SERIAL WORD LEARNING TEST: ITS APPLICATION IN NORMAL AGING AND DEMENTIA.

^P.Caffarra, *A.Scaglioni, *M.Chiusa, *L.Malvezzi,
^A.Venneri, **D.Salmaso.

^Institute of Neurology, University of Parma, Italy
*Division of Neurology, Fidenza (Parma), Italy
**Inst. of Psychology, C.N.R., Roma, Italy

OBJECTIVE :

Identification of different components of the learning process and its correlation with intelligence and pathological conditions.

INTRODUCTION

The ability to learn a list of words implies an organization of the learned material. Usually learning is viewed as number of trials to achieve a criterion. However, the obtained result does not illustrate the subjective organization of memory processes.

Organization measures can be classified as primary or secondary (Tulving, 1968). The first ones are measures not based on item meaning,while the second are based on item meaning. One of the best known phenomenon of primary organization is seriation: items that are presented together are also recalled together.

The purpose of the present study was to ascertain the learning organization in normal aging compared to Parkinson's disease (PARK), AAMI and Alzheimer's disease (AD), using five different measures (Table 1-2).

TABLE 1
TEST AND MEASURES

TEST DESCRIPTION

Seven unrelated words were presented for learning in a fixed order up to a maximum of 12 trails. Subjects were required to repeat the list in the same order.

MEASURES DESCRIPTION

A = Total number of words recalled

C = Relative temporal order
(i.e. item 1 followed by item 3)

B = Absolute temporal order
(i.e. item 2 recalled in 2nd position)

D = Distance score among pairs of words recalled

E = Overlapping words
(same words recalled on each pair of trial)

TABLE 2: the table shows the ability of the scoring system to discriminate different levels of learning

BALL	STREET	WIFE	WALL	NOSE	SUN	STAIRS
1	2	3	4	5	6	7
REPETITION 1						
STREET	WIFE	WALL	NOSE	SUN	STAIRS	
2	3	4	5	6	7	
A = 6	B = 0	C = 5	D = 5	E = 6		
REPETITION 2						
BALL	STREET	WIFE	WALL	NOSE	SUN	
1	2	3	4	5	6	
A = 6	B = 6	C = 5	D = 5	E = 5		
REPETITION 3						
BALL	WIFE	STREET	WALL	NOSE	SUN	
1	3	2	4	5	6	
A = 6	B = 4	C = 4	D = 3	E = 6		
REPETITION 4						
BALL	SUN	WIFE	WALL	NOSE	STREET	
1	6	3	4	5	2	
A = 6	B = 4	C = 3	D = 2.17	E = 6		
REPETITION 5						
BALL	STREET	WIFE	WALL	NOSE	SUN	STAIRS
1	2	3	4	5	6	7
A = 7	B = 7	C = 6	D = 6	E = 6		

SUBJECTS

Demographic profile of the patients is listed in Table 3. Age and educational level did not differ among groups ($F= 1.07$; $df=2,41$; $p=0.352$; $F=1.98$; $df=2,42$; $p=0.15$).

TABLE 3

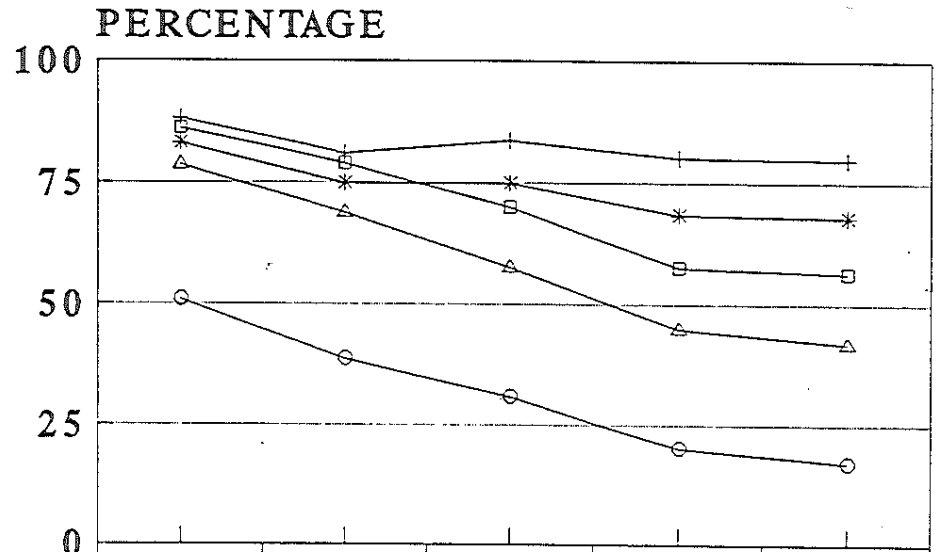
	N	AGE	IQ/MMSE
OLD/IQ>	16	67.1	119.4
OLD/IQ<	16	70.6	98.4
PARK	10	62.0	28.8
AAMI	13	67.1	28.3
AD	26	64.4	19.9

RESULTS

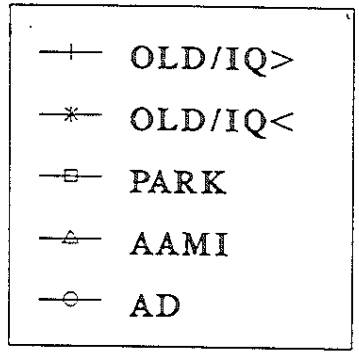
Analysis of variance showed significant differences among groups ($F=48.81$; $df=4,76$; $p< .000$). High IQ elderly people performed better than any other group and AD subjects had the lowest score. Group x measures interaction was also significant ($F=12.99$; $df=16,304$; $p< .000$)(Figure 1).

Figure 2 shows that AAMI is closer to AD than any other group and PARK fails to temporally retrieve verbal material.

FIGURE 1
SERIAL LEARNING



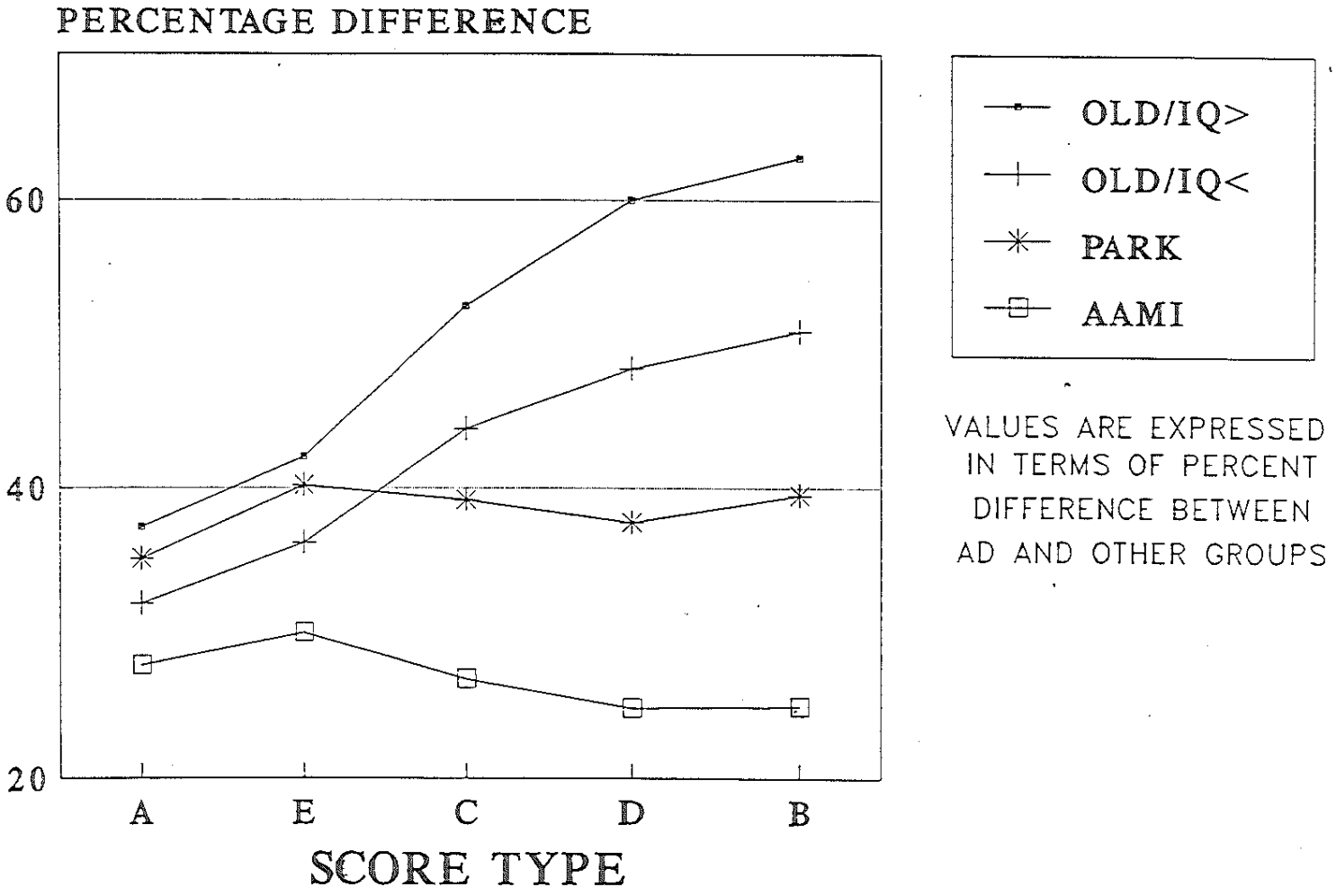
	A	E	C	D	B
OLD/IQ>	88.2	80.9	83.5	80.1	79.8
OLD/IQ<	83	74.9	74.9	68.3	67.8
PARK	86.1	78.9	70	57.7	56.4
AAMI	78.7	68.7	57.6	44.9	41.8
AD	51	38.7	30.8	20.1	16.9



MEAN VALUES FOR EACH GROUP ACCORDING TO THE MEASURE SIZE

SCORE TYPE

FIGURE 2
SERIAL LEARNING



CONCLUSIONS

The Serial Learning Task used in this study was able to discriminate normal people with different cognitive level and subjects with pathological conditions (AAMI, PARK, AD).

Significant differences were fuond among measurés and particularly for temporal order measure (B value), which requires greater demand than simple retrieval.

These conclusions are more evident comparing AAMI and PARK subjects and seem to suggest that strategic retrieval processes involved in memory for temporal order depend on the integrity of the fronto-striatal system which is impaired in Parkinson's disease.

Further researches are obviously needed to better clarify the nature of the memory disorder in Parkinson's disease and AAMI.

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BOOK OF ABSTRACTS

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subjects. Non paired Student's t test is used.

RESULTS

In the following table are reported the values of radioactivity (percent of cerebellar activity ± SD).

LOBE	PATIENTS	CONTROLS	SIGNIFICANCE
Frontal	78.2 (6.6)	87.6 (6.8)	$p < 0.05$
Parietal	82.3 (6.7)	89.1 (6.2)	$p < 0.05$
Temporal	80.2 (5.3)	87.7 (7.1)	$p < 0.05$
Occipital	95.3 (5.3)	98.5 (6.7)	N.S.

CONCLUSIONS

Cerebral blood flow, as measured with the SPECT, is globally reduced, except for the occipital lobes. No difference between the cerebral hemispheres neither focal deficits are seen. These findings seem to constitute a peculiar pattern, suggesting for the SPECT a role in the differential diagnosis of the dementias.

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PATTERN OF VERBAL MEMORY IMPAIRMENT IN DIFFERENT FORMS OF DEMENTIA

Diego Monteleone, Camillo Marra, Giampiero Villa
Istituto di Neurologia, Università Cattolica del Sacro Cuore, Roma, Italy

Verbal memory has been tested in three groups of patients affected by Parkinson Disease with Dementia (PD, n=40), Alzheimer Disease (AD, n=50), Multi-Infarctual Dementia (MID, n=35), respectively. Patients affected by Parkinson Disease without Dementia (PnD, n=45) and Normal Controls (NC, n=35) were also examined.

Mental deterioration was of the same overall severity (mild-to-moderate) in the three demented groups. All subjects were administered a battery of verbal memory tasks, including the Digit Span forward and backward (DSf, DSb) and the Rey's Auditory Verbal Learning Test (AVLT).

In comparison with the non-demented (PnD, NC), the demented groups (PD, AD, MID) obtained pathological scores on both DSf and DSb, but the degree of the deficit was not different in the three groups. On the other hand, PD and AD (but not MID) showed a significantly higher dissociation between DSf and DSb scores.

As for the AVLT, on both short term and long term measures (immediate recalls 1-5, delayed recall) AD performed worse than PD and MID who, in turn, scored lower than PnD and NC.

The 'Learning' score (4+5 - 1+2 immediate recalls) also showed a clear-cut discrepancy between non-demented and demented patients, but no significant difference emerged among the demented groups (PD, AD, MID).

The 'Mnesic Decay' score (mean of 1-5 immediate recalls/long term recall) was higher in AD and MID (with a significant difference for AD > MID) than in the other groups.

The 'Primacy' effect (tendency to recall the first 1-5 items of the word list) was much more reduced in AD than in PD and MID, whereas the 'Recency' effect (tendency to recall the last 10-15 items of the word list) was uniformly flattened in the three demented groups.

On the basis of these date the following hypotheses can be advanced:

- PD, AD, MID are affected by a comparable deficit of the primary memory;
- in comparison with the other demented groups, AD exhibit a more severe deficit of the secondary memory;
- PD have specific difficulties with encoding and retrieval mechanisms, whereas their storage capacities are relatively spared.

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SERIAL WORD LEARNING TEST: ITS APPLICATION IN NORMAL AGING AND DEMENTIA. PRELIMINARY RESULTS.

CAFFARRA P.,SCAGLIONI A., CHIUSA M.,VENNERI A.,MALVEZZI L., SALMASO D. Inst.of Neurology(Parma);Dept.Psychology, C.N.R. (Rome), Italy.

The ability to maintain the order of a list of words implies to use a sort of sequential organization of learned material. The aim of the present report was to investigate an alternative scoring system for ordered recall in normal aging and dementia. DAT patients (mean MMS 18.9;SD=3.9;mean age=63.4;SD=9.7),AAMI(age-associated memory impairment)subjects (mean age 65.6;SD=4.91) and normal controls with two different IQ levels (more than 110;mean age=67.1; less than 110, mean age 70.6)participated to the study. Subjects were instructed to repeat seven bysillabic words in the same sequence they were presented. Four different scoring criteria were used: A(total number words),B("exact temporal order"), C("relative temporal order"), D("distance effect").

Statisticalanalysis revealed significant differences among groups ($F=103.6$; $df=3.51$; $p<.001$), scoring criteria(A,B,C,D)($F=486.3$; $df=3.153$; $p<.001$) and a significant group x criteria interaction ($F=49.8$; $df=9.153$; $p<.001$).

These data seem to suggest that a different approach to a simple verbal memory test, may help to differentiate distinct groups of patients, even when they recall the same total number of items.