DOCUMENT RESUME

ED 088 913 TM 003 469

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TITLE	The Computer Programmer Aptitude Battery: A Field Trial.
INSTITUTION	Vancouver Board of School Trustees (British Columbia). Dept. of Planning and Evaluation.
REPORT NO	RR-73-03
PUB DATE	Feb 73
NOTE	10p.
EDRS PRICE	MF-$0.75 HC-$1.50
DESCRIPTORS	*Aptitude Tests; Computer Oriented Programs; Computers; Computer Science Education; Job Skills; Management Systems; Norms; *Programers; Secondary School Students; *Student Evaluation; *Systems Analysts; *Test Results
IDENTIFIERS	Canada; Computer Programmer Aptitude Battery

ABSTRACT

This study is on the examination of a battery developed to aid managers and personnel directors in selecting persons with the aptitudes for computer programmer and system analyst positions. It comprises five separately timed tests, measuring the following skills and aptitudes: verbal meaning, reasoning, letter series, number ability, and diagramming. Two Vancouver secondary school teachers administered the Computer Programmer Aptitude Battery (CPAB) to their computer science classes. This study is an examination of those results compared with two other groups for which published norms were available: a group of computer trainees and applicants, and a group of experienced computer programmers and systems analysts. Considering the age and degree of programming experience of those involved, the performance of the computer science students on the CPAB was impressive. They scored well above the average of both more experienced groups. However, the results may be distorted since one of the high school groups was given 25% more time than that specified in the test manual. A more valid comparison of performance could be attained if the test were given to a class whose members shared similar programming experience. (RC)

RESEARCH REPORT

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Research Report 73-03

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THE COMPUTER PROGRAMMER APTITUDE BATTERY: A FIELD TRIAL

The Computer Programmer Aptitude Battery

The Computer Programmer Aptitude Battery (CPAB)[1] was developed by Jean Maier Palormo of Science Research Associates, Inc., to aid managers of data-processing centers and personnel directors in selecting persons with the aptitudes for computer programmer and systems analyst positions. It comprises five separately timed tests, measuring the following skills and aptitudes:

Verbal Meaning (38 items - 8 min.)	a test of communications skill; vocabulary commonly used in mathematical, business, and systems engineering literature
Reasoning (24 items - 20 min.)	a test of ability to translate ideas and operations from word problems into mathematical notations
Letter Series (26 items - 10 min.)	a test of abstract reasoning ability, finding a pattern in the given series of letters
Number Ability (28 items - 6 min.)	a test of facility in using numbers; ability to estimate quickly reasonable answers to computations
Diagramming (35 items - 35 min.)	a test of ability to analyze a problem and order the steps for solution in a logical sequence.

On their own initiative, two Vancouver secondary school teachers administered the CPAB to their computer science classes. This study is an examination of those test results.

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[1] Computer Programmer Aptitude Battery, developed by Jean Maier Palormo, Science Research Associates, Inc., Chicago, Illinois.

Description of the Two Computer Science Classes

The first group (hereafter referred to as Group A) was composed of 32 students from Mr. J. Schellenberg's computer science class at Sir Winston Churchill Secondary School. The class included students from grades 9 to 12 with varying degrees of programming experience. The Verbal Meaning, Reasoning, Letter Series and Number Ability tests were administered in October 1972; the Diagramming test in January, 1973. These students were given approximately 25% more time to complete the test than was specified in the CPAB manual, since Mr. Schellenberg's original intention was to use the battery as a power test only.

The second group (Group B) consisted of 18 students from Mrs. M. Zelter's computer science 11E class at Templeton Secondary School who had very limited programming experience. Mrs. Zelter, who administered the battery in January, 1973, kept within the time limits specified in the CPAB manual, but because of lack of class time and the unfamiliarity of her students with flowcharting, did not include the Diagramming test.

Description of Two Groups Used for CPAB Performance Comparisons

To get a general idea of how the students fared on the CPAB, their performance on the test was compared to that of two groups for which published norms were available: a group of computer programmer trainees and applicants, and a group of experienced computer programmers and systems analysts. The educational level of both groups was considerably higher than that of the students, and this must be born in mind when examining the comparisons.

Two thirds of the computer programmer trainees and applicants were applying for jobs with a civil service agency in the eastern United States and the remainder were enrolled in basic computer systems training at universities or computer manufacturer training sites. Approximately half of this group were college graduates.

The experienced computer programmers and systems analysts included personnel from a variety of business and industrial installations, including computer manufacturers. Approximately 80% of these were college graduates, and their median experience in the computer programmer field was three to four years.

Results

The mean, median and range of the raw test scores (expressed as percentages) of Groups A and B are presented in Tables I and II. (No scores or comparisons on the Diagramming test or on the Total Battery are presented for Group B).

TABLE I: MEAN, MEDIAN AND RANGE OF PERCENTAGE SCORES OF THE COMPUTER SCIENCE CLASS A ON THE COMPUTER PROGRAMMER APTITUDE BATTERY (N=32)

TEST	MEAN	MEDIAN	RANGE
Verbal Meaning	44.6%	43.4%	15.8 - 81.6%
Reasoning	62.0%	60.4%	20.8 - 100.1%
Letter Series	70.5%	70.2%	30.8 - 96.2%
Number Ability	69.8%	73.2%	32.1 - 96.4%
Diagramming	83.7%	92.9%	42.9 - 100.0%
Total Battery	70.2%	73.4%	36.9 - 95.7%

TABLE II: MEAN, MEDIAN AND RANGE OF PERCENTAGE SCORES OF THE COMPUTER SCIENCE CLASS B ON THE COMPUTER PROGRAMMER APTITUDE BATTERY (N=18)

TEST	MEAN	MEDIAN	RANGE
Verbal Meaning	27.2%	25.0%	10.5 - 63.2%
Reasoning	48.6%	50.7%	25.0 - 66.7%
Letter Series	54.3%	51.9%	26.9 - 84.6%
Number Ability	45.6%	47.0%	25.0 - 67.9%

Table III presents a comparison of the raw score means and standard deviations of the two computer science classes with those of the programmer trainee and the experienced programmer groups.

Figures 1(A) and 1(B) present the mean scores of the computer science classes expressed in terms of the percentile norms for the two programmer groups.[2]

[2] A percentile is a score at or below which a given percentage of the groups perform. For example, figure 1(A) shows that the average score for Group A on the Verbal Meaning Test is equal to or better than the scores of 55% of the programmer trainees and equal to or better than the scores of 24% of the experienced programmers.

TABLE III: COMPARISONS OF THE MEANS AND STANDARD DEVIATIONS OF RAW SCORES FOR GROUPS A* AND B** WITH THE SCORES OF COMPUTER PROGRAMMER TRAINEES AND APPLICANTS AND EXPERIENCED COMPUTER PROGRAMMERS AND SYSTEMS ANALYSTS

	Verbal Meaning (38)		Reasoning (24)		Letter Series (26)		Number Ability (28)		(35) Diagramming		Total Battery (141)	
	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.	Mean	S. D.
Computer Programmer Trainees and Applicants	16.77	7.29	9.49	6.52	10.46	4.82	12.13	5.61	16.15	11.11	64.86	29.00
Experienced Programmers and Systems Analysts	21.58	5.93	14.77	4.80	11.72	4.46	15.90	4.41	25.46	6.84	83.39	17.23
Group A*	16.94	7.08	14.88	6.05	18.34	4.89	19.53	5.70	29.28	6.64	98.97	23.60
Group B**	10.33	4.84	11.67	2.97	14.11	4.14	12.78	3.32	- **	- **	-	-

* 25% more additional time given to Group A.

** Diagramming test not administered to Group B.

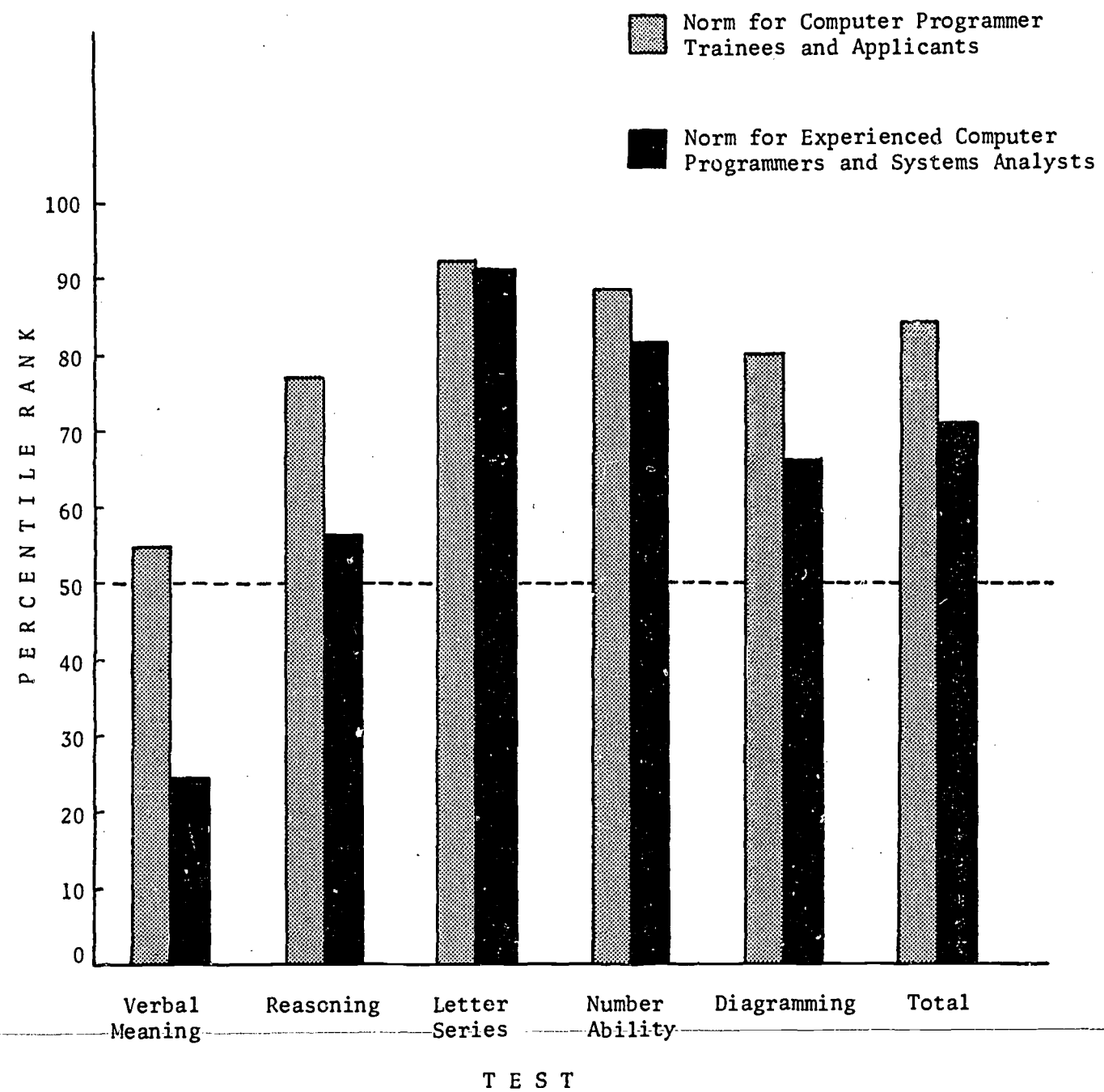

FIGURE 1(A): PERFORMANCE OF GROUP 'A' IN TERMS OF NORMS FOR TRAINEES AND EXPERIENCED PROGRAMMERS

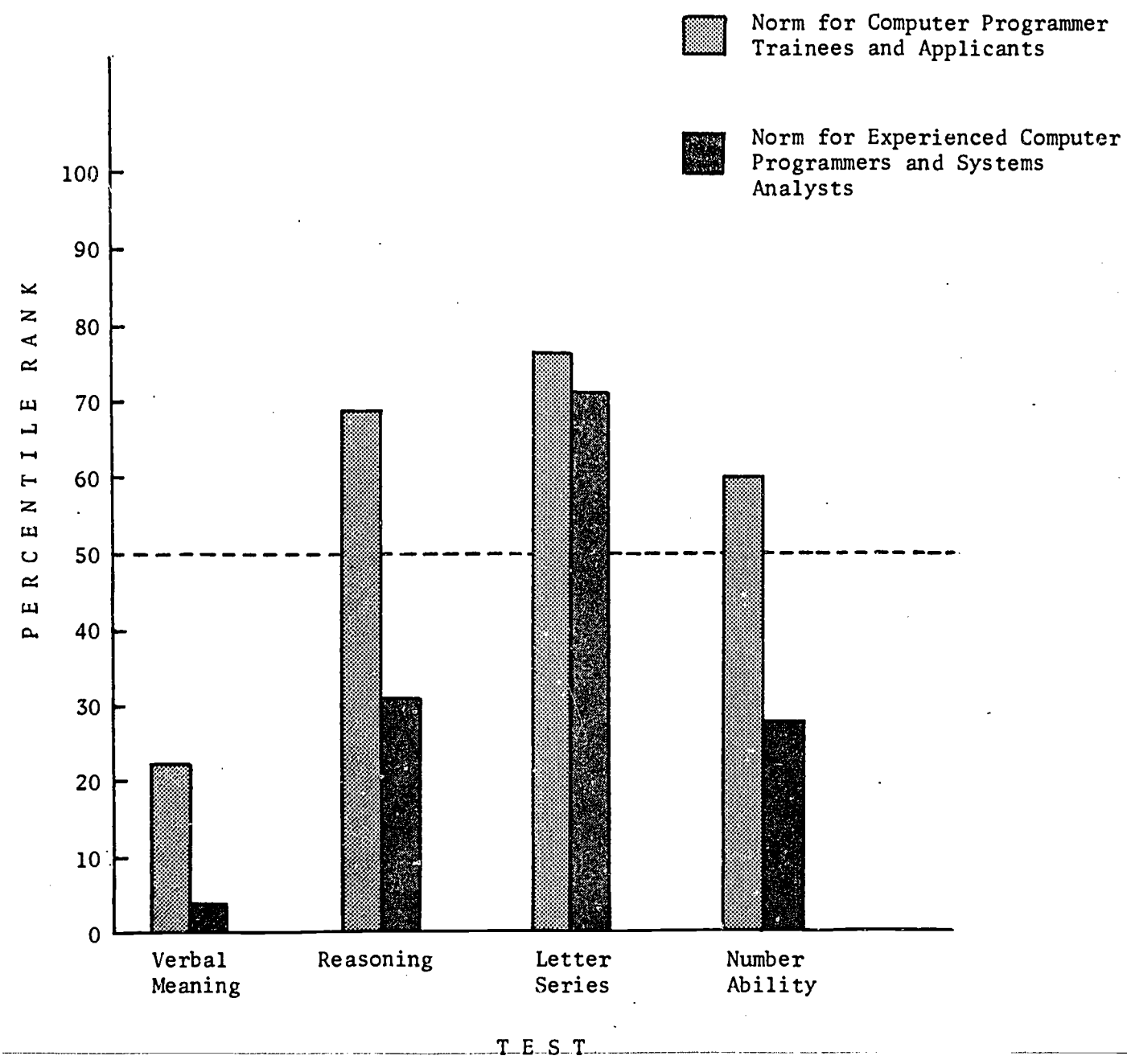

FIGURE 1(B): PERFORMANCE OF GROUP 'B' IN TERMS OF NORMS FOR TRAINEES AND EXPERIENCED PROGRAMMERS

Discussion

Group A's scores were higher than Group B's on all tests. It is difficult at this time to determine how much of this difference is attributable to the additional time given to Group A, and how much to the higher level of programming experience of most of the Group A students.

Both groups scored lowest on the Verbal Meaning test (Group A - 44.6%, Group B - 27.2%). Nevertheless, Group A, composed of students in grades 9 to 12, was still above the average of the trainee group, half of whom were college graduates [percentile rank = 55% -- see Figure 1(A)]. Group B's scores on the Verbal Meaning test were noticeably lower, but may be accounted for by the fact that over 80% of the students were from homes where English was not the first language.

Except for Group B's performance on the Verbal Meaning test, both groups of students performed better on all tests than the computer programmer trainee and applicant group [i. e. their percentile ranks in Figures 1(A) and 1(B) were above 50.]

Group A's performance was especially impressive, with a Total Battery percentile rank of 84 in terms of the norms for the programmer trainee group. In addition, they were above the average of the experienced programmer group on all but the Verbal Meaning test, with a quite respectable percentile rank of 67 on the Total Battery [see Figure 1(A)]. The group's adeptness at flowcharting was demonstrated by their success on the Diagramming test: a mean percentage score of 83.7% and a median score of 92.9%. Eleven of the 32 students in Group A had perfect scores on that test. Here, however, as in the examination of all of Group A's results, the additional time element must be taken into consideration.

Teacher Comments

The reaction of Group A's instructor to the CPAB was, on the whole, positive. It served his purposes in giving "added perspective as to what the students could do." His one criticism was that the Verbal Meaning section was too difficult and would have to be modified for high school students. The other sections, he felt, were "quite valid".

Group B's instructor expressed the opinion that the test measured "background, not ability".

Summary

Considering the age and degree of programming experience of those involved, the performance of the computer science students on the Computer Programmer Aptitude Battery was impressive, that of Group A noticeably so: they scored well above the average of both trainees and experienced computer programmers. Additional time given to Group A, however, may have distorted their scores somewhat.

In the event of future use of the CPAB, it would be desirable to administer the test to a class whose members have the same amount of programming experience (e. g. at the end of a first year course in computer science), and to keep within the specified time limits. A more thorough comparison of the students' performance with published norms could then be made.