

Neuropsychological Assessment of Time Perception

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INTRODUCTION I

- Time Perception Measurement: different methods *Nichelli 1996*
- Lack of validated tests
- No "Gold-Standard"

INTRODUCTION II

- Two possible methods: magnitude estimation and production of time intervals *Nichelli 1996*
- Time estimation measurement: retrospective and prospective *Mangels & Ivry 2001*
- Attention Working Memory → Prospective
- Long-term Memory → Retrospective *Mangels & Ivry 2001*

Methods and Material I

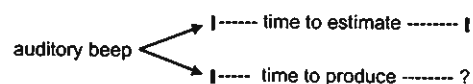
- Objectives:
 - To develop a neuropsychological test to evaluate temporal perception
 - To study temporal perception along normal aging

Methods and Material II

- Sample size: 86 subjects
- Inclusion Criteria:
 - . healthy volunteers
 - . male & female
 - . 15-90 yrs-old
- Exclusion Criteria:
 - . major depression (MINI International Neuropsychiatry Interview version 4.4)
 - . dementia (MMSE)
 - . neurological / psychiatry disease
 - . drugs with CNS effect
 - . unable to understand the test

Methods and Material III

- Estimation & production test: run on standard personal computer
- Tasks:
 - . Verbal estimation (E) (7 sec, 32 sec, 58 sec)
 - . Verbal production (P)



Methods and Material IV

- "Gold-standard" :
 - . estimated time for drawing a clock
 - . global duration of current evaluation
- . Digit Span Forward (DSF)
- . Digit Span Reverse (DSR)

Methods and Material V

- Analysis:
 - . each subject : $\frac{\text{time E or P}}{\text{target time}}$
 - . each subject: $\frac{\text{E draw of clock or global time}}{\text{objective time}}$
 - . result on DSF and DSR





Methods and Material VI

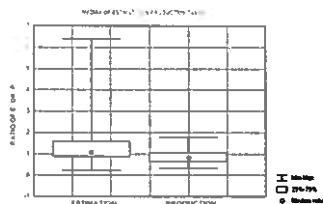
- Analysis:
 - . Estimation and Production metric properties
 - . Relation of E and P with "gold standards"
 - . Age effect on E and P
 - . Comparison of E and P in 3 age groups (15-40 yrs; 41-64 yrs; 65-90 yrs)

Results I

Demographic data:

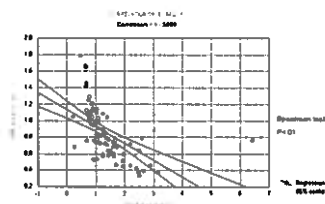
Yrs	15-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
 	1 / 9	11 / 1	8 / 2	7 / 3	10 / 1	5 / 5	9 / 5	7 / 2
N	10	12	10	10	11	10	14	9
literacy (mean of yrs)	11,6	17,3	14	12,2	8,8	7,1	7,0	7,5

Results II



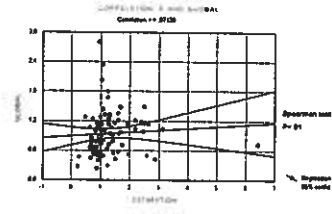
Estimation and Production

Results III



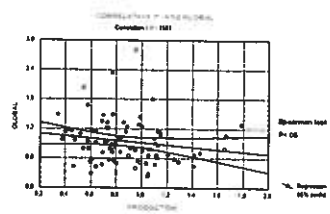
Estimation and Production

Results IV



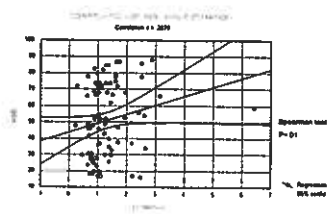
Estimation and Global Time

Results V



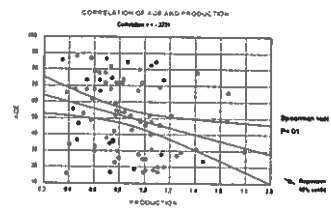
Production and Global Time

Results VI



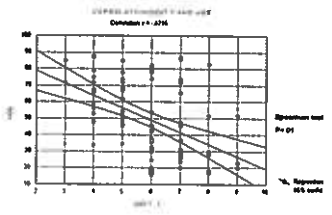
Estimation and Age

Results VII



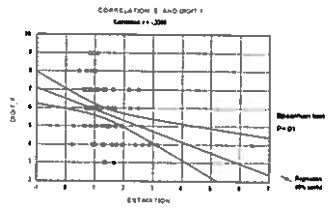
Production and Age

Results VIII



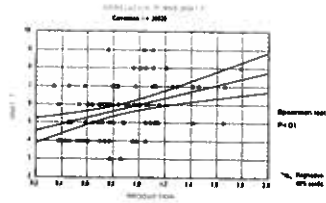
Digit F and Age

Results IX



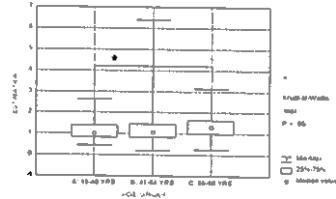
Estimation and Digit F

Results X



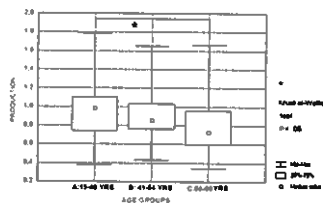
Production and Digit F

Results XI



Time Estimation

Results XII



Time Production

Discussion I

- Tests were easy to perform
- Sample size with power to show expected correlations (age effect on Digit Span)
- Estimation and Production associated with global time but not with clock time



Different time magnitudes ?
Prospective ≠ Retrospective durations

Discussion II

- Negative correlation between E and P



- Internal consistency
- Share same mechanism

Discussion III

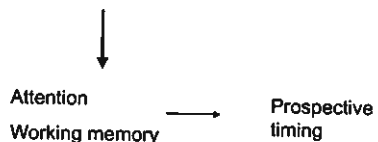
- Clear age effect on Digit Span
- Trend to age effect on E and P



acceleration with age

Discussion IV

- Correlation between prospective durations and Digit Span



Only w. memory and not attention interferes with prospective production *Vennery 1998*

Discussion V

AGING

- Acceleration of larger units of time *Fraisse 1963*
- Data concerning short intervals are scanty and inconclusive *Nichelli 1993*

Discussion VI

- Normal aging: underestimation in the seconds-minutes range *Craik 1999*
- Our results:
Favor acceleration of subjective timing, both retrospective and prospective

↓

Probably not completely independent

Conclusions

- Suggested new test for prospective / retrospective duration
- Not completely validated
- Lack of validated tools
- Well designed studies are needed

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