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Hereditary-Environmental Differentiation of General Neurotic, Obsessive, and Impulsive Hysterical Personality Traits

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The inheritance of General Neurotic, Obsessive, and Impulsive Hysterical personality traits has been studied in a sample of 260 female and male adult same-sexed twins. At least one of the twins in each pair had been treated for neurotic or borderline disorders. The results showed that the General neurotic and the obsessive personality factor had a significantly but moderately high hereditary component. The same was also true for more than half of the 17 separate personality scales. No personality scales emerged as highly hereditary. Therefore, each item was analyzed separately, and items classified as either distinctly hereditary or environmental were placed in each of these two groups. The items of the two groups were separately factor-analyzed, and three hereditary and three environmental main factors emerged. The hereditary factors seemed to represent a basic core in the three personality factors of the total questionnaire, whereas the environmental factors could be explained as derivatives of early representation of the basic hereditary core, influenced by familial and cultural patterns.

Key words: Personality factors, Neurosis, Borderline disorders, Heredity, Environment, Family influences, Twins, Factor Analysis

INTRODUCTION

A number of twin studies have demonstrated greater similarity in personality questionnaire scores in monozygotic (MZ) than in dizygotic (DZ) twin pairs [see 10 and 20 for reviews]. This greater similarity in MZ pairs is generally thought to be due to the identical genetic makeup in MZ twin pairs and not to a more similar environment for MZ twin partners than for DZ twins [13, 14]. It is difficult, however, to find scales where MZ twins consistently in different studies score more similar than DZ twins. This may be due to insufficient reliability of the scales, or that all personality traits are in fact products of more or less equal hereditary and environmental influences. The possibility also exists, however, that the scales consist partly of items measuring traits with predominantly hereditary origin, partly of items measuring traits of predominantly environmental causation.

In order to create more "pure" hereditary and environmental scales or factors,

Loehlin [9] grouped items from the Thurstone Temperament Survey (TTS) and the Cattell Junior Personality Quiz (JPQ) into clusters of three to six items with intercorrelations above 0.30, and separated the clusters into a "hereditary" group and an "environmental" group. He performed a factor analysis in each group, and obtained two sets of factors. The environmental and hereditary factors were not much different, but: "factors in the first set (hereditary) seem more focused on the individual himself, the ones in the second set (environmental) on his reaction to his environment" [9:164].

Horn and co-workers [6] criticize Loehlin's study on methodological grounds, especially the clustering of items before the heritability analysis. They maintain that this may be the reason for the similarity between the environmental and the hereditary clusters of items. Their own study employed the California Personality Inventory (CPI). The heritability analysis was performed on item level, and the hereditary and environmental items were separately factor-analyzed. In their own opinion, clearly different hereditary and environmental factors emerged. The hereditary factors that were most easy to interpret were related to sociability and compulsiveness. The environmental factors were more diverse, associated to school, intellectual interests, and philosophy of life. The results of this study, however, depend on the items contained in their personality questionnaire. It might be worthwhile to proceed along the lines proposed by the authors in examining other questionnaires.

The personality questionnaire used in the present study is a modified version of a questionnaire originally constructed by Lazare and co-workers [7]. The questionnaire was constructed to verify the existence of the psychoanalytic typology of oral, obsessive, and hysterical personality. The items of the questionnaire were selected according to description in the psychoanalytic literature. Factor analysis of the answers to the questionnaire in a female patient population revealed three factors more or less similar to the psychoanalytic description of the oral, the obsessive, and the hysterical personality types. This factor structure has been replicated in later studies of female and male, patients and normals, Americans and Norwegians, twins and nontwins [7, 12, 17].

It may be questionable to designate the factors oral, obsessive, and hysterical, since these terms imply a psychoanalytic psychosexual theory concerning the origin of these types, and such a theory is of course not supported by the studies. Besides, only the obsessive personality type was almost completely represented by one of the factors. The factor most similar to the psychoanalytic description of the oral personality type contained, in addition to dependency, pessimism and passivity, also traits such as self-doubt and lack of self-esteem, and may more appropriately be designated as a "General Neurotic" factor. The factor designated "hysterical" personality type did not only contain classical hysterical traits such as emotionality, exhibitionism, egocentricity, and sexual provocativeness, but also aggression, oral aggression, and obstinacy. Perhaps a better name for the factor is "Impulsive Hysterical," to separate it from the description of the so-called "Quiet Hysteric" [1].

The modified questionnaire used in the present study is improved psychometrically. Also, negative items are included, whereas items that may be difficult to understand are omitted. The internal consistency of the scales has also been improved, new scales have been constructed, and the questionnaire has been somewhat shortened. Thirteen items are included from Foulds's Obsessoid-Hysteroid questionnaire [5] and eight from Eysenck's MPI [4]. Only 36% of the items in the revised questionnaire were also represented in the same form in the original questionnaire, but still the main structure of the questionnaire is the same.

In a previous study of the original scale [17] the General Neurotic factor in the male group and the Impulsive Hysterical factor in the female group seemed to have an inherited component. The aim of this study is to investigate the inheritance of the factors of the revised questionnaire in a psychiatric patient population. Are some scales measuring clearly hereditary traits? Are others measuring clearly environmental traits? If not, is it possible to separate the questionnaire into factors measuring distinctly hereditary and environmental personality dimensions by the method proposed by Horn and co-workers [6]?

SAMPLE AND PROCEDURE

This study is part of a larger investigation of same-sexed twins born 1910–1955 who have been treated for neurotic or borderline disorders in Norwegian mental hospitals and in outpatient clinics. The sampling is described elsewhere [18]. In less than 9% of the twin pairs, one or both twins refused to participate in the investigation. Of 299 pairs interviewed, 260 (87%) returned the personality questionnaire. The age ranged from 18 to 66 with a mean of 44 years; 179 were females and 81 males.

The zygosity of the twin pairs was determined by means of blood and serum typing and a questionnaire concerning similarities in appearance in childhood [16]. Of the twin pairs, 105 seemed to be MZ and 155 DZ.

The psychiatric diagnosis of the twins was determined by independent evaluation of semistructured interviews and psychiatric hospital records by two psychiatrists and one clinical psychologist (the author) [18]. The probands were classified as follows: 184 as neurotics, 47 as borderline states, 10 as psychotics, 2 as psychopaths, 2 as alch psychotics, 2 as psychopaths, 2 as alcoholics, and 15 as normals. Of the co-twins, 88 were diagnosed as neurotics, 2 as borderline states, 5 as psychotics, 8 as alcoholics, and 157 as normals. (Where both twins were index twins, the twin with the most serious disorder is designated as proband.)

The questionnaire was given to the twins during the interview with the instructions to fill it out at home, without discussing the answers with anybody. The questionnaire contains 136 items, 8 items in each of 17 scales randomly distributed, to which the subjects had to answer “Right” or “Wrong.” A positive answer was given the score 3, a negative answer the score 1, and no answer the score 2. Very few subjects gave no answer to any of the items.

STATISTICAL ANALYSIS

All statistical analyses were carried out by using the EDB statistical package SPSS [11]. The within-pair variances War_w was calculated from the formula:

$$\frac{\sum (A-B)^2}{2N} \quad \text{with } N \text{ degrees of freedom}$$

and the among-pair variance War_A from the formula:

$$\frac{1}{N-1} \left[\frac{\sum (A+B)^2}{2} - \frac{(\sum (A+B))^2}{2N} \right] \quad \text{with } N-1 \text{ degrees of freedom}$$

where A is the score of the proband, B the score of the co-twin, and N the number of pairs. The intra-class correlation was calculated from the formula:

$$\frac{War_A - War_w}{War_A + War_B}$$

The F ratios are calculated in the usual manner. In accordance with the suggestions by Christian and co-workers [2] the F ratio of the total variances ($War_w + War_A$) is calculated. If the probability of difference

between the total variances of MZ and DZ is greater than 0.20 (0.10 in traditional statistical tables because the test is two-tailed, and with the approximate degree of freedom calculated after Cochran [3], the F ratio of a special genetic estimate, the genetic component estimate, is preferable. The F ratio of this estimate is calculated by the formula:

$$\frac{\text{War}_{\text{AMZ}} + \text{War}_{\text{WDZ}}}{\text{War}_{\text{ADZ}} + \text{War}_{\text{WMZ}}} \quad \text{with the approximate degrees of freedom calculated after Cochran [3].}$$

As the estimate is somewhat conservative, it is probably too low if the total variances are the same in the twin groups.

In order to separate more environmental and more hereditary items, rules not very different from those by Horn and co-workers [6] were developed. If the intraclass correlations were less than -0.10 in the MZ or the DZ twin pairs, the items were excluded. If the difference between the intraclass correlations were above or equal to 0.20, the items were classified as more hereditary. (The study of Horn and co-workers used correlations of 0.10 and above, but they separated the twin population in two and the criterion had to be fulfilled in both samples.) The remaining items were classified as more environmental if the intraclass correlations were 0.10 or above in both the MZ and DZ twin populations. The others were excluded.

RESULTS

The Cronbachs Alpha was calculated in order to test the internal consistency of the personality scales. Two of the scales, namely Imagination and Severe Superego, showed a Chronbach Alpha of 0.41 and 0.42. For the rest, the Cronbach Alpha ranged from 0.64 to 0.83 with the majority around 0.75. As the scales only contain eight items each, the internal consistency must be considered acceptable.

TABLE 1. Varimax Rotated Factor Matrix of the Personality Questionnaire

Personality trait	Loading		
	I General Neurotic	II Impulsive Hysteric	III Obsessive
1. Self-doubt	0.79	-0.03	-0.01
2. Insecurity	0.79	0.05	-0.01
3. Sensitivity	0.68	0.10	0.19
4. Dependence	0.77	0.01	0.03
5. Compliance	0.59	-0.28	-0.10
6. Emotional instability	0.63	0.42	-0.21
7. Rigidity	-0.02	-0.37	0.52
8. Severe superego	0.20	-0.04	0.59
9. Parsimony	-0.15	-0.13	0.57
10. Indecision	0.10	-0.47	0.43
11. Orderliness	-0.04	-0.03	0.60
12. Exhibitionism	-0.06	0.57	-0.24
13. Imagination	-0.02	0.42	-0.44
14. Sociability	-0.49	0.53	-0.14
15. Aggression	0.26	0.51	-0.03
16. Oral aggression	-0.45	0.62	-0.18
17. Emotional expressiveness	0.39	0.51	-0.01

The scales were factor-analyzed by means of principal component analysis and rotated to Varimax solution. Three factors had an Eigen value above 1.0. Oblique rotation (oblimin) gave very similar results. The factor structure is much the same if the sample is divided in a group of probands and affected co-twins and a group of well co-twins. The factors are similar to factors in earlier studies [7, 8, 12, 17], even if the revised questionnaire is somewhat different from the questionnaire used in earlier studies.

The factor scores of the three factors designated "General Neurotic," "Obsessive," and "Impulsive Hysterical" have been calculated. Table 2 presents the variances and Table 3 the intraclass correlations and the F ratios of the variances and the genetic component estimates.

The intraclass correlations of MZ twin pairs are high for the General Neurotic and the Obsessive factors, somewhat lower for the Impulsive Hysterical factor. The intraclass correlations of the DZ twin pairs are low for all the factors, and in fact negative for the General Neurotic factor. The difference between the intraclass correlations of the MZ twin pairs and the DZ twin pairs are statistically significant when the correlations are z-transformed for the General Neurotic and the Obsessive factor, but not for the Impulsive Hysterical factor. Correspondingly, the F ratios of the within-pair variances in MZ and DZ twin pairs are statistically significant for the General Neurotic and the Obsessive factor, but not for the Impulsive Hysterical factor. The F ratios of the genetic component estimate are also significant for the General Neurotic and the Obsessive factor, although somewhat lower. But as the total variances are very similar in MZ and DZ twin pairs, the F ratios of the within-pair variances give the best test of the difference between MZ and DZ twin pairs [2].

TABLE 2. The Twin Variances of the Questionnaire Factors

Personality factors	Variances					
	Among twins		Within twins		Total	
	War _A		War _W			
	MZ	DZ	MZ	DZ	MZ	DZ
General Neurotic	1.372	0.828	0.501	0.955	1.873	1.783
Impulsive Hysterical	0.995	0.963	0.572	0.662	1.567	1.625
Obsessive	1.035	0.864	0.338	0.559	1.373	1.423

TABLE 3. The Intraclass Correlations and the F Ratios of the Twin Variances of the Questionnaire Factors

Personality factors	Intraclass correlations		Within-pair variances	F ratios of genetic component estimates	Total variances
	MZ	DZ			
General Neurotic	0.47*	-0.07	1.91*	1.75*	1.05
Impulsive Hysterical	0.27	0.19	1.16	1.08	1.04
Obsessive	0.51*	0.21	1.65*	1.33*	1.04

*P < 0.05, for the difference between the correlations of MZ and DZ.

Table 4 presents the among-pair variances, within-pair variances, and the total variances of the different scales in MZ and DZ twin pairs. Table 5 presents the intraclass correlations and the total variances.

The intraclass correlations in MZ twin pairs range from 0.17 to 0.45 with a mean of 0.32. The intraclass correlations in DZ twin pairs are very low, ranging from 0.11 to 0.22, with a mean of 0.07. The difference between the intraclass correlations in MZ and DZ twin pairs are statistically significant for 11 of the 17 personality scales. Also the F ratios of the within-pair variances and genetic component estimates are similar for a number of personality scales. As the genetic component estimate gives a more conservative estimate of the genetic loading, these F ratios are somewhat lower. But because the degree of freedom is higher, the low F ratios of the among-component estimates are still more often statistically significant than the F ratios of the within-pair variances. When the total variances are different (Christian and co-workers propose a probability of equality of the total variances of 0.20 or less), the genetic component is a better estimate than the difference between the intrapair variances. Accordingly, F ratios of the within-pair variances are put in parentheses when the total variances in MZ and DZ twin pairs are different according to these criteria.

More hereditary and more environmental items were selected according to the rules described in the section about statistical analysis. Forty-one more hereditary items and 38 more environmental items of the total 136 appeared. The more hereditary and more environmental items were separately factor-analyzed by means of principal component analysis and rotated to Varimax solution.

The factor analysis of the more hereditary items gave ten factors with an Eigenvalue above 1.0, but with a low percentage of variance accounted for by each of them. There was, however, a breaking point after three factors, and the factors were again

TABLE 4. *The Twin Variances of the Questionnaire Scales*

Personality traits	Variances among twins Var_A		Variances within twins Var_W		Total variances	
	MZ	DZ	MZ	DZ	MZ	DZ
Self-doubt	34.392	24.146	14.133	25.558	48.558	49.704
Insecurity	28.832	23.728	12.290	21.245	41.122	44.973
Sensitivity	26.107	21.410	12.714	20.129	38.821	41.539
Dependence	26.549	13.006	10.319	16.258	36.868	29.264
Compliance	19.922	15.834	14.038	16.694	33.950	32.528
Emotional instability	23.723	19.107	15.990	19.832	39.713	38.939
Rigidity	17.121	17.266	7.400	11.381	24.521	18.781
Severe superego	11.376	11.273	6.467	7.203	17.843	18.476
Parsimony	20.080	22.471	13.229	19.232	33.309	41.703
Indecision	18.728	17.425	11.448	15.400	30.176	32.825
Orderliness	24.565	14.743	9.395	12.190	33.960	26.933
Exhibitionism	18.527	15.100	8.252	10.713	26.779	25.813
Imagination	16.013	9.950	6.457	9.571	22.470	19.521
Sociability	41.262	32.782	16.662	21.790	57.924	54.572
Aggression	26.533	17.987	18.214	19.152	44.747	37.139
Oral aggression	25.103	29.470	13.338	19.665	38.441	49.135
Emotional expressiveness	19.538	18.180	13.167	15.248	32.705	33.428

TABLE 5. The Intraclass Correlations and F Ratios of the Twin Variances

Personality traits	Intraclass correlations		F-ratio of		
	MZ	DZ	Within-pair variances	Component estimates	Total variances
Self-doubt	0.42*	-0.03	1.81*	1.57*	1.02
Insecurity	0.40*	0.06	1.73*	1.39*	1.09
Sensitivity	0.34*	0.03	1.58*	1.35*	1.07
Dependence	0.44*	-0.11	(1.58)*	1.84*	1.26 ⁺
Compliance	0.17	-0.03	1.19	1.23	1.04
Emotional instability	0.19*	-0.02	1.24	1.24*	1.02
Rigidity	0.40*	0.21	1.54*	1.16	1.17
Severe superego	0.28	0.22	1.11	1.05	1.04
Parsimony	0.21	0.08	(1.45)*	1.10	1.25 ⁻
Indecision	0.24	0.06	1.35	1.18	1.09
Orderliness	0.45*	0.09	(1.30)	1.52*	1.26 ⁺
Exhibitionism	0.38*	0.17	1.30	1.25*	1.04
Imagination	0.43*	0.02	1.48*	1.56*	1.15
Sociability	0.42*	0.22	1.31	1.28*	1.06
Aggression	0.19*	-0.03	(1.05)	1.26*	1.20 ⁺
Oral aggression	0.31	0.20	(1.47)*	1.05	1.28 ⁻
Emotional expressiveness	0.19	0.09	1.16	1.11	1.02

*P < 0.05.
⁺P < 0.20, two-tailed test, MZ higher.
⁻P < 0.20, two-tailed test, DZ higher.

rotated with the limit of three factors. Table 6 presents the first factor, Table 7 the second, and Table 8 the third. The scale number is shown to the left and the loading to the right of the item.

Only items with a loading of 0.30 or higher are presented in the tables. Thirty-six more hereditary items are represented in any of the factors with a loading above 0.30.

The first factor consists of items from different scales with a high loading of the so-called General Neurotic factor and in addition three items from the Obsessive scales, Severe Superego and Indecision. The factor is a Neurotic factor and may be called "Lack of Self-Esteem."

The second factor consists of items from scales with a loading of the Obsessive factor, in addition to items from the scale Emotional Instability and one item with a low loading from Self-Doubt with opposite signs. The factor may be called "Rigid Phlegm."

The third factor consists of items from scales with a loading of the Impulsive Hysterical factor, especially the scale Exhibitionism. In many ways it describes the common stereotype of the "Histrionic Hysteria."

The more environmental items gave 11 Varimax rotated factors with an Eigen value above 1.0. Also, each of these factors accounted for a low percentage of variance and there was a breaking point after three factors. The items were again rotated with three factors as a limit. Thirty-one of the 38 items had a loading above 0.30 in one of the three factors.

Table 9 presents the first factor, Table 10 the second, and Table 11 the third.

The first factor consisted mostly of negative answers to items from Sociability. In addition there were two items from the scale Oral Aggression with opposite signs, two

TABLE 6. *The First More Hereditary Factor: Lack of Self-Esteem*

2	I am easily discouraged when things go wrong.	0.63
1	My lack of self-confidence is sometimes a bother for me.	0.61
4	I feel insecure when I must act on my own.	0.58
5	Sometimes I feel that I have no mind of my own.	0.55
3	I'm very touchy about criticism.	0.53
1	Sometimes I think that everybody else does things much better than I do.	0.50
1	Luckily I don't lack faith in myself.	-0.49
16	In situations where I ought to speak up, I sometimes can't get a word out.	0.48
16	When I'm with people who are discussing something, I usually sit quietly and just listen.	0.48
4	I feel lost and helpless when I am left by someone I love.	0.47
2	I often get very worked up even over small things.	0.47
8	The strong sense of responsibility I feel about my duties can sometimes become too much, so that it is a strain on me.	0.46
2	I usually feel self-confident even in new and unfamiliar situations.	-0.42
8	I carry a strict conscience with me wherever I go.	0.37
2	I usually feel at ease and calm, even when I am with people of a higher social position than I.	-0.37
5	I probably would have done better in life if I'd been a bit more stubborn.	0.36
10	I am slow to decide upon a course of action.	0.35
16	I am poor at quick retorts and snap judgments.	0.34

from Insecurity, and one from the scale Sensitivity. The factor pictures a "Neurotic Introversion."

The second factor consists solely of items from scales with a high loading of the Obsessive factor, above all others Parsimony, but also Rigidity and Orderliness. The factor may be named "Perfectionistic Orderliness."

The third environmental factor consists of items from scales with a high loading of the Impulsive Hysterical factor and also items with negative signs from scales with a high

TABLE 7. *The Second More Hereditary Factor: Rigid Phlegm*

13	I can definitely be characterized as thorough.	0.60
11	Everything I do must be precise and accurate.	0.52
10	I often wait until I have studied all sides of an issue before I make a decision.	0.47
7	I like to arrange my life so that it runs smoothly and without conflict.	0.47
6	My emotional life is really quite balanced and stable.	0.42
13	I have both feet on the ground and stick to facts, rather than get lost in all kinds of breezy daydreams.	0.37
7	I am moderate in my tastes and sentiments.	0.37
6	I am calm and placid most of the time.	0.35
1	Luckily, I don't lack faith in myself.	0.33
11	I am easily bored with people who have to be neat and orderly about everything.	-0.31
11	I am somewhat messy.	-0.30

TABLE 8. *The Third More Hereditary Factor: Histrionic Hysteria*

12	I like to be noticed.	0.58
12	I feel pleasantly exhilarated when all eyes are upon me.	0.52
12	Sometimes when I am in a crowd, I say humorous things I expect strangers will overhear.	0.49
12	I often exaggerate my part in an event in order to make myself appear in a more interesting light.	0.45
14	Many people consider me a lively person.	0.43
13	I have a good imagination.	0.41
13	I find it hard to think up stories.	-0.35
5	I do not usually back down from my opinions even when others argue with me.	0.34

loading of the Obsessive factor. The factor may be named "Aggressive Impulsiveness."

The items with a loading above 0.30 of a factor were summed up for all the six factors. If an item was loaded with more than one factor, the item was ascribed to the factor of the highest loading. Thus six scales emerged. The new scales were correlated with the original three factors, the General Neurotic, the Obsessive, and the Impulsive Hysterical.

TABLE 9. *The First More Environmental Factor: Neurotic Introversion*

14	I usually keep quiet when I'm with other people.	0.76
14	I usually keep in the background when I'm with other people.	0.68
14	It is difficult for me to "let myself go" even at a lively party.	0.66
14	I am usually quite retiring and reserved, except with close friends	0.65
14	I can easily get life into a very dull party.	-0.52
16	I am fond of arguing.	-0.47
16	I try to avoid getting into arguments.	0.41
14	I like to go out and mix with lots of people.	-0.41
2	When suddenly confronted by a crisis, I can become inhibited and do nothing.	0.39
2	I can get completely confused when the unexpected happens.	0.38
3	If I hear about something sad or unpleasant, it can make such an impression on me that I'm upset about it for a long time afterwards.	0.34
16	I don't hold my tongue, if someone makes a passing remark to me, I can make a quick retort.	-0.34

Table 12 presents the results. It shows that the more hereditary scale Lack of Self-Esteem is highly correlated to the General Neurotic factor, the more hereditary scale Rigid Phlegm is highly correlated to the Obsessive factor, and the more hereditary scale Histrionic Hysteria is highly correlated to the Impulsive Hysterical factor. The more hereditary scales are thus closely related to each of the original factors in the total questionnaire. However, the more environmental scale Neurotic Introversion is highly positively correlated to the General Neurotic factor, and at the same time highly negatively correlated to the Impulsive Hysterical factor. The more environmental scale Aggressive Impulsiveness is highly positively correlated to the Impulsive Hysterical factor and negatively related to the Obsessive factor. Only the more environmental scale Perfectionistic Orderliness is solely correlated to one factor only, the Obsessive factor. Each of the three more hereditary scales seems thus to be closely related to each of the three factors of the total questionnaire, and two of the more environmental scales seem to be a combination of two factors.

The correlation matrix may also be interpreted as showing that the General Neurotic factor contains one more hereditary and one more environmental scale, and the Obsessive and the Impulsive Hysterical factors contain one more hereditary and two more environmental scales.

TABLE 10. *The Second More Environmental Factor: Perfectionistic Orderliness*

9	I pride myself in my thriftiness.	0.52
9	I keep a careful record of money that I spend.	0.50
7	I find that a well-ordered mode of life with regular hours and an established routine is most suited to my temperament.	0.47
9	I believe in "saving for a rainy day."	0.46
10	I do most things slowly and deliberately.	0.45
7	I am usually consistent in my behavior, go about my work in the same way, frequent the same preferred places, follow the same routes, etc.	0.43
9	I do not like to waste money.	0.42
8	I am guided in my conduct by certain principles which I have accepted.	0.40
11	Other people are sometimes irritated by my neatness and orderliness.	0.38
11	Some people say that I have a mania for neatness.	0.37

TABLE 11. *The Third More Environmental Factor: Aggressive Impulsiveness*

10	Some people would consider me a daredevil; I like to take chances and let come what may.	0.44
17	I have intense likes and dislikes.	0.41
13	I can lead more than one life in my imagination.	0.40
16	I find myself frequently disagreeing with and contradicting people.	0.39
10	I often act on the spur of the moment.	0.35
15	I often let myself go when I am angry.	0.35
8	Some people would probably consider me a bit irresponsible.	0.32
12	I like to have people watch me do things I do well.	0.32
16	I don't hold my tongue; if someone makes a passing remark to me, I can make a quick retort.	0.32
1	I like variety in my life.	0.30

TABLE 12. The Correlations Between the More Hereditary and the More Environmental Scales and the Factors of the Total Questionnaire

Factors	General Neurotic	Factors Impulsive Hysteric	Obsessive
Hereditary Scales			
Lack of Self-Esteem	0.89	-0.18	0.15
Rigid Phlegm	-0.30	-0.33	0.70
Histrionic Hysteria	-0.13	0.65	-0.24
Environmental Scales			
Neurotic Introversion	0.69	-0.56	0.20
Perfectionistic Orderliness	0.01	-0.18	0.84
Aggressive Impulsiveness	0.22	0.65	-0.40

TABLE 13. The Correlations Between the More Environmental and the More Hereditary Scales

More environmental scales	More hereditary scales		
	Lack of Self-Esteem	Rigid Phlegm	Histrionic Hysteria
Neurotic Introversion	0.69	0.03	-0.45
Perfectionistic Orderliness	0.14	0.64	-0.11
Aggressive Impulsiveness	0.08	-0.34	0.55

Table 13 presents the correlations between the more hereditary and the more environmental scales. It shows that the more environmental scale Neurotic Introversion is strongly related to the more hereditary scale Lack of Self-Esteem, and also negatively related to the more hereditary scale Histrionic Hysteria. The more environmental scale Perfectionistic Orderliness is strongly related to the more hereditary scale Rigid Phlegm, whereas the more environmental scale Aggressive Impulsiveness is positively related to the more hereditary scale Histrionic Hysteria and somewhat lower negatively related to the more hereditary scale Rigid Phlegm.

DISCUSSION

The findings show that MZ twins are clearly more equal than DZ twins for two of the three factors in the questionnaire, the so-called General Neurotic and the Obsessive factors. The same is true for half of the personality traits. As noted in the introduction, this greater similarity in MZ twin pairs can best be explained as due to the genetic identity of MZ twins and not to a more similar childhood environment. MZ twins brought up apart are just as similar as MZ twins brought up together [15], MZ twins with more similar childhood experiences are not more similar in personality than MZ twins with more dif-

ferent childhood experiences [17, 19], MZ who are similar in appearance are not more similar in personality [13], and, mothers' hypotheses with regard to zygosity are of no importance for treatment and similarity in personality [14].

The low intraclass correlations in DZ twin pairs pose a special problem, which is common to many studies [10]. According to a genetic model, the correlations in DZ twin pairs should be half that of the MZ correlations. An environmental hypothesis would predict that the correlations in DZ twin pairs were more than half of the correlations in MZ twin pairs. Horn and co-workers [6] explain these results by contrast effects and epistasis. DZ twins may rate themselves as more dissimilar than they are in reality, and some genes may prevent other genes from expressing themselves in behavior. Other explanations include assortative mating and low reliability of the scales.

How do the more hereditary and the more environmental factors in this study compare with Horn and co-workers' more hereditary and more environmental factors from CPI? The first more hereditary factor Lack of Self-Esteem has some similarity to Horn and co-workers' first more hereditary factor Conversational Poise. The second more hereditary factor Rigid Phlegm is clearly similar to Horn and co-workers' second more hereditary factor Compulsiveness. The third more hereditary factor Histrionic Hysteria resembles Horn and co-workers' sixth more environmental factor Exhibitionism, and to some degree their fifth more hereditary factor Social Ease.

The first more environmental factor Neurotic Introversion resembles Horn and co-workers' first more hereditary factor Conversational Poise, their fifth more hereditary factor Social Ease, as well as their sixth more environmental factor Exhibitionism. The second more environmental factor Perfectionistic Orderliness corresponds to their second more hereditary factor Compulsiveness. Any parallel to the third more environmental factor Aggressive Impulsiveness is not easy to find among the factors indicated by Horn and co-workers. Perhaps some resemblance can be found between our factor and their fourth more hereditary factor Openness to Common Human Faults and their second more environmental factor Impulse Control.

In the main, there seems to be a distinct similarity between our more hereditary factors and the more hereditary factors described by Horn and co-workers. However, there is also some likeness between our more environmental factors and the more hereditary factors of Horn and co-workers. The reason could be that while items with a correlation difference between MZ and DZ twins from 0.10 to 0.20 are regarded as more hereditary by Horn and co-workers, some of these items are considered more environmental in the present study. (They are omitted if the correlations are lower than -0.10 either in MZ or DZ pairs.) However, even if these items are excluded, our more environmental factors would be much the same. It is important to note that even if our factors are similar to those of Horn and co-workers, they are not identical. One cannot expect to find the same results when the questionnaire and the sample are different. Anyway, it makes sense that the so-called more environmental factors in the present study, characterized by modesty and inhibition of aggression, parsimony and orderliness, aggressive impulsiveness and the foolhardy adventure-seeking, are determined by upbringing, family pattern, and cultural style. The more hereditary factors, however, seem to be of a more basic nature, constituting the core of the neurotic, the obsessive, and the impulsive hysteric personality structure. It might appear that the more environmental factors have evolved from the early representation of the more hereditary factors. Neurotic Introversion might be thought to have generated from Lack of Self-Esteem and the opposite of Histrionic Hysteria, whereas Perfectionistic Orderliness might have developed from the germs of Rigid Phlegm, and

Aggressive Impulsiveness out of the early representation of Histrionic Hysteria and the opposite of Rigid Phlegm.

These are of course speculations. The high correlations between our so-called hereditary and environmental factors display the difficulties in separating hereditary and environmental aspects of personality structure, perhaps supporting Loehlin's [9] doubts about the possibility of making such a separation.

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