

PERFORMANCE FACTORS AND AGE GROUP ABILITY DIFFERENCES:

PRACTICE IN THE FACE OF FATIGUE

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Observed ability differences between young and old subjects have often been attributed to "ability-extraneous" performance related factors. Among those factors believed to affect age differences in performance are practice and fatigue effects.

There have been a number of recent studies suggesting that training, i.e., giving participants practice in similar types of tasks, will improve the performance of older people (e.g., Gonda & Labouvie, 197 ; Plemons, Willis & Baltes, 197 ); however, both young and older age groups may equally profit (Hertzog, Williams, & Walsh, 1976).

Effects of fatigue have also been of interest in recent reports. Furry and Baltes (1973) found that young and old age groups were differentially affected by varying the position of a test in a battery and by pre-test fatigue conditions (administering the Finding A's test), concluding that such fatigue inducing factors may explain some of the observed age differences. On the other hand, in a somewhat related study, Cunningham, Sepkoski, and Opel (1978) conclude that the elderly are not as susceptible to test fatigue as had been suggested. The latter authors felt the Finding A's test was more fatiguing than a long battery of tests. They added a condition in which a break was added between the Finding A's test and the main battery and found no significant fatigue effect.

The present investigation was undertaken to determine the differential effects of practice by age groups on highly similar and dissimilar tasks in a situation which induced fatigue.

## METHOD

### Subjects

Men and women aged 22 to 80 (N=239) were randomly sampled by sex and within year of birth from the membership of a group medical plan in the Pacific Northwest. (See Table 1 for age/sex breakdown).

### Measurement Variables

The 1948 PMA consists of five subtests--Verbal Meaning ( $V_{48}$ ), Space ( $S_{48}$ ), Reasoning ( $R_{48}$ ), Number ( $N_{48}$ ), and Word Fluency ( $W_{48}$ ). The 1962 version differs from the earlier format by omitting  $W_{48}$ ; by having  $N_{62}$  include subtraction, multiplication, and division instead of just addition as does  $N_{48}$ ; and by having  $R_{62}$  include number series and word groupings as well as the letter series which is included in  $R_{48}$ . More vocabulary items are included in  $V_{62}$  than are in  $V_{48}$ . Selected tests from the ETS battery were also included--Hidden Patterns, Letter Sets, Length Estimation, Finding A's, Identical Pictures, Nonsense Syllogisms, Maze Tracing and Paper Folding--which will not be included in the present paper.

Tests were administered in a modified counterbalanced order; i.e., PMA (1948), ETS tests, PMA (1962); or PMA (1962), ETS tests (in reverse order from the initial order), and PMA (1948). A 20 minute break, where refreshments were served, was given after one-half of the ETS tests had been administered.

Thus the battery included similar tasks for which a practice effect could be determined, and dissimilar tasks where practice effects should be minimal.

### Design and Data Analysis

Data were organized into 9 age groups and analyzed by a 2 x 2 x 9 (Order x Sex x Age Group) analysis of variance (ANOVA) adjusted for unequal cell frequencies.

### RESULTS

Results from the analysis of variance can be seen in Table 2 and the associated means in Table 3. Significant differences by Order effect were found on both Verbal and both Space subtests ( $p .01$ ). Examination of the means shows that the performance of participants improved on the second tests that they took. Significant Order effects ( $p .01$ ) were not found on other subtests, although trends ( $p .05$ ) in the same direction were noted for R 48 and letter series (R 62).

Significant effects ( $p .01$ ) by age groups were found for all variables and by Sex on both Space tests and N 62 and number series.

### DISCUSSION

The present results suggest that practice on the first set of tests improved performance on similar tests in the second set of tests, but did not seem to influence performance on dissimilar tasks. Since the present design did not manipulate fatigue effects, but, in fact, may have been confounded by them, it cannot be unequivocally stated that performance on dissimilar tests did not improve. For example, performance may have improved but the effects may have been offset by fatigue and thus no differences would have been observed. If this were the case, however, an even greater improvement may have been seen on the Verbal and Space subtests.

A critical finding of the study, however, is that the performance of the different age groups were not differentially affected on any of the variables as evidenced by the lack of Order x Age Group interactions. Although one might conclude that the various age groups were similarly affected by fatigue and practice, it is possible again that the effects affect each other in opposite directions-- practice aided the elderly more than the young but fatigue affected the elderly more than the young and thus offset what would otherwise have been a differential effect. This explanation does not seem all that likely given the results of Cunningham, et al. (1978); unfortunately, however, the present data cannot answer such a question.

Table 1

## PARTICIPATION OF SUBJECTS BY AGE AND SEX

Mean Age	Order 1		Order 2	
	Men	Women	Men	Women
81	4	4	7	5
74	6	3	6	7
67	8	7	9	8
60	6	6	6	7
53	8	7	7	7
46	6	3	7	8
39	8	6	7	7
32	4	3	7	8
25	7	5	5	5
<b>Total:</b>	<b>57</b>	<b>59</b>	<b>61</b>	<b>62</b>

TABLE 2

## Analysis of Variance on Cognitive Tasks

Significant F ratios for Sex, Order, and Age Group <sup>4</sup>

	Sex	Cond	Age Group
V 48		12.2***	17.8***
S 48	13.0***	9.4**	19.8***
N 48			5.0***
W 48			6.1***
R 48			29.8***
V 62		25.8***	16.8***
S 62	12.3***	7.3**	21.3***
N 62	39.2***		20.9***
R 62 (letter)			28.6***
R 62 (word)			19.9***
R 62 (number)	8.2**		24.4***

<sup>4</sup> No significant interactions\*\*  $p < .01$  \*\*\*  $p < .001$

TABLE 3

## Means for Dependent Measures by Order

	PMA: 1948-1962 Mean	PMA: 1962-1948 Mean
V 48	35.0	38.7
S 48	20.1	23.0
N 48	26.3	24.5
W 48	42.0	43.1
R 48	15.5	16.4
V 62	31.5	25.7
S 62	31.0	26.8
N 62	16.0	15.3
R 62 (letter)	9.8	8.7
R 62 (word)	18.5	18.3
R 62 (number)	7.1	6.3