derived from a subset of verbs (the Italian lemma "girare", its hyponyms and semantic relatives), by applying pragmatic variations to the action types.



SMAAV has been structured in two subtests, to point out lexical erosion patterns: a visual confrontation naming test (25 stimuli) and a comprehension-lexicalization multiple choice test (11 stimuli). The aim is to distinguish semantic memory breakdown and lexical retrieval difficulties.

Stimuli consist of short video clips (3-5 s) depicting movements and actions.



Test Scoring

Subtest 1: visual confrontation naming

- Item named correctly: +2 points
- Lacking answer, regionalism, phonological paraphasia or mispronunciation: +1 point
- Incorrect response (off task, circumlocutions, visual misperception or no response): +0 point

Subtest 2: multiple choice comprehension test

For each item, four response options are provided: two correct verbs in hyponym/hypernym relation (e.g. *to turn*, *to whirl*), an extremely general verb (e.g. *to do*), an incorrect verb.

BASIC SCORE:

- Incorrect response/no response: -2 points
- General verb only: +1 point
- Correct response: +2 point

BONUS: If the subject give a complex response (e.g. both correct verbs, the hyponym and general verb, the hypernym and the general verb...) a +0.5 bonus is added to the score.

Psychometric validation

The standard setting (still ongoing) has currently involved 45 persons, according to a cross-sectional study design.

AGE			
Age group	Age	# TEST	
Children/Teenagers	A age group	< 20	0
	B age group	21 - 35	14
	C age group	36 - 50	3
Adults	D age group	51 - 65	14
	E age group	> 66	14

Age Group	Females		Males	
	# test	%	# test	%
B	8		6	
C	0	51.6 %	3	48.4 %
D	8		6	
E	9	64.3 %	5	36 %

ISTAT statistics (<http://dati.istat.it/>)

Resident population, Italy (1/01/2013)		
	#	%
females	30 795 630	51.59 %
males	28 889 597	48.40 %
total	59 685 227	100 %

Subtest 1

B group

mean	median	variance	standard deviation
45.64	46.00	9.631868	3.103525
min	max	1st Qu.	3rd Qu.
41.00	50.00	43.00	48.00

Shapiro-Wilk test (normality test)
W= 0.9613 p-value= 0.7447

D group

mean	median	variance	standard deviation
46.36	46.00	3.631868	1.905746
min	max	1st Qu.	3rd Qu.
43.00	50.00	45.25	47.75

Shapiro-Wilk test (normality test)
W= 0.9136 p-value= 0.1777

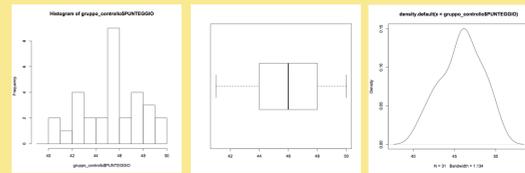
B group - D group

F-test of the equality of two variances
F= 2.652 p-value= 0.09045
Student's t-test (Independent unpaired samples, equal variance)
t= -0.7338 p-value= 0.4696

No statistically significant changes in naming scores during adulthood! B, C and D groups have been merged ("Adults" group).

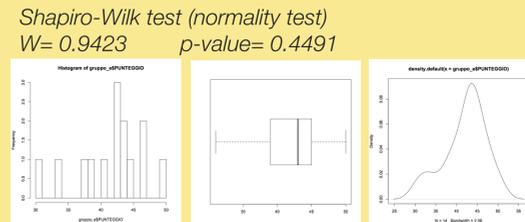
Adults

mean	median	variance	standard deviation
45.84	46.00	6.273118	2.504619
min	max	1st Qu.	3rd Qu.
41.00	50.00	44.00	48.00



E group

mean	median	variance	standard deviation
42.07	43.00	26.53297	5.151016
min	max	1st Qu.	3rd Qu.
31.00	50.00	39.50	44.75



Shapiro-Wilk test (normality test)
W= 0.9423 p-value= 0.4491

Adults - Elderly

F-test of the equality of two variances
F= 4.2296 p-value= 0.001077
Student's t-test (Independent unpaired samples, unequal variance)
t= -2.6012 p-value= 0.0194

Results indicate an age-related decrease in naming ability, with healthy elderly people performing significantly worse than adults. (p-value < .05)

Cut-off score has been determined [$\mu - 2\sigma$]

Adults: 41 points
Elderly: 32 points

Furthermore some statistically significant trends and correlations have been investigated (e.g. score/age, score/education).

Only the score/age correlation is statistically significant (Pearson's R test: $t = -3.1023$ p-value= 0.009151 Pearson's R=-0.6671348)

Subtest 2

Basic score

Adults: all the subjects scored 22 points ("ceiling effect")

Elderly:

mean	median	variance	standard deviation
21.43	22.00	1.802198	1.34246
min	max	1st Qu.	3rd Qu.
17.00	22.00	21.25	22.00

Cut-off score has been determined [$\mu - 2\sigma$]

Adults: 22 point
Elderly: 19 points

Bonus

Adults:
range: 0.0-5.5 mean: 3.58

Elderly:
range: 0.0-5.0 mean: 1.43

High variability.
No significant correlations between variables (score/age, score/education) have been found.
(Spearman's $\rho > 0.05$)

Conclusions

The standard setting is a critical component of the test development process. Therefore, more data are needed. SMAAV might be used for the early diagnosis of Mild Cognitive Impairment and the neuropsychological evaluation of acute stroke and Traumatic Brain Injury patients.