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# Age Changes in the Causes of Individual Differences in Conservatism

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Age-related changes are analyzed in the correlation of 3416 monozygotic and 3780 dizygotic U.S. twin pairs aged between 9 and 75+ years for conservatism scores derived from a 28-item social attitude inventory. The effects of the shared environment are overwhelming in twins aged 20 years or younger. In older twins, genetic effects appear to play a larger role. A more dynamic conception of the interaction between genes and environment in the development of complex human differences is needed.

**KEY WORDS:** Social attitudes; conservatism; twins; genetics; development.

Family studies of human behavior have led to the astonishing claim that the shared family environment plays a small role in the creation of adult differences in ability and personality compared with those of genes and the unique, nonshared, environmental experiences of the individual (e.g., Jinks and Fulker, 1970; Plomin and DeFries, 1985; Tellegen *et al.*, 1988; Eaves *et al.*, 1989; Loehlin, 1992). Social attitudes have been studied in the attempt to identify more culturally labile traits (Cavalli-Sforza and Feldman, 1981; Cavalli-Sforza *et al.*, 1982) but studies of identical and fraternal twins, separated twins, adoptions, and the relatives of twins suggest that the overall effects of the shared environment are small even in the social attitude domain (Eaves and Eysenck, 1974; Insel, 1974; Feather, 1978; Scarr, 1981; Martin *et al.*, 1986; Waller *et al.*, 1990).

If the family environment accounts for so little, then why have biological and cultural evolution produced the various forms of human family grouping which appear to have educational as well as protective and nutritional functions? Perhaps the apparent failure to detect the effects of the shared environment in family studies is less a matter of choice of measure than it is due to a static conception of the family environment as a source of specific fixed information. A more dynamic conception of the human family as a short-term support mechanism and source of flexible adaptive strategies could result in a greater contribution of the shared environment to behavior in juveniles than in adults. The different experiences and social interactions of genetically distinct independent adults transform information acquired socially from parents, peers, and teachers into partially heritable complex adult phenotypes.

Thus, the family environment may not affect social attitudes of adults for whom the family environment has outlived its adaptive purpose. By this time, genetically different individuals have be-

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gun their different trajectories through life. In contrast, we expect a larger, transient effect of the shared environment during the earlier stages of attitude development when juveniles are still dependent on their parents and teachers.

This model may be tested by charting age changes in the attitude correlations of identical (monozygotic; MZ) and nonidentical (dizygotic; DZ) twin pairs during adolescence and into adulthood. In so far as adolescence serves an educational function in which children acquire the basic language and concepts of attitudes from relatives, friends and teachers, we expect the attitude correlations to be similar for MZ and DZ twins. In "free-" living adults who have begun to select and interact with their own environments, we might expect a greater role for genetic effects and a consequent excess of the correlations in MZ twins over those for DZs.

The data summarized in this report derive from two sources. The Medical College of Virginia Cardiovascular Twin Study (Schieken *et al.*, 1992) is a longitudinal cohort-sequential study of cardiovascular function in approximately 550 adolescent twin pairs and their parents. Twins aged 9–11 years were ascertained through responses to a letter of invitation sent home from school to parents of all the eligible pairs enrolled in Virginia public schools. Twins and parents are studied repeatedly in the laboratory within 3 months of twins being 9.5, 11, 12.5, 14, 15.5, and 17 years of age. Zygosity is established by typing for a number of highly informative blood group and/or DNA polymorphisms. Twins aged 18 years and older were recruited for the "Virginia 30,000" study of twins and their relatives (Truett *et al.*, 1994) from the Virginia population-based twin registry (Corey *et al.*, 1991). The sample of older twins (age 50+) was augmented by volunteer twins recruited as a result of a letter published in the Newsletter of the American Association of Retired Persons. In the 18+ twins, zygosity was established with a high degree of reliability (e.g., Kasriel and Eaves, 1976) by brief questionnaire.

The conservatism dimension of social attitudes was assessed at every age by a 28-item scale (Appendix I) modeled on the Wilson–Patterson (1970) Conservatism scale. Juveniles completed the inventory under supervision to prevent collusion. They were asked to indicate "can't decide" if they were unclear about the meaning of a particular topic. The inventory was administered to adults by mail.

**Table I.** Twin Correlations for Conservatism by Age (Pooled Over Sexes)

| Age group (yr) | MZ | *N* | DZ | *N* |
|---|---|---|---|---|
| 9.5 | 0.093 | 115 | 0.308 | 115 |
| 11 | 0.311 | 199 | 0.284 | 187 |
| 12.5 | 0.419 | 201 | 0.370 | 180 |
| 14 | 0.524 | 134 | 0.506 | 121 |
| 15.5 | 0.433 | 112 | 0.441 | 105 |
| 17 | 0.647 | 92 | 0.634 | 77 |
| 18–20 | 0.622 | 51 | 0.675 | 49 |
| 21–25 | 0.619 | 229 | 0.432 | 282 |
| 26–30 | 0.699 | 205 | 0.392 | 338 |
| 31–35 | 0.569 | 226 | 0.442 | 287 |
| 36–40 | 0.722 | 147 | 0.369 | 245 |
| 41–45 | 0.557 | 111 | 0.396 | 186 |
| 46–50 | 0.562 | 73 | 0.335 | 80 |
| 51–55 | 0.661 | 225 | 0.296 | 200 |
| 56–60 | 0.635 | 298 | 0.309 | 266 |
| 61–65 | 0.605 | 345 | 0.369 | 378 |
| 66–70 | 0.671 | 328 | 0.395 | 343 |
| 71–75 | 0.734 | 187 | 0.421 | 189 |
| 75+ | 0.580 | 138 | 0.358 | 152 |
| Total | — | 3416 | — | 3780 |

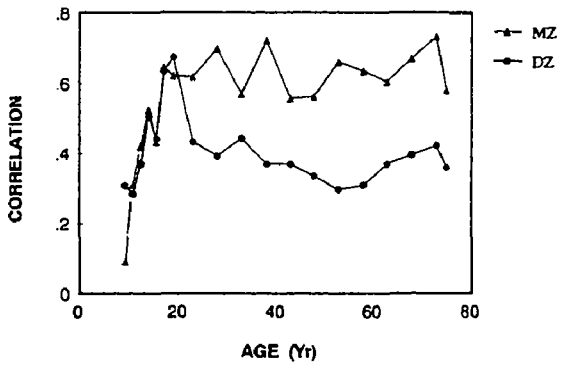


**Fig. 1.** Twin correlations for conservatism by age (pooled over sexes).

Factor analysis showed the same pattern of loadings on the first principal component at every age during adolescence and in adults. The variance of the first principal component increased with age in the juveniles, reflecting the increasing salience of the items in older subjects.

Twin correlations (Table I, Fig. 1) were computed separately for MZ and DZ twins in each of 19 separate age groups. The correlations in juve-

Table II. Sources of Heterogeneity in Twin Correlations for Conservatism by Zygosity and Age

| | Age (yr) | | | |
|---|---|---|---|---|
| | Under 21 | | Over 20 | |
| Effect | $\chi^2$ | df | $\chi^2$ | df |
| Zygosity | 0.26 | 1 | 175.09* | 1 |
| Age group | 50.44* | 6 | 11.67 | 11 |
| Age × zygosity | 3.44 | 6 | 15.79 | 11 |

* $P<0.001$.

niles increase during adolescence, reflecting the growing salience of the items. Throughout this period, there is little difference between the correlations of MZ and DZ twins, suggesting that the shared environment plays an overwhelming role in the creation of family resemblance with genetic factors playing no part at all. In twins aged 21 and older, the MZ correlations remain relatively stable, but the DZ correlations are smaller, reflecting the expression of some genetic effects in adults.

Linear models were fitted to the *z*-transforms of the 38 raw correlations, weighted by their degrees of freedom ($N - 3$), using the SAS GLM procedure (SAS 1985) to analyze the principal sources of heterogeneity in the observed correlations. The model sums of squares partition the chi-square for heterogeneity into sources due to age, zygosity and the interaction of zygosity with age. Separate analyses were performed for correlations grouped arbitrarily into those based on subjects aged 20 years or younger ("juveniles"), and those based on subjects older than 20 years ("adults").

The sources of heterogeneity in twin resemblance are entirely different in younger and older twins (Table II). In the younger age group, all the significant heterogeneity is associated with differences in age group. There are no effects of zygosity on twin resemblance, confirming that the familial determinants of attitude differences are entirely social in this group. The role of shared environment increases during adolescence as the items become more salient. In striking contrast, adult twins show no significant heterogeneity in correlation with age but reveal highly significant differences between the correlations of MZ and DZ pairs. In neither younger nor older twins is there any significant residual heterogeneity due to the interaction between zygosity and age. Thus, age differences explain all the heterogeneity in the correlations before age 20 and zygosity explains all the differences measured after age 20.

Our findings may admit explanations in terms of cohort differences in the role of genetic and social factors or a major developmental change at age 20 which suddenly makes DZ twins less alike than MZs for nongenetic reasons. However, they are also consistent with a developmental change from a purely environmental mechanism to a partly genetic model for conservatism around the age that people in the United States typically leave home for college or start employment. The failure of past behavior-genetic studies to find significant shared environmental effects may partly be due to the ages at which subjects were studied. Genetic effects may be expressed in adults but in juveniles the twin correlations for conservatism are entirely nongenetic. Further theoretical and empirical work is needed to describe developmental changes in family resemblance in young adults and to offer a coherent explanation of these changes in terms of the mechanisms of gene–environment correlation and interaction.

## APPENDIX

### Attitudes Questionnaire (After Wilson and Patterson, 1970)

Here is a list of various topics. *Please indicate whether or not you agree with each topic by circling Yes or No as appropriate. If you are uncertain, please circle ?.* Again, the best answer is usually the one which comes to mind first, so just give us your first reaction and don't spend too long on any one topic.

| | | 1 | 2 | 3 |
|---|---|---|---|---|
| (1) | Death penalty | Yes | ? | No |
| (2) | Astrology | Yes | ? | No |
| (3) | X-rated movies | Yes | ? | No |
| (4) | Modern art | Yes | ? | No |
| (5) | Women's liberation | Yes | ? | No |
| (6) | Foreign aid | Yes | ? | No |
| (7) | Federal housing | Yes | ? | No |
| (8) | Democrats | Yes | ? | No |
| (9) | Military drill | Yes | ? | No |
| (10) | The draft | Yes | ? | No |
| (11) | Abortion | Yes | ? | No |
| (12) | Property tax | Yes | ? | No |
| (13) | Gay rights | Yes | ? | No |

| | | | | |
|---|---|---|---|---|
| (14) | Liberals | Yes | ? | No |
| (15) | Immigration | Yes | ? | No |
| (16) | Capitalism | Yes | ? | No |
| (17) | Segregation | Yes | ? | No |
| (18) | Moral majority | Yes | ? | No |
| (19) | Pacifism | Yes | ? | No |
| (20) | Censorship | Yes | ? | No |
| (21) | Nuclear power | Yes | ? | No |
| (22) | Living together | Yes | ? | No |
| (23) | Republicans | Yes | ? | No |
| (24) | Divorce | Yes | ? | No |
| (25) | School prayer | Yes | ? | No |
| (26) | Unions | Yes | ? | No |
| (27) | Socialism | Yes | ? | No |
| (28) | Busing | Yes | ? | No |

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