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POSTER PRESENTATION

# SHIFTING OF ATTENTION IN PARKINSON'S DISEASE

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*Title* Shifting of attention in Parkinson's disease

Abstract

Objectives. The ability te focus attention in Parkinson's disease (PD) is controversial. In the present report we studied the importance of the internal scurces of attention using a modified version of Posner's paradigm.

Design/methods. Nine patients with PD belonging to stage I of the H-Y scale and nine to stage 3 participated in the study. Nine elderly subjects and nine ycung subjects served as controls. All participants were screened by means of Mini Mental State Examination, Rayen's coloured Progressive Matrices PM47, Wisconsin Card sorting test and a simple visual test (Albert test} in order to exclude any sign of cognitive decline. Subjects sat in front of a CRT screen driven by IBM compatible computer. The head was positioned in an adjustable head-and-chin rest at a distance of 57 cm from the screen. The stimulus locations were marked by boxes(one in the left and one in the right hemifield) and three kinds of cue were used flash, arrows and digits). The cues differed in the degree of internal control required.

Results and Conclusion. A comparison between PD and elderly aged-matched subjects showed patients to be slower than normal ones.
The validity effect was significant with the less demanding cues (flash and arrows); the affect was much slower and not significant with the more demanding cue (digit) . The same pattern of results was present in patients and controls. A comparison between elderly and young subjects showed a validity effect with digit cue much stronger in young than in elderly subjects. PD patients seem as much affected as normal age-matched in using internal attentional control and aging may play a crucial role in this regard.

Three different cueing conditions were tested: exogenous cueing in which attention was passively captured by peripheral flashes which did not predict the location of the imperative stimulus; endogenous cueing in which attention was actively directed by central arrow or digit which predicted the location of the imperative stimulus.

The arrow cue has to be considered less demanding than the digit one because in the latter case the rule between the to-be-attended location and the cue is completely arbitrary (see below), while in the former there is a spatial congruence between direction of the arrow and the to-be-attended location.

# TABLE I

| Subjects | Age | Oldfield Score | H-Y stage | Duration of symptoms | Medication |
|---|---|---|---|---|---|
| 1M | 62 | .88 | II | 3 | L-DOPA (**), Deprenyl |
| 2M | 54 | .78 | II | 4 | Biperidene, Bromocriptine |
| 3M | 65 | .88 | II | 2 | L-DOPA, Bromocriptine |
| 4M | 58 | .70 | II | 4 | L-DOPA, Biperid., Bromocr. |
| 5F | 72 | .73 | II | 1 | Deprenyl |
| 6F | 60 | -.28 | II | 3 | L-DOPA, Deprenyl |
| 7M | 76 | 1 | II | 4 | Deprenyl |
| 8F | 62 | .68 | II | 2 | L-DOPA, Bromocriptine |
| 9M | 69 | .50 | II | 5 | Trazodone |
| 10M* | 62 | .56 | I | 4 | Deprenyl |
| 11F* | 59 | .80 | I | 2 | L-DOPA |
| 12F* | 60 | .80 | I | 3 | L-DOPA, Bromocriptine |

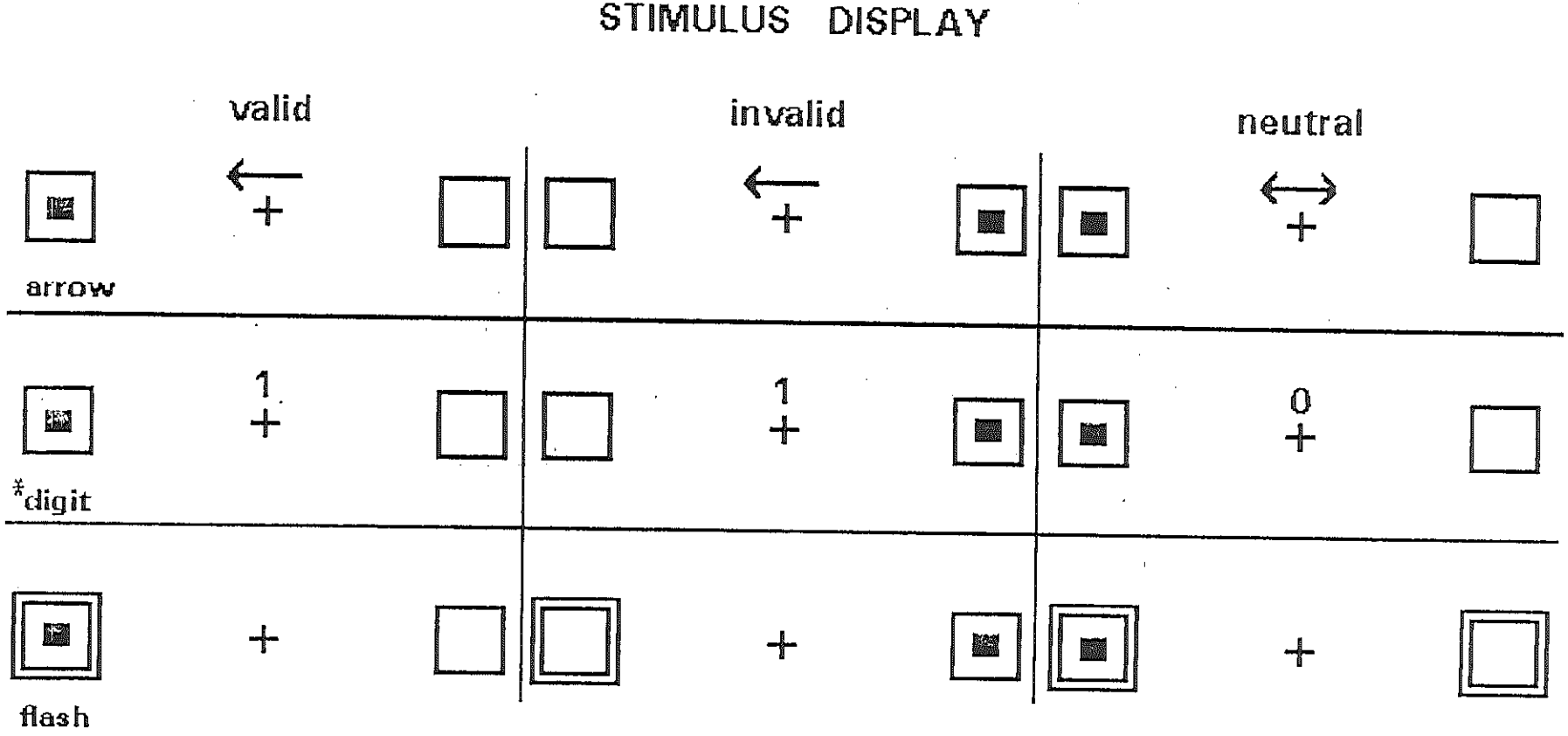
* early parkinsonians

** L-DOPA + Benserazide

## TABLE II

| Subjects | Years of Education | Mini Mental State Score | PM 47 | | W C S T | |
|---|---|---|---|---|---|---|
| | | | AS | ES | %Persev. | Categories |
| 1M | 5 | 28 | 30.5 | 3 | 42 | 7 |
| 2M | 5 | 29 | 32 | 4 | 50 | 7 |
| 3M | 5 | 29 | 23.5 | 2 | 44 | 7 |
| 4M | 4 | 30 | 33.5 | 4 | 16 | 6 |
| 5F | 5 | 28 | 24.5 | 2 | 20 | 6 |
| 6F | 5 | 29 | 29.5 | 3 | 30 | 5 |
| 7M | 3 | 29 | 34.5 | 4 | 37 | 5 |
| 8F | 5 | 29 | 26.5 | 2 | 35 | 5 |
| 9M | 5 | 27 | 24 | 2 | 25 | 5 |
| 10M* | 5 | 30 | 37.5 | 4 | 0 | 7 |
| 11F* | 5 | 27 | 28.5 | 2 | 40 | 6 |
| 12F* | 5 | 30 | 34 | 4 | 37 | 5 |

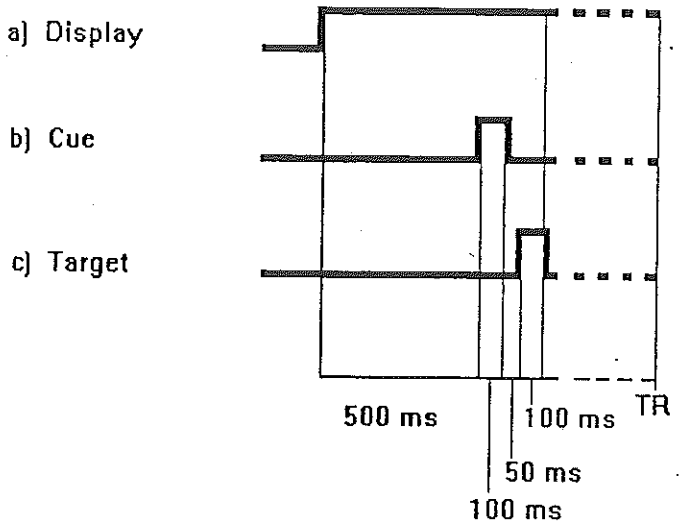
* early parkinsonians


STIMULUS DISPLAY
valid
invalid
neutral
arrow
1
1
0
*digit
flash

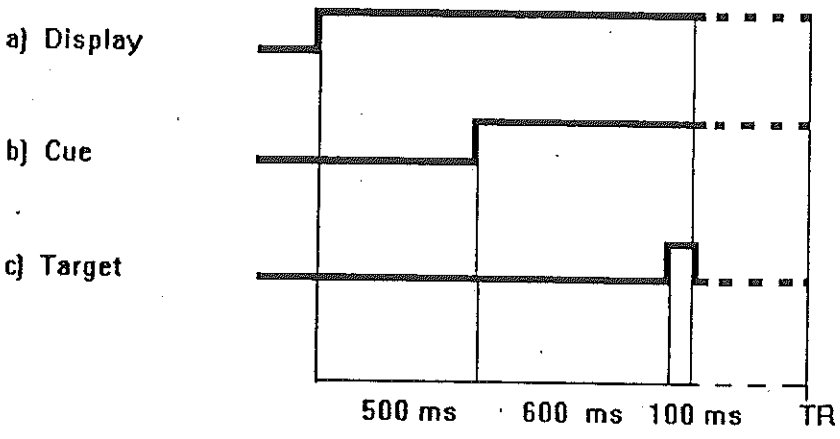
Eye movements were monitored by means of a closed circuit TV system. The camera was located under the CRT, directly below the fixation point.

The stimulus display (Fig. 1) consisted of the fixation cross (0.8° x 0.8°) at the geometrical centre of the screen and two empty square boxes (1° x 1°) positioned 4° to the left and right of the fixation point. The imperative stimulus was a full white square (0.5° x 0.5°) which appeared inside one of the stimulus boxes.

FLASH




DIGIT AND ARROW

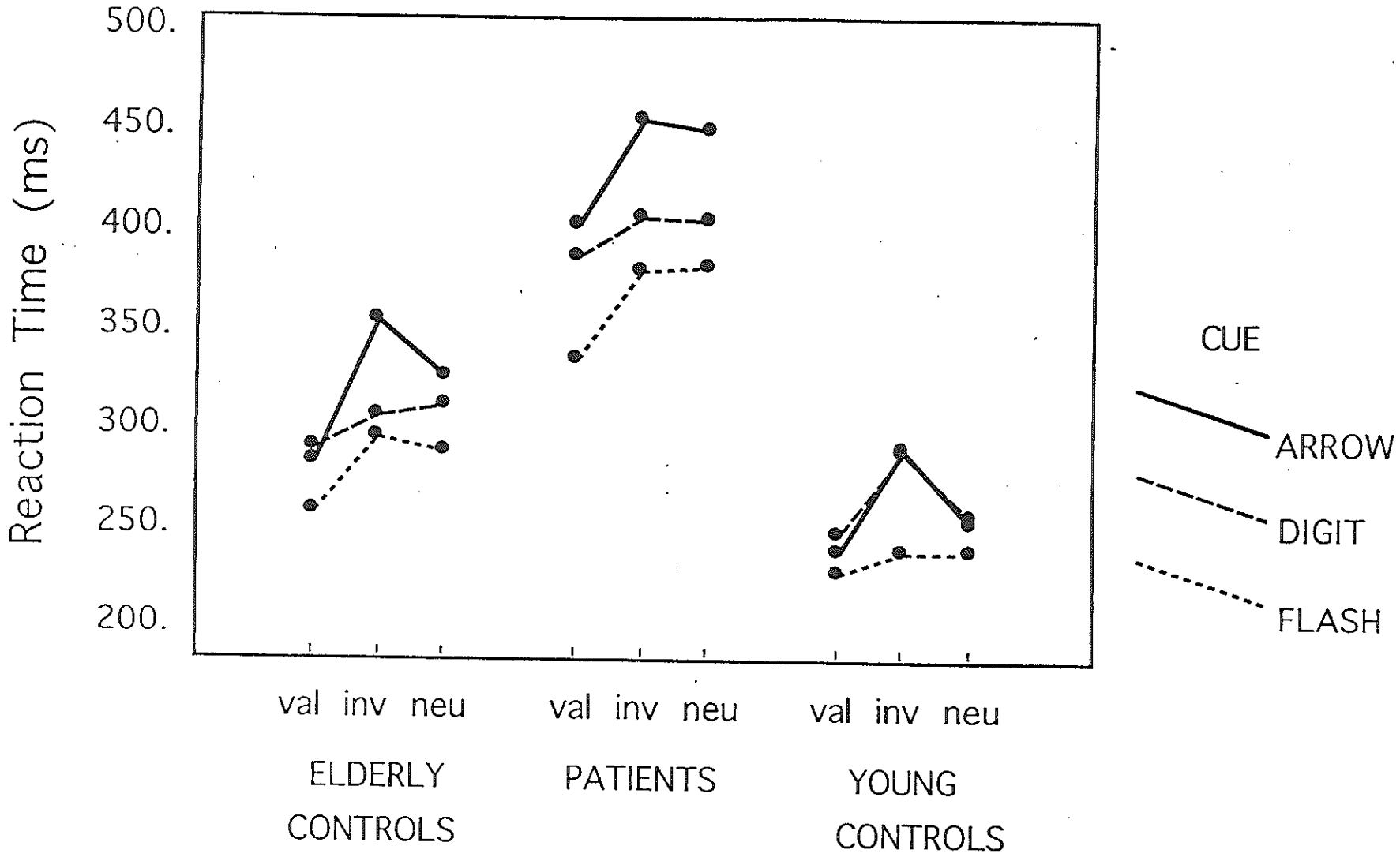


On some trials a non-directional cue was presented (neutral trials): flashing of both boxes; bidirectional arrow and 0 digit. In this case the stimulus probability was always 50 % for each box.

The instructions were different according to the exogenous and endogenous cueing. In the former condition, subjects had to ignore the cues; in the latter they had to pay attention to the more likely locations. Subjects had to press the response key as fast as possible after the occurrence of the imperative stimulus (simple RT), regardless to its position. RTs shorter than 150 ms or in eccess of 1000 ms were considered errors, along with those trials in which an eye movement was detected. Errors were discarded and not replaced.

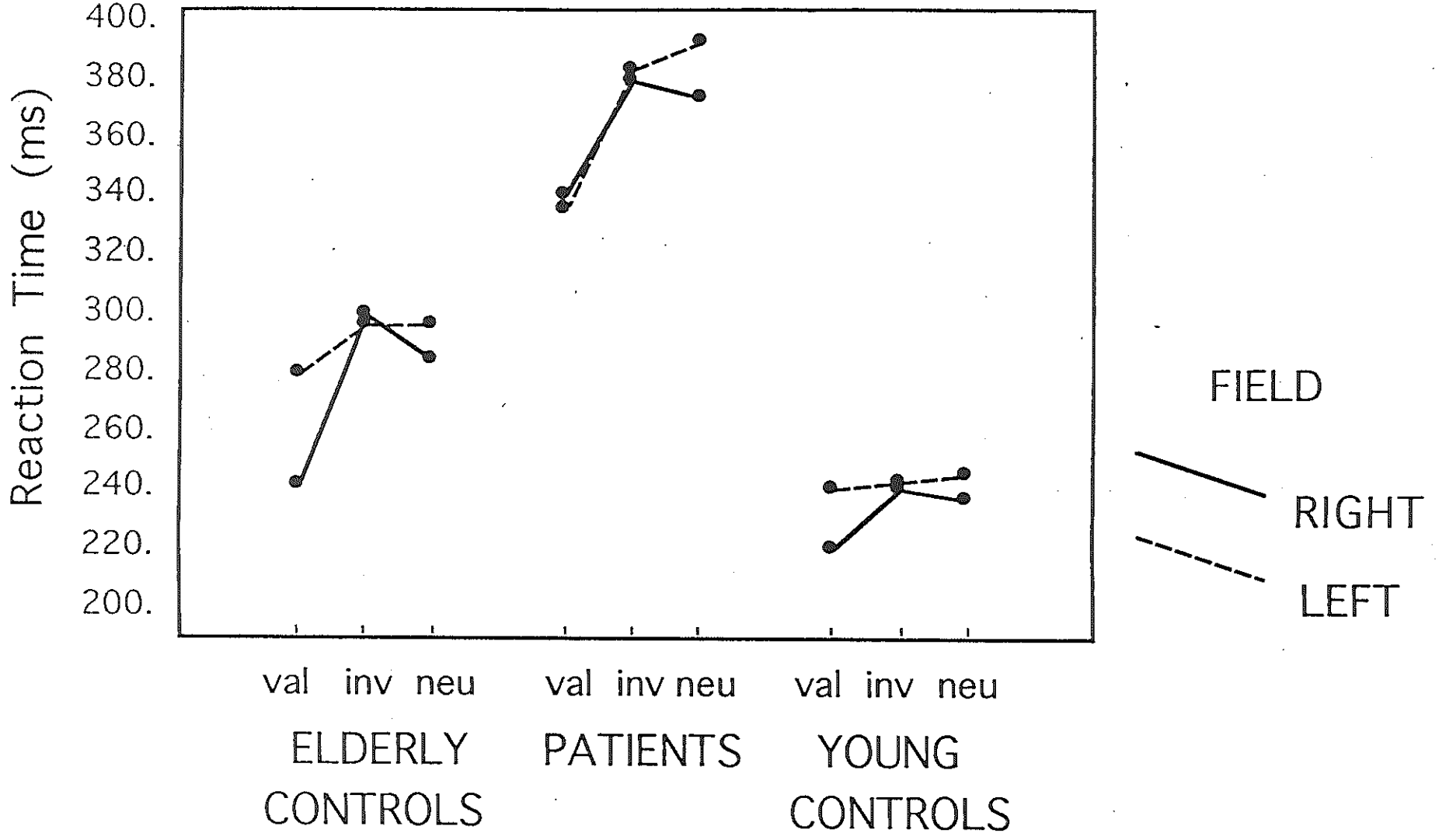
# GROUP x CUE x CONDITION INTERACTION

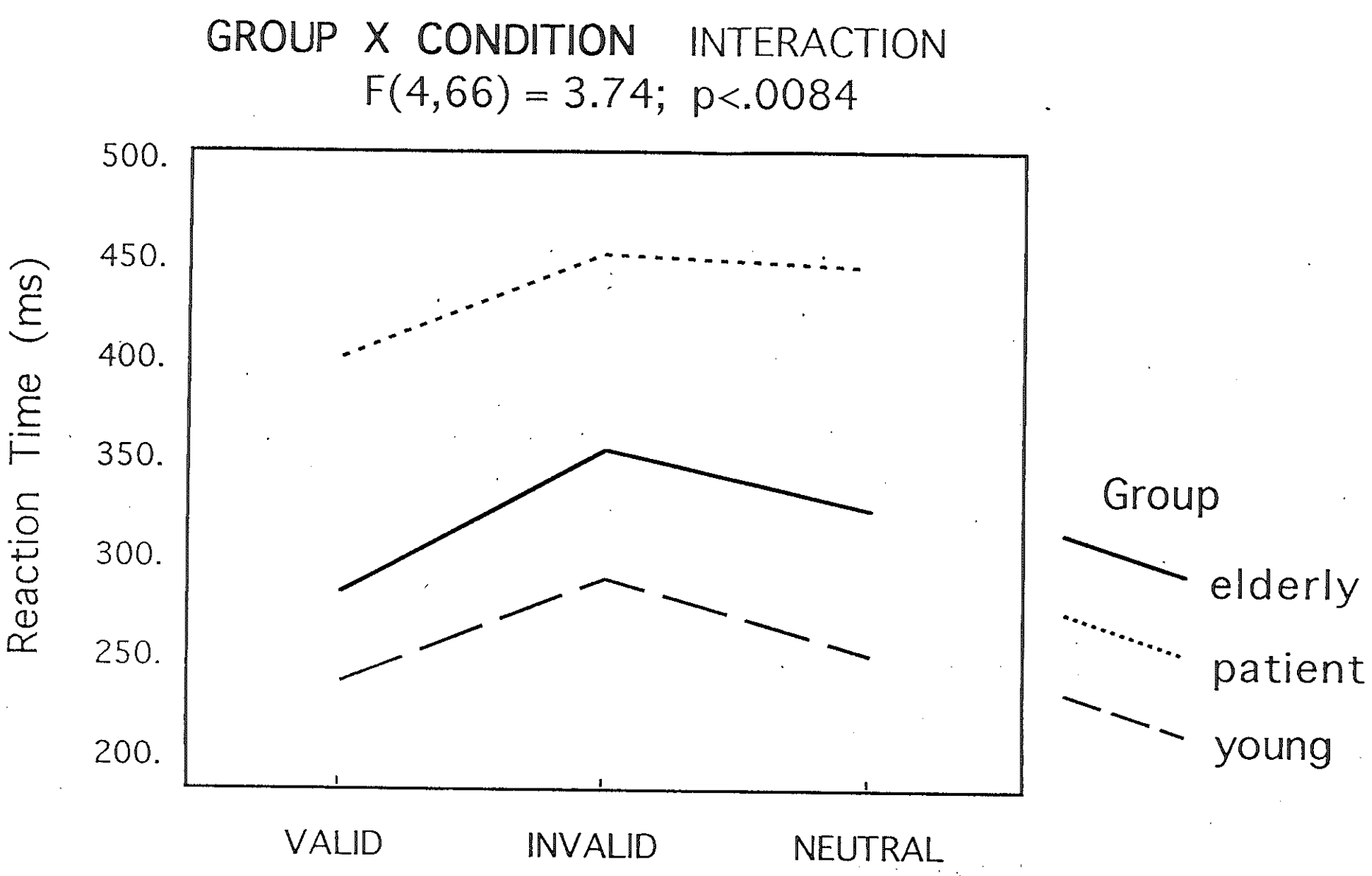
F(8,132)=2.41; p<.0183

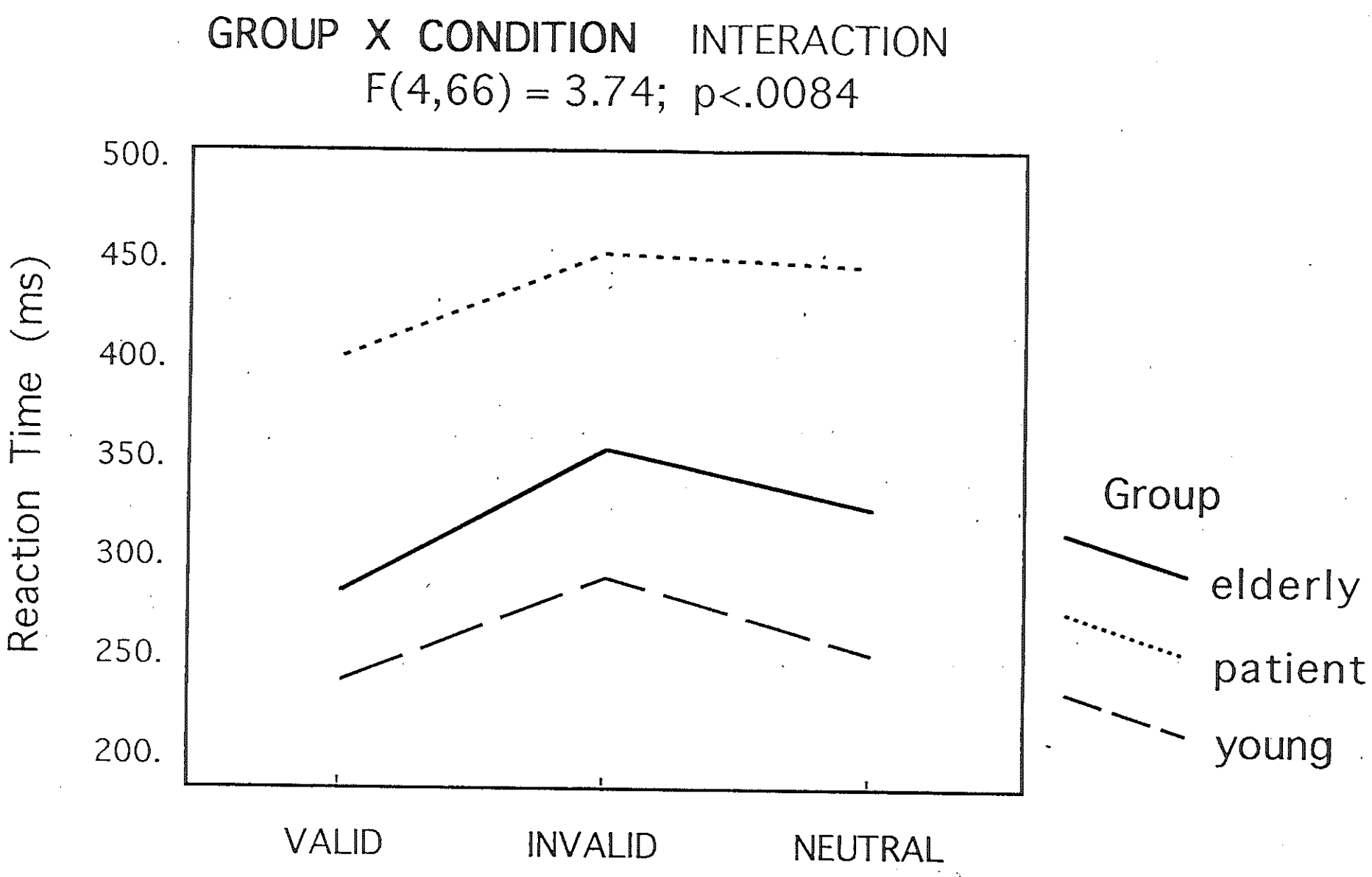


## GROUP X FIELD X CONDITION INTERACTION

$F(4,66) = 2.51;\ p=.05$




GROUP X CONDITION INTERACTION
F(4,66) = 3.74; p<.0084
Reaction Time (ms)
500.
450.
400.
350.
300.
250.
200.
VALID
INVALID
NEUTRAL
Group
elderly
patient
young


GROUP X CONDITION INTERACTION
F(4,66) = 3.74; p<.0084
Reaction Time (ms)
500.
450.
400.
350.
300.
250.
200.
VALID
INVALID
NEUTRAL
Group
elderly
patient
young

## FLASH

Group, $F(2,33) = 22.31$, $p<.01$; Field, $F(1,33) = 6.69$, $p<.02$; Condition, $F(2,66) = 26.10$, $p<.001$; Field x Condition, $F(2,66) = 4.36$, $p<.02$ and Group x Field x Condition, $F(4,66) = 2.50$, $p = .05$ were all significant. Fig. 3 shows data for the three groups referring to Field and Condition. Valid trials were faster than invalid trials, for both fields in parkinsonians, while the difference between valid and invalid trials was significant only for the right field in elderly and young controls. For all groups, response latencies in the neutral condition were never significantly different from those of invalid condition.

## Means

| | elderly controls | | | patients | | | young controls | | |
|---|---|---|---|---|---|---|---|---|---|
| | val | inv | neu | val | inv | neu | val | inv | neu |
| right | **243** | **301** | **284** | **337** | **376** | **372** | **221** | **242** | **238** |
| left | **278** | **295** | **294** | **333** | **379** | **384** | **242** | **243** | **246** |
| X | **260** | **298** | **289** | **335** | **378** | **378** | **232** | **242** | **242** |

## DIGIT

Group, $F(2,33) = 22.81$, $p<.001$; Condition, $F(2,66) = 12.01$, $p<.001$ and Group x Condition, $F(4,66) = 3.01$, $p<.03$ (Fig. 5) reached significance. Only young controls showed invalid trials significantly slower than valid and neutral trials. The difference in response speed between valid and neutral trials is small and not significant. Both elderly and parkinsonians' groups did not show any significant difference between conditions.

### Means

| elderly controls | | | patients | | | young controls | | |
|---|---|---|---|---|---|---|---|---|
| val | inv | neu | val | inv | neu | val | inv | neu |
| **297** | **312** | **318** | **393** | **413** | **410** | **254** | **294** | **263** |

As far as endogenous cueing is concerned, an age-related effect emerged. Indeed, with digit cue, the validity effect (valid versus invalid trials) was present only in young subjects, whereas elderly controls and PD patients were unsuccessful in following the instructions. This difficulty may be ascribed to an overall slowing of cognitive processes for both groups.

As for arrows, on the one hand, all groups shifted attention properly as revealed by the significant difference between valid and invalid trials; on the other, only PD patients showed neutral trials not different from invalid ones (Wright, 1990).

In conclusion, we were not able to find the amount of internal control required in the task as a clear-cut explanation for the attentional impairments in PD patients. Our findings disclosed an heterogeneous pattern of results in the process of orienting attention linked to the cognitive operations involved in the task.