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Cross-cultural differences in cognitive performance and Spearman's hypothesis: *g* or *c*?

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Abstract

Common tests of Spearman's hypothesis, according to which performance differences between cultural groups on cognitive tests increase with their *g* loadings, confound cognitive complexity and verbal–cultural aspects. The present study attempts to disentangle these components. Two intelligence batteries and a computer-assisted elementary cognitive test battery were administered to 474 second-generation migrant and 747 majority-group pupils in the Netherlands, with ages ranging from 6 to 12 years. Theoretical complexity measures were derived from Carroll [*Human cognitive abilities. A survey of factor-analytic studies.* Cambridge: Cambridge Univ. Press] and Fischer [Psychol. Rev. 87 (1980) 477]. Cultural loadings of all subtests were rated by 25 third-year psychology students. Verbal loading was operationalized as the number of words in a subtest. A factor analysis of the subtest loadings on the first principal component, the theoretical complexity measures, and the ratings of cultural loading revealed two virtually unrelated factors, representing cognitive (*g*) and cultural complexity (*c*). The findings suggest that performance differences between majority-group members and migrant pupils are better predicted by *c* than by *g*.

Keywords: "g"; Intelligence; Minority groups; Cognitive complexity; Cultural complexity; Spearman's hypothesis

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1. Introduction

Spearman (1927, p. 379) was the first to observe that tests with a higher *g* saturation tended to reveal larger performance differences between ethnic groups. The *g* saturation of a test refers to its cognitive complexity. Elaborating on these observations, Jensen (1985) formulated "Spearman's hypothesis" (SH), which predicts larger performance differences between ethnic groups on tests as their *g* loading increases. Performance differences are measured by effect sizes, such as Cohen's *d*. A test's *g* loading is usually represented by its loading on the first factor of the intertest correlation matrix or by its loading on the first factor of the second-order *g* factor derived from hierarchical factor analysis (i.e., the general factor among the obliquely rotated first-order factors). A less common measure of *g* is the use of correlations with tests that are known to have a high *g* loading. For example, Jensen (1993) has used Raven's Standard Progressive Matrices to calibrate tests of unknown *g* loadings.

In the discussion of studies on SH, a distinction can be made between studies that (1) directly test SH, (2) propose and test alternative explanations of SH, (3) refute alternative explanations of SH, and (4) test the generalizability of SH.

1.1. Direct hypothesis tests

Jensen (1998) gives an overview of research into SH based on paper-and-pencil tests and reaction time (RT) tests, most frequently employing samples of African–Americans (AA) and European–Americans (EA). In many studies, SH was strongly supported (e.g., Jensen, 1982, 1984, 1985, 1993; Jensen & Reynolds, 1982; Naglieri & Jensen, 1987; Peoples, Fagan, & Drotar, 1995; Vernon & Jensen, 1984). Differences between the ethnic groups correlated significantly positive with the test's *g* loading.

1.2. Studies supporting alternative explanations of SH

Evidence for the role of cultural bias in the explanation of EA–AA differences comes from Montie and Fagan (1988). In addition to large mean differences favoring EA preschool children (3-year-olds) tested with the third revision of the Stanford–Binet test, these authors found that performances were larger on some items relative to others (Significant Race×Item interactions), but that these differences were not in line with SH. They concluded that test bias might have contributed to the racial differences in IQ.

1.3. Studies refuting alternative explanations of SH

Jensen (1993) refuted motivational effects as an alternative explanation of EA–AA differences. AA showed faster movement times (MTs) and slower RTs than EA in elementary cognitive tests. According to Jensen, it is difficult to see why EA would be more motivated in RT-related processes and less motivated in MT-related processes as both refer to processes that immediately follow each other in the tests studied and together do not take more than a few seconds.