

Omission and Commission Errors:

Task-specific Adult Life-span Differences

Elizabeth M. Zelinski, K. Warner Schaie, and Kathy Gribbin

Andrus Gerontology Center
University of Southern California

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Botwinick (1973) and Witte (1975) documented the phenomenon of performance-related "cautiousness" in the elderly. They report that older persons tend to omit responses to stimuli or to test items. These errors of omission have been found to occur to a greater extent in the elderly than in younger individuals in studies of intellectual function (cf. Botwinick, 1973), serial (Eisdorfer, 1968) and paired associates learning (cf. Witte, 1975) and in perceptual recognition (Basowitz & Korchin, 1957; Rees & Botwinick, 1971). Most of these studies involved fairly limited, often nonrandom samples of subjects. Within any one study, few tasks with differing requirements were used.

Our investigation consisted of an examination of omission and commission errors across the life span with a relatively large and varied pool of tasks. Data were collected from 242 individuals, randomly selected within age strata of the membership of a large health maintenance organization located in the Pacific Northwest. Subjects were grouped into four birth cohorts, described in Table 1. They were tested in 1975 on 25 measures, described in Table 2. Data were scored for number correct, number of omission and number of commission errors.

Twenty-two measures for which both errors of omission and commission were available were included and grouped on the basis of similarity of task demands. We hypothesized that the inherent bias in the test to make errors of omission or commission was related to task requirements. For instance, we expected to find a greater incidence of commission errors on

tasks requiring selection of a single response from a limited set of alternatives, such as on a vocabulary test. On the other hand, we would expect to find more omission errors on tasks requiring multiple responses from a pool of multiple alternatives, e.g., on a spatial ability test in which subjects must select the correct rotations of a figure from six possible responses, of which one to three may be correct. Table 3 groups tests according to this strategy.

Five sets of scores were analyzed separately using cohort by sex MANOVAs. Errors of omission and errors of commission were analyzed. Commissions minus the number of omissions were analyzed to determine the predominance of error types in all cohorts. The proportion of omissions to total errors and proportion of commissions to total errors were each analyzed to determine cohort differences in the relationship of error type to all errors. Logarithmic transformations of all five sets of scores were necessary to achieve homogeneity of covariance. Two analyses were performed on each set of scores: one for omission-biased measures, the second for commission-biased ones. Because a total of 10 analyses were necessary with data from the same individuals, the criterion level of significance was set at $p .001$.

Results and Discussion

No significant sex by cohort interactions were obtained. Sex effects will not be discussed here. Because of the number and complexity of the analyses, I will first discuss our conclusions. Figure 1 presents a prototype of the general results. The top panel of Figure 1 shows the effect of cohort on errors of commission. Significant cohort differences were found for both omission and commission bias measured. Older cohorts make significantly more errors than do younger ones. The lower panel of Figure 1

shows summary results of data for errors of omission. Again the older cohorts make significantly more errors than the young. The data suggest that older persons make more errors in general than do the young on psychometric measures, regardless of the bias toward the error type inherent in the task requirements. Contrary to earlier studies, older persons are not only manifesting "cautious" behavior in test-taking, but are also "careless" in responding.

Specific results are given in Table 3. Analyses I and II indicate that for the measures considered to be omission-biased, older subjects made significantly more errors of omission and commission than did younger subjects. In the third analysis, the contrast of the number of commission minus the number of omission errors (Analysis III, Table 3), indicates that there are no significant cohort differences in the predominance of error type. That is, all cohorts made similar scores on this contrast—younger and older subjects made equally frequent or infrequent numbers of omissions and commissions. As seen in the fourth analysis, the significant cohort effect on the number of omissions relative to the total number of errors indicates that older cohorts had a greater proportion of omissions to all errors than had the young. Finally, in the fifth analysis, the proportion of commission errors to the total error score was significantly greater in the old compared to the young.

For commission error-biased measures, the multivariate F's, seen for analysis I and II, also revealed that older persons made significantly more errors of omission and commission than did the young. In analysis III contrasting the frequency of commission errors with the frequency of omissions indicated that older subjects made significantly more commission than omission errors than did the younger ones, who made similar numbers of both error types. For analysis IV, the proportion of omissions relative to total errors

was equivalent in both older and younger cohorts. However, the proportion of commissions to all errors in the fifth analysis was significantly greater in the old than in the young.

To determine the amount of variance accounted for by cohort on the kinds of errors made, η^2 values were computed. Table 4 indicates the values of η^2 for the significant univariate F's for comparisons between the number of omissions and number of commissions. For omission bias measures, the cohort effect accounts for slightly more of the variance in omission than in commission errors. In commission bias measures, η^2 values were greater for cohort effects on errors of commission than errors of omission.

The data suggest that one examines both omission and commission errors when studying "cautiousness" in the responses of older persons. We have seen that older cohorts make more errors of both types than do the young on psychometric tests. Their scores appear to reflect an exaggeration of the error bias inherent in task requirements, as the η^2 analysis has shown. However, the trend is for them to make proportionally more incorrect responses than omissions in relation to total errors, when compared to younger subjects in test taking situations.

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Table 1

Cohort Groups: Age and N's			
<u>Cohort</u>	<u>Birth Year Range</u>	<u>Mean Age at Test</u>	<u>n</u>
1	1893-1906	75	50
2	1907-1920	61	57
3*	1921-1941	44	86
4	1942-1955	26	49

*The rationale for the twenty-one year age span delimiting Cohort 3 is based upon data indicating that individuals in this group tend to score similarly on various performance measures (cf. Schaie & Labouvie-Vief, 1974).

Table 2

Explanation of the Test Variables

Verbal Meaning is the ability to understand ideas expressed in words. It is used in any activities in which information is obtained by reading or listening to words.

Space is the ability to think about objects in two or three dimensions. It is perhaps best described as the ability to imagine how an object or figure would look when it is rotated, and to see the relations of an arrangement of objects in space.

Reasoning is the ability to solve logical problems, to foresee and plan. The person with good reasoning ability can solve problems, foresee consequences, analyze a situation on the basis of past experience and can make and carry out plans according to recognizable facts.

Table 2
(continued)

Reasoning I (1963 PMA) is a logic-of-series test using letter series.

Reasoning II (1963 PMA) is a logic-of series test using word groupings.

Reasoning III (1963 PMA) is a logic-of-series test using number series.

Number is the ability to work with figures, to handle simple quantitative problems rapidly and accurately. It involves primarily speed and accuracy in handling numbers.

Word Fluency is the ability to write and talk easily. It differs from verbal meaning because it concerns the speed and ease with which words can be used rather than the degree of understanding of verbal concepts.

Hidden Patterns I and II measure "flexibility of closure", the ability to keep one or more objects in mind in spite of distractions. It involves being able to ignore irrelevant material while finding the objects.

Letter Sets I and II measure "inductive reasoning", the ability to find general concepts that will fit sets of data by forming and trying out different rules. It is very similar to the ability of reasoning discussed above.

Identical Pictures I and II measure speed of form discrimination. They are used in tasks involving visual perception.

Vowel Cancellation I and II measure speed of symbol discrimination. Like Identical Pictures, they are used in tasks involving visual perception.

Nonsense Syllogisms I and II are measures of "syllogistic reasoning", the ability to reason from stated premises to their necessary conclusions. It differs from the other reasoning tasks in the battery in that it involves deductive reasoning. The test consists of nonsense sentences so that solutions cannot be obtained by reference to past learning. The task is to indicate which conclusions follow correctly from the premises and which do not.

Paper Folding I and II measure "visualization", the ability to manipulate or transform the image of spatial patterns into other visual arrangements.

Maze Tracing I and II measure "spatial scanning", the ability to scan the field quickly for openings, to follow paths with the eye, and to quickly reject false leads. This ability seems somewhat analogous to that required in rapidly scanning a printed page for comprehension.

Table 3

Results of Multivariate Analyses of Variance: Cohort Effects

	I Errors of Omission		II Errors of Commission		III Commissions- Omissions		IV Omissions/ Total Errors		V Commissions/ Total Errors	
	F		F		F		F		F	
<u>Omission Bias Measures</u>										
<u>Multivariate Test</u> ¹										
	3.77***		3.75***		1.22		3.28***		3.91***	
<u>Univariate Tests</u> ²										
1949 PMA Spatial Ability	15.59***		11.74***		.24		7.40***		16.01***	
1963 PMA Spatial Ability	10.30***		4.26		.59		5.48		10.41***	
ETS Hidden Patterns I	4.96		1.65		2.24		3.59		5.06	
ETS Hidden Patterns II	8.97***		.43		1.59		8.62***		8.89***	
ETS Vowel Cancellation I	1.75		1.89		1.28		1.50		2.10	
ETS Vowel Cancellation II	.22		*****		*****		1.48		.22	
<u>Commission Bias Measures</u>										
<u>Multivariate Test</u> ³										
	1.99***		3.44***		2.97***		1.20		1.87***	
<u>Univariate Tests</u> ²										
1949 PMA Verbal Meaning	1.94		2.54		1.33		.50		1.30	
1949 PMA Reasoning	2.80		17.14***		7.59***		1.60		4.66	
1949 PMA Number Ability	.12		2.41		2.32		.88		.50	
1963 PMA Verbal Meaning	3.60		8.48***		6.94***		.94		2.52	
1963 PMA Reasoning I	4.61		4.79		2.32		6.20***		8.40***	
1963 PMA Reasoning II	.19		1.91		1.97		.01		.63	
1963 PMA Reasoning III	2.20		7.03***		3.24		2.77		4.26	
1963 PMA Number Ability	1.84		.56		.13		.90		1.52	
ETS Letter Sets I	.63		13.61***		7.87***		.33		.99	
ETS Letter Sets II	10.58***		10.51***		4.15		1.27		8.31***	
ETS Nonsense Syllogisms I	.41		2.09		1.51		1.01		.14	
ETS Nonsense Syllogisms II	.59		2.10		1.31		.79		.98	
ETS Paper Folding I	.36		17.46***		15.08***		.37		.61	
ETS Paper Folding II	3.11		18.87***		13.92***		.04		.51	
ETS Identical Pictures I	.34		.50		.66		.29		.37	
ETS Identical Pictures II	1.17		6.65***		4.99		1.78		1.81	

*** p < .001

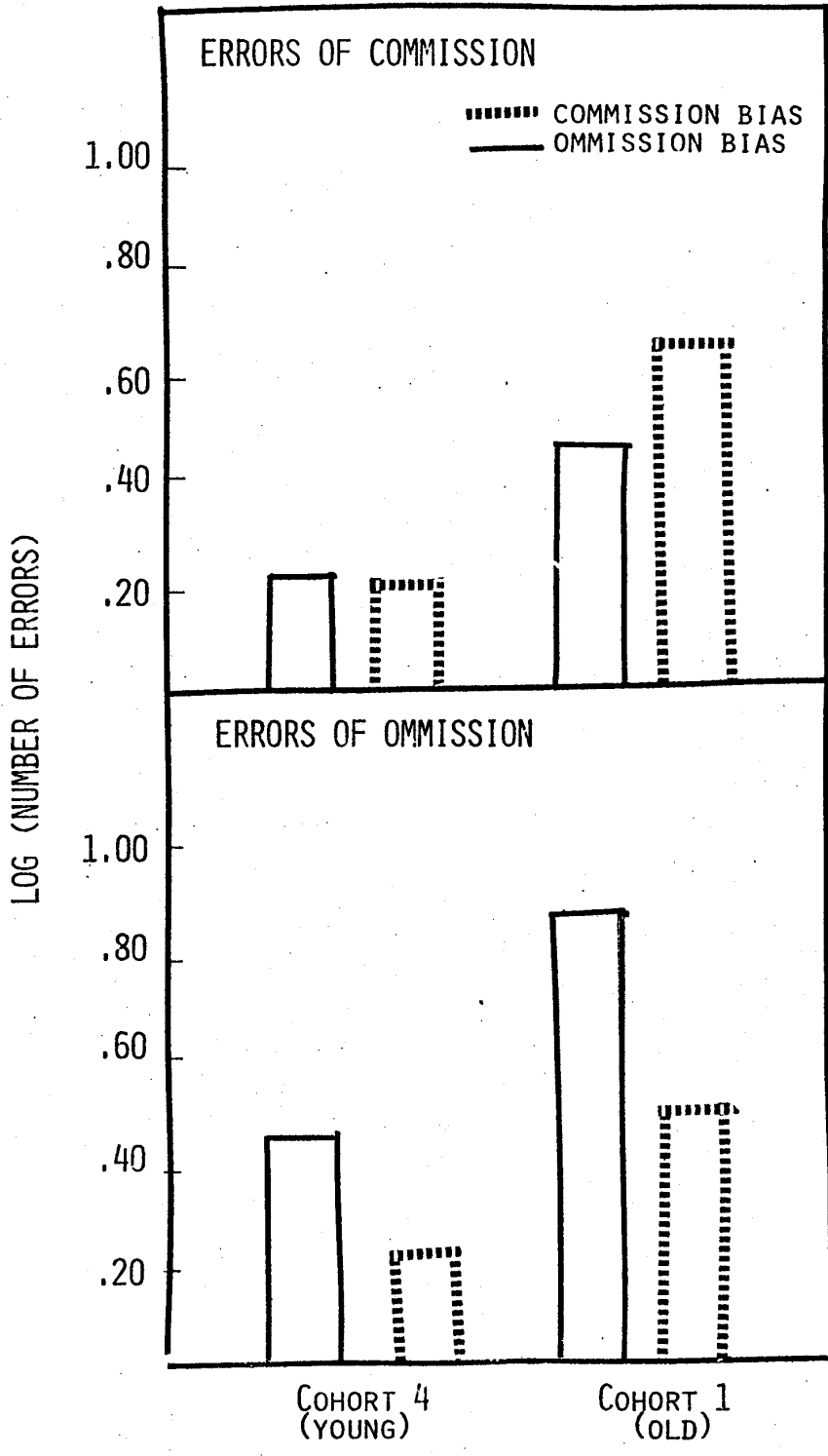
*****Heywood case

¹df = 18, 648
²df = 3, 234
³df = 48, 652

Table 4

Percent of Variance Accounted for by Cohort for Omission
and Commission Biased Measures

	<u>Errors of Omission</u> (Percent)	<u>Errors of Commission</u> (Percent)
<u>Omission Bias Measures</u>		
1949 PMA Spatial Ability	16	13
1963 PMA Spatial Ability	11	5
ETS Hidden Patterns I	10	10
<u>Commission Bias Measures</u>		
1949 PMA Verbal Meaning	3	18
1963 PMA Verbal Meaning	4	9
1963 PMA Reasoning III	2	18
ETS Letter Sets I	0	14
ETS Letter Sets II	11	12
ETS Paper Folding I	0	18
ETS Paper Folding II	3	19
ETS Identical Pictures I	1	7



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