MENTAL SLOWING and AGE

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INTRODUCTION

Speed of information processing is now generally considered as one of the best index of cerebral functioning. Since speed is an important factor for all mental processes, its use in aging constitutes an economic way to study cognitive decline. Besides age, cognitive decline is greatly influenced by some subjective variables, like physical health, emotional state or intelligence. These variables may considerably change the profile of that decline, transforming normal ageing in successful (or pathological) ageing. Furthermore, cognitive decline, as measured by reaction time tasks, changes noticeably as a function of the task: the more processing a given

task requires (longer RT), the larger the resulting decline.
Taking into account the previous considerations, we decided to run an overall analysis of RT-data obtained in 2 different experimental conditions. Both conditions included a simple-RT and a choice-RT, the main difference being the kind of choice-RT submitted to subjects: one verbal and the other nonverbal.

SUBJECTS

A total number of 152 subjects, 101 females and 51 males, participated in the experiments. There was no statistical difference in the demographic characteristics of females and males.

TABLE I: SUBJECT CHARACTERISTICS

	AGE	SCHOOLING	PM38
Mean	44.1	11.5	42.7
SD	20.8	4.4	13.5
Range	18-81	1-21	12-60

Young subjects (n=71) were mainly students, while old subjects (N=81) came from recreational activities. All subjects filled out a questionnaire on their psychological status (SRT). Subject's level of intelligence was assessed with Raven's Progressive Matrices. Raw scores rather than IQ conversion were considered.

PROCEDURE

All subjects completed 2 reaction-time (RT) tasks: the first is a simple-RT (RT-1), where the target is an asterisk appearing on a monitor screen; and the second is a choice-RT (RT-2) with 2 stimuli. Each task was made of 96 presentations; the first 24 were practice trials and thus excluded from the analysis.

RESULTS AND DISCUSSION

Statistical analyses were conducted on the following variables: age, schooling, PM38, RT-1, RT-2, SRT. Since the most consistent correlate of IQ is the intraindividual variability of RT, standard deviations of the 2 tasks (SDRT-1, SDRT-2) have been also analysed.

TABLE II: RESULTS FOR EACH TASK AND GROUP

	RT-1	RT-2	SDRT-1	SDRT-2
OLD (N=81)				
MEAN	296.5	416.7	66.8	98.0
SD	55.1	69.2	34.7	34.4
YOUNG (N=71)				
MEAN	274.1	346.8	47.6	67.1
SD	48.3	49.1	17.2	18.6

Intercorrelation matrix (with Bonferroni-adjusted probabilities) revealed no effect for SRT and this variable was no longer considered. Significant correlation coefficients emerged for all variables except for RT-1 (see Table III).

We noticed that SDRT-2 obtained higher correlations. When partial correlations were computed, all significant effects remained.

TABLE III: PEARSON CORRELATION MATRIX

	AGE	SCHOOL	PM38	RT-1	RT-2
SCHOOL	-0.71	-			
PM38	-0.73	0.76	-		
RT-1	0.23#	-0.14#	-0.17#	-	
RT-2	0.52	-0.44	-0.50	0.61	-
SDRT-1	0.36	-0.31	-0.39	0.61	0.42
SDRT-2	0.52	-0.55	-0.59	0.20#	0.60

non-significant

To determine the relative weight of previous variables, we performed 2 stepwise regression analyses: the first with RT-1 as dependent variable and the second with RT-2.

TABLE IV: MULTIPLE REGRESSION ON RT-2

VARIABLE	STD COEF	P <
AGE	0.223	0.006
PM38	-0.249	0.002
RT-1	0.516	0.000

TOTAL R^2 = 0.56 F(3,148)=62.1; P<.001

When RT-1 was considered, stepwise regression revealed only age as main predictor (R^2=.05).

On the contrary, stepwise regression on RT-2 revealed AGE, PM38 and RT-1 as best predictors with 56% of the variance explained. As you can see in TABLE IV age influences RT-2 (STD COEF) less than the other 2 variables.

CONCLUSIONS

The information-processing speed decreases with age. The degree of slowing is directly related to the number of operations underlying task performance.

As processing increases the slowing can be greatly reduced by more intelligent subjects.

Simple reaction times are scarcely influenced by the variables considered, revealing some basic motor ability. Together with age and IQ they

account for 56% of choice-RT variance, a considerably high value.

Intraindividual variability strongly correlates with variables, particularly intelligence. Variability seems to capture one of the individual's key characteristics, quite independently from the phenomenon of slowing. This issue needs to be explored further within the framework of aging.

We were not able to identify the relative weight of emotional variables on speed. This may be due more to the nature of the sample than to the relationship itself.

The diagnostic value of the information-processing speed may be greatly enhanced by studies that specify the role of each variable in the overall performance.

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Growing evidence is now available on the age-related slowing of information-processing and on the possible cause of this slowing for mental decline. However, some subject-variables may considerable change the profile of that decline transforming normal ageing in successful ageing. Simple- (SRT) and choice-reaction times (CRT) have been studied for more than 150 subjects (18-81 yr. old), together with different subject-variables (education, intelligence, physical and psychological symptoms). Simple regression analyses on reaction-time tasks and age show positive significant effects and different slopes. Partial-correlation and multiple-regression analyses were further conducted to separate the relative weights of each independent variable. Best predictors of CRT result to be age and intellectual level (R^2=.34). A stepwise regression on CRT, considering previous variables together with SRT and standard deviations (SD) of both tasks, indicate as best predictors: age, SRT and SD of CRT with R^2=.74. The role of emotional variables on reaction times results not very clear or minimal. The importance of separating the effect of single variables for understanding age-effect will be discussed.