



Finnish Twins Reared Apart III: Personality Factors

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Abstract. This study is based on data from 165 adult twin pairs separated at 10 years or less. Information on personality factors: extraversion (E) and neuroticism (N) (EPI scale short form), life satisfaction (LS) (Allardt) and stress of daily activities (SDA) was obtained as part of the questionnaire study carried out in the entire Finnish Twin Cohort in 1975. Later in 1979 a questionnaire sent to the twins reared apart yielded a scale (range 7-30 points) measuring the environmental dissimilarities after separation (reliability 0.83). The effect of separation on personality factors by analysis of variance of individual data was studied. Sex, zygosity and age-at-separation were included in the models. The overall explanatory rates were low (2.1-4.4%). The definitive study group was formed by selecting those pairs with a dissimilarity score greater than 15. The following intraclass correlations were obtained:

Age at separation	No. of cases		E		N		LS		SDA	
	MZ	DZ	MZ	DZ	MZ	DZ	MZ	DZ	MZ	DZ
0 - 5	18	61	0.40	0.17	0.34	0.07	0.22	0.18	0.04	0.00
0 - 10	30	95	0.38	0.12	0.25	0.11	0.40	0.19	0.06	0.02

Key words: Twins reared apart, Rearing environment, Adoption, Behavioral genetics, Personality

INTRODUCTION

The purpose of this study is to analyse the effect of environmental and genetic factors of various personality traits among Finnish twins reared apart in childhood. In an earlier paper, the preliminary characterization of the rearing environment and causes of separation was given [6]. The study sample of twins reared apart analysed in this paper has been described in more detail in a companion paper [7].

MATERIALS AND METHODS

The sample consists of 30 monozygotic (MZA) and 95 dizygotic (DZA) pairs of twins separated prior to age 11, with little contact after separation as assessed by items from a rearing environment questionnaire. The data are compared to 47 monozygotic (MZT) and 135 dizygotic (DZT) pairs of similar age and sex distribution, but reared together and living apart in 1975. The mean age at separation among the study groups were as follows: MZA 4.3 yr, DZA 4.2 yr, MZT 23.0 yr, and DZT 22.5 yr.

The twins had all replied to a general health questionnaire in 1975, which included items of the personality factors. To characterize the rearing environment of the twins, a second questionnaire was mailed in 1979 to the study sample specifically.

Four personality factors were studied: extraversion (E) and neuroticism (N) (EPI scale short form) [2,3], stress of daily activities [5] and life satisfaction [1]. The extraversion dimension was measured with a nine-item scale with yes/no response alternatives and the neuroticism with a ten-item scale. The reliability coefficient (Cronbach's alfa) has been found satisfactory in previous studies (extraversion 0.72, neuroticism 0.74) [10]. The stress of daily activities was measured by a self-rating scale:

- 1) In general I am unusually tense and nervous.
- 2) There is a great deal of stress connected with my daily activities.
- 3) At the end of the day I am completely exhausted mentally and physically.
- 4) My daily activities are extremely trying and stressful.

It was asked how well an item described the respondent. The responses were scored on a scale of 1-4 and a total score was obtained by summing the scores of all four items (Cronbach's alfa 0.91). The life satisfaction was measured in the following scale:

Do you feel that your life at the present moment is

- 1) very interesting, fairly interesting, fairly boring or very boring
- 2) very happy, fairly happy, fairly sad or very sad
- 3) very easy, fairly easy, fairly hard or very hard
- 4) Do you feel that at the present moment you are very lonely, fairly lonely or not at all lonely (Cronbach's alfa 0.69).

For each variable, the means for individuals were tested by analysis of variance to examine the null hypothesis that the groups (MZA, DZA, MZT, DZT) did not differ. For pairwise analyses, intrapair differences and correlation coefficients were computed. A model with a heritability (h^2) effect (1 for MZ pairs, 0.5 for DZ pairs) and a common environmental effect (1 for pairs reared together, 0 for pairs reared apart) was fitted by weighted least squares analysis to the observed correlation coefficients. The model fit was assessed by a chi-square test.

RESULTS

For extraversion, men had a slightly lower mean score among MZA than among MZT, but in women the reverse was found; however, the mean values among all groups did not differ (Table 1). For neuroticism, men and women had a higher mean score among MZA than among MZT (Table 2). For stress of daily activities, MZT pairs had a slightly higher mean score than other groups (Table 3). MZA pairs had the highest dissatisfaction mean score, but the means between groups did not differ (Table 4).

For extraversion, the intrapair difference was smallest in MZA pairs (1.8), while in MZT pairs the difference was 2.4 (Table 5). The intrapair correlation was higher in MZA (0.38) than in MZT pairs (0.33). The intrapair correlation was highest (0.40) in the subgroup of pairs separated at 0-5 years (18 MZ, 61 DZ) (Table 6). The fit of the model was good ($P = 0.85$) and the heritability estimate was 0.34. The common environment effect was minimal (Table 5).

Table 1 - Extraversion (EPI-E): Mean Scores by Sex and Study Groups

	MZA	DZA	MZT	DZT	F-Test
Men	3.6	4.7	5.0	4.6	F (3,117) = 0.77, P = 0.51
Women	4.7	4.0	3.7	4.2	F (3,151) = 0.52, P = 0.66
Total	4.3	4.3	4.3	4.4	F (3,272) = 0.04, P = 0.99

Table 2 - Neuroticism (EPI-N): Mean Scores by Sex and Study Groups

	MZA	DZA	MZT	DZT	F-Test
Men	5.1	4.1	3.3	4.1	F (3,116) = 1.22, P = 0.30
Women	4.4	4.8	3.9	4.9	F (3,139) = 0.99, P = 0.40
Total	4.6	4.5	3.6	4.6	F (3,259) = 1.72, P = 0.16

Table 3 - Stress of daily Activities (SDA): Mean Scores by Sex and Study Groups

	MZA	DZA	MZT	DZT	F-Test
Men	12.6	12.1	13.7	12.7	F (3,108) = 1.45, P = 0.23
Women	13.2	11.9	13.3	12.7	F (3,133) = 1.30, P = 0.28
Total	12.9	12.0	13.5	12.7	F (3,245) = 2.67, P = 0.048

Table 4 - Life Satisfaction (LS): Mean Scores by Sex and Study Groups

	MZA	DZA	MZT	DZT	F-Test
Men	9.2	8.1	8.1	8.5	F (3,125) = 0.53, P = 0.69
Women	8.7	8.8	8.6	8.2	F (3,164) = 0.67, P = 0.57
Total	8.9	8.6	8.4	8.3	F (3,293) = 0.42, P = 0.74

Table 5 - Extraversion (EPI-E) Intrapair Differences and Correlations

	Mean difference	Correlation	N
MZA	1.8	0.38	30
DZA	2.7	0.12	95
MZT	2.4	0.33	47
DZT	2.5	0.13	135
Weighted	$h^2 = 0.34$		$SE(h^2) = 0.12$
Least	$c^2 = 0.03$		$SE(c^2) = 0.10$
Squares	$\chi^2 = 0.32$		P = 0.85

Table 6 - Intraclass Correlations for Psychological Variables in the Whole Study Group and Subsample Separated at Age 0-5 Years

Age at separation	N cases		E		N		LS		SDA	
	MZ	DZ	MZ	DZ	MZ	DZ	MZ	DZ	MZ	DZ
0 - 5	18	61	0.40	0.17	0.34	0.07	0.22	0.18	0.04	0.00
0 - 10	30	95	0.38	0.12	0.25	0.11	0.40	0.19	0.06	-0.02

Table 7 - Neuroticism (EPI-N): Intrapair Differences and Correlations

	Mean difference	Correlation	N
MZA	2.0	0.25	30
DZA	2.4	0.11	95
MZT	2.2	0.32	47
DZT	2.8	0.10	135
Weighted Least Squares	$h^2 = 0.27$ $c^2 = 0.008$ $\chi^2 = 0.35$		$SE(h^2) = 0.12$ $SE(c^2) = 0.01$ $P = 0.84$

Table 8 - Life Dissatisfaction (LS): Intrapair Differences and Correlations

	Mean difference	Correlation	N
MZA	1.8	0.40	30
DZA	2.4	0.19	95
MZT	1.8	0.46	47
DZT	2.8	0.12	135
Weighted Least Squares	$h^2 = 0.44$ $c^2 = -0.055$ $\chi^2 = 0.82$		$SE(h^2) = 0.11$ $SE(c^2) = 0.10$ $P = 0.66$

Table 9 - Stress of Daily Activities (SDA) Intrapair Differences and Correlations

	Mean difference	Correlation	N
MZA	2.5	0.06	30
DZA	2.9	0.02	95
MZT	1.6	0.47	47
DZT	2.8	0.09	135
Weighted Least Squares	$h^2 = 0.15$ $c^2 = 0.12$ $\chi^2 = 5.53$		$SE(h^2) = 0.12$ $SE(c^2) = 0.11$ $P = 0.06$

For neuroticism, the mean intrapair difference was smallest in MZA pairs (2.0) and slightly greater (2.2) in MZT pairs (Table 7). The intrapair correlation was smaller in MZA (0.25) than in MZT pairs (0.32) (Table 7), but for the subgroup separated at 0-5 years the correlation was highest (0.34) (Table 6). The fit of the model was good ($P = 0.84$), the heritability estimate was 0.27 and the common environmental effect did not differ from 0 (Table 7).

For the life dissatisfaction scale there was no difference between MZA and MZT pairs (Table 8). The intrapair correlation was 0.40 in MZA and 0.46 in MZT pairs. In the subgroup separated at 0-5 years the correlation was only 0.22 (Table 6). The fit of the model was adequate ($P = 0.66$), the heritability estimate was 0.44 and no common environmental effect was found (Table 8).

For the stress of daily activities, the mean difference was smaller in MZT (1.6) than in MZA pairs (2.5). Also the intrapair correlation was higher in MZT (0.47) than in MZA pairs (0.06). The fit of the model was quite weak ($P = 0.06$). The heritability estimate was 0.15 and the common environment effect was 0.12 (Table 9).

DISCUSSION

Examination of personality structure and development in twins reared apart are few. The two studies that had MZ and DZ control groups [8,9] came to the surprising results that twins reared apart were in some traits more alike than twins reared together. Our study supports this findings. However, the differences between the correlations for the entire sample and the subsample separated at 0-5 years are generally small, except for life satisfaction. Shields [9] presented intraclass correlations of extraversion and neuroticism in his study. The correlation of extraversion for MZA twins was 0.61, for controls (twins reared together) 0.42, and for DZ twins -0.17. Neuroticism showed respective correlations: MZA 0.53, MZT 0.38 and DZ 0.11. There was no substantial change in Shields heritability estimates when the data were reanalysed with more sophisticated models by Jinks and Fulker [4]. In our study the heritability estimates were markedly lower. The standard errors of the estimates should be noted, thus the difference between previous results and the present ones may be due to sampling variation. Also, the environmental source of variance may be greater in Finland. Life history and its correlates to personality development and health behavior patterns need to be assessed in future studies.

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