



FACTOR ANALYSIS APPLIED TO STANDARD TESTS AND TO HIGH SCHOOL MARKS

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In an endeavor to discover whether there are subject abilities operating in school work which will enable the student to do excellent work in mathematics while doing poor work in English or vice versa, or whether on the other hand success in the different school subjects may be thought of as springing from a general factor which we might call scholastic aptitude or general intelligence, we secured high school marks in the different subjects over a period of four years for the graduating classes of five Cleveland, Ohio, high schools. For each of these classes some objective test scores were available and were also used as variables.

In the East High School correlations were obtained in the different subjects and also for the subtests of the *Ohio State University Psychological Test*, Form 17—sixteen variables in all—for 285 graduating seniors. In the Glenville High School correlations were obtained on fifteen variables for 230 cases. In the June, 1933, graduating class of Collinwood High School correlations were obtained for twenty-five variables on 146 cases. In the January, 1934, graduating class of Collinwood High School correlations were obtained for thirty-two variables and 203 cases. In the John Hays High School correlations were obtained for thirty-nine variables on 281 cases. All of the possible intercorrelations were computed.

The factor analyses of these five tables of intercorrelations all point to the conclusion that there is one general factor which underlies all the high school marks and all the so-called intelligence tests that had been administered to these students. This factor is of major importance in determining the student's success or failure in his school studies as well as all his intelligence tests. These results, then, seem to be a corroboration of Spearman's thesis that after all there is only one general factor applying to all kinds of mental tests.

This conclusion has implications of utmost importance to the problem of selecting students for entrance to colleges and universities. If there is but one general factor operative in the kinds of mental tests which are common to different levels of our school system, then the major component of a battery of entrance tests for the selection or guidance of students entering the college or university would be a good so-called intelligence test long enough and difficult enough to get a true picture of the amount of general intelligence that the student possesses.

In our studies we made a thorough effort to find whether high school subjects could be made into groups or constellations of the variables which were more closely related among themselves than with the other groups. Thus from a *a priori* consideration we might expect the different semester marks in English to correlate more highly among themselves on the average than they would correlate with the semester grades in mathematics on the average. In the study of the January, 1934, class of the

Collinwood High School the thirty-two variables were divided into five groups: the English group, the mathematics and science group, the history and civics group, the physical training group, and the test group. The average intercorrelation of the English marks among themselves was .52; the average intercorrelation with the history marks, .46; with mathematics and science, .44. This shows that the English marks do tend to be somewhat more closely related to one another than to the marks in the other subject fields.

It has been expected that the Sones-Harry Language and Literature test would be found to belong to the English group, the Sones-Harry Social Studies test to the history and civics group; however, this did not prove to be the case. All four of the Sones-Harry tests by their correlations very clearly fitted into the fifth group, or that group composed of the so-called intelligence tests.

