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Genetic and environmental contributions to the covariance between occupational status, educational attainment, and IQ: A study of twins

Abstract

Scores of occupational status, educational attainment, and IQ were obtained for 507 monozygotic and 575 dizygotic male twin pairs born 1931–1935 and 1944–1960. A multivariate genetic analysis with statistics from different cohorts showed heterogeneity between cohorts, and analyses were performed in four separate cohorts. The only set of results which departed clearly from the rest was found for the group born 1931–1935, where the ratio of environmental to genetic effects exceeded those of the other groups. Typical heritability values in the three youngest groups (weighted means) were .43, .51, and .66 for occupation, education, and IQ, respectively. The values in the oldest group were .16, .10, and .37, but this sample is small and the estimates are unstable. Genetic variance influencing educational attainment also contributed approximately one-fourth of the genetic variance for occupational status and nearly half the genetic variance for IQ. The values for the between-families variances (reflecting family environment and assortative mating) varied from 2 to 35% in the three youngest groups but were higher for education (62%) and IQ (45%) in the oldest groups. All the between-families variance was common to all three variables. **For educational attainment and IQ, the bulk of this between-families variance is probably genetic variance due to assortative mating.** The common-factor environmental within-family variances were generally small, and the specific estimates seemed to contain mainly measurement error.

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Genetic and Environmental Contributions to the Covariance Between Occupational Status, Educational Attainment, and IQ: A Study of Twins

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Scores of occupational status, educational attainment, and IQ were obtained for 507 monozygotic and 575 dizygotic male twin pairs born 1931–1935 and 1944–1960. A multivariate genetic analysis with statistics from different cohorts showed heterogeneity between cohorts, and analyses were performed in four separate cohorts. The only set of results which departed clearly from the rest was found for the group born 1931–1935, where the ratio of environmental to genetic effects exceeded those of the other groups. Typical heritability values in the three youngest groups (weighted means) were .43, .51, and .66 for occupation, education, and IQ, respectively. The values in the oldest group were .16, .10, and .37, but this sample is small and the estimates are unstable. Genetic variance influencing educational attainment also contributed approximately one-fourth of the genetic variance for occupational status and nearly half the genetic variance for IQ. The values for the between-families variances (reflecting family environment and assortative mating) varied from 2 to 35% in the three youngest groups but were higher for education (62%) and IQ (45%) in the oldest groups. All the between-families variance was common to all three variables. For educational attainment and IQ, the bulk of this between-families variance is probably genetic variance due to assortative mating. The common-factor environmental within-family variances were generally small, and the specific estimates seemed to contain mainly measurement error.

KEY WORDS: intelligence; educational attainment; occupational status; covariance analysis; heritability; twins.

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INTRODUCTION

The substantial intercorrelations among psychometrical intelligence (IQ), educational attainment, and occupational status are well documented. These relations are predictable a priori from the fact that intelligence tests were originally validated against school performance, which in turn influences career advancement. Still, the causal relationships are far from clear-cut and can be illuminated (if not elucidated) by considering the relative impact of environmental and genetic factors and the extent to which such impacts are common or specific for each of the variables. This study offers some tentative answers to these questions, using the method developed by Martin and Eaves (1977).

In large samples of Norwegian twins, including the subjects from the present study, Heath *et al.* (1985a,b) have shown that the relative contributions from genetic and environmental sources vary across cohorts for education, and Sundet *et al.* (1988) have shown a similar trend for IQ. Even in a smaller sample, we were able to explore such trends further, also examining the trends for occupational status and for the relative values of common and specific variances.

A number of twin studies (Martin and Eaves, 1977; Fulker, 1978; Martin *et al.*, 1984; Tambs *et al.*, 1986) have shown that the between-family variance, V_B , for various abilities, education, and socioeconomic variables appears to be due to a single common factor. This is to say that any genetic effect due to assortative mating is common for these variables, and so is any effect of the family environment (Eaves *et al.*, 1984). An important objective of this study was to test the expectation of no V_B specific to any single measure.

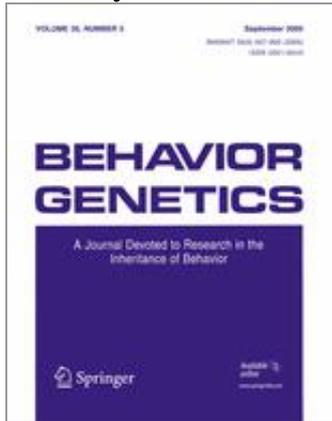
MATERIALS AND METHODS

Sample

The sample consisted of 507 male monozygotic (MZ) pairs and 575 male dizygotic (DZ) pairs. At age 18–19 years, about 90% of the male population is investigated physically and psychologically before the entrance to the compulsory military service. From the army files, IQ scores were available for the cohorts born 1931–1935 and 1944–1960.

The data were obtained by the matching of the army files with the Norwegian Twin Panel. The panel contains all Norwegian like-sexed twin pairs born 1915–1960 where both were alive at age 20 and for whom addresses could be found in census data. Zygosity has been assigned for 80% of the pairs, in which at least one of the twins returned a mailed

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