A STUDY OF SPEED FACTORS IN TESTS 
AND ACADEMIC GRADES*

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Speeded and unspeeded tests of vocabulary, spatial relations, and arith-
metic reasoning were factorially analyzed, together with certain reference 
tests and academic grades. Lawley's maximum likelihood method was used, 
the computations being carried out on the Whirlwind electronic computer. 
Four different speed factors were isolated, together with a second-order general 
speed factor. Consistent small positive correlations between the academic 
grades and the speed factors were found.

The speed with which an examinee responds to the items in a test 
frequently affects his score. Almost all achievement and aptitude tests are to 
some extent measures of "speed." Tests for factor analyses are frequently 
speeded because many tests must be given in a limited time.

Much remains to be learned about "speed," in spite of the fact that it is 
commonly an element in test scores. Is speed on cognitive tests a unitary 
trait? Or are there different kinds of speed for different kinds of tasks? If 
so, how highly correlated are these different kinds of speed? How highly 
correlated are speed and level on the same task? How do various criteria 
relate to speed, and how speeded should tests to predict these criteria be? 
These are the questions which the present study attacks.

Some Previous Results

Factor analytic studies have often isolated a "perceptual-speed factor," 
usually measured by tests requiring simple, rapid visual discriminations. 
"This factor is characterized by the task of (quickly) finding in a mass of 
distracting material a given configuration which is borne in mind during the 
search" (6). Any speed test composed of very easy items is likely to have a 
loading on this factor. A more recent publication (7) breaks down "perceptual 
speed" into at least two factors, "speed of symbol discrimination" and "form

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perception," the former relating to familiar symbols, the latter to unfamiliar figures.

Other factors related to speed include finger dexterity, fluency of expression, ideational fluency, reaction time, speed of association, speed of judgment, tapping, word fluency (6). Speed of closure and motor speed are included in (7). Rimoldi (20) finds a "speed of judgment," a "speed of cognition," and a second-order "personal tempo" factor; but his subjects, like those in many earlier studies, were to work at a "natural, congenial" speed rather than at the maximal speed required by most tests.

Since many tests in factor analytic studies are speeded, many of the factors are speed factors, although not always so described. An example is the "number" factor, which is commonly measured by highly speeded tests of addition, subtraction, multiplication, and division. This factor will here be referred to as the number-speed factor.

In spite of the presence of both speeded and unspeeded tests in most factor analysis batteries, a general intellectual-speed factor has not routinely been found. Studies designed to investigate the existence of both general and specific speed factors in ordinary aptitude test batteries have been few and have yielded conflicting evidence (3, 4, 17, 18, 21, 22).

For further consideration of "speed factors," the reader is referred to (24, pp. 80-85) and to the 33 references in (8).

Data for the Present Study

The Subjects

All measures in this study were obtained on 649 students in the entering class at the United States Naval Academy at Annapolis. This large number of cases was used to obtain clearly interpretable results.

The Tests

The study centers around tests of the verbal factor, of spatial ability, and of arithmetic reasoning, because of the widespread use of tests in these areas.

In each area, seven tests were administered. One was the regular admissions examination, denoted by (A), which is only slightly speeded. The remaining six were short experimental tests administered at the beginning of the school year. These were parallel in content, but different in degree of speededness. Two were "level" tests, denoted by (L), involving virtually no speed. One was moderately speeded (M). The remaining three tests were highly speeded (S). In order to confound practice effect insofar as possible, the tests were administered in scrambled order, as follows: LSMSLS. The examinee was told the degree of speededness that would be required.