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Are Differences between Twins a Result of Mutual Rivalry?

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Abstract. The sexual index included in the Szondi test makes it possible to define the domains of an individual's "internal sex" or gender – especially the degree of the subject's bisexuality. This index was employed in a comparison between partners reared together in 62 monozygotic and 23 dizygotic pairs of twins. The observed incongruence in 1/3 MZ pairs would not appear to derive totally from errors of measurement. In most of these pairs it is competition which underlies the incongruence seen on the sexual index. It was further observed that the congruence here as in general in female pairs is clearly more marked than in males. A hypothesis was proposed, whereby competition for dominance is a distinctively major-tonality (masculinity) characteristic. The incongruence is more conspicuous among males because males are in general more markedly major-toned than females. This hypothesis was borne out. It is thus necessary here as in general to adopt two sex variables in parallel: external (i.e. matricular) sex and internal sex (gender). It is due to the presence of these competitive pairs that the means and especially deviations of twins' test results will consistently diverge from those in the population at large.

Key words: Twins, Competition, Sex, Gender, Extraversion

INTRODUCTION

All twin siblings differ from each other. This is true whether the pairs are mono- or dizygotic. The present study focuses particularly on differences between partners in respect of masculinity-femininity – that is, degree of bisexuality. Central to the approach here are the major-minor tonality concepts evolved by Leopold Szondi. The terms refer, respectively, to *hard and cold* as against *soft* and *warm* qualities of personality, which can be determined by means of the Szondi test. This is a projective test in which the choice of pictures of deviant persons is decisive to its function. The degree of major and minor tonality peculiar to a given individual is expressed in percentual

terms on a sexual index. The terms masculinity and femininity tend in Szondi's view to imply rather the matricular sex and somatic aspects; hence his preference for the tonality concepts. In thus displacing the conventional terms he also stresses as focus of attention the personality as an entity as against sexual definition in the narrower sense [37]. – The work of Deri [12] may still be recommended as an introduction to the principles underlying Szondi's test.

The matricular sex is dichotomous; it defines any given individual as man or woman. The major-minor aspect of personality, which Szondi envisages and describes by means of his sexual index, closely resembles the concept of gender. As defined by Freimuth & Hornstein [20], gender is multi-dimensional, involving the following bipolar aspects: 1) Gender-related hormones; 2) Gender-related physical characteristics; 3) Gender role; 4) Gender-preference; 5) Subjective gender identity. The present author has proposed the formulation *internal sex = gender* [2] in distinction from external, dichotomously classifiable sex.

There has been, it is true, controversy as to the reliability and validity of the Szondi test. However, since this test is capable of eliciting correlations of the same level between twins as other personality tests, this is surely a manifestation of sufficient validity [3, 4, 6]. Here monozygosity is one kind of criterion of validity.

1. In the initial phase of the present study, comparison was made in terms of the sexual index between partners in monozygotic (MZ) and dizygotic (DZ) twin pairs [3]. Among the MZ pairs approximately 2/3 were found to be congruent (41 MZ: Q = + .70, r = .40). Among the DZ pairs 1/4 were congruent (23 DZ: Q = + .25). Among nonsiblings of the same age studied as a control material, congruence was close to zero. The incongruence in 1/3 of the MZ pairs would not appear to be ascribable to errors of measurement in the test itself – at least not exclusively. Some of these pairs seemed to show a division of labour in respect of leadership or dominance. The evidence suggests that in most cases this division of labour was responsible for the incongruence emerging on the sexual index; in any case the two phenomena coincide.

2. In the second phase of the study the division-of-labour hypothesis was tested. A new twin material was seen to confirm the conception; 21 MZ pairs – the partners having been reared together as in the first case. Here criteria external to the Szondi test were also applied, namely items measuring dominance in the Cattell and CMPS questionnaires [4, 26]. Apart from confirming the presence of an element of dominance, the test underlined another observation made in the earlier material; the congruence in female pairs of twins was clearly more conspicuous than that in male pairs. This striking phenomenon is seen repeatedly in investigations of twin materials. The present writer has proposed [4] the hypothesis that sibling competition might offer a solution to the riddle.

3. The subsequent, third phase of the investigation was designed to test the rivalry hypothesis.

Leinonen's observations [26] on the material collected in collaboration with the author may be summarized as follows.

Table 1 - Correlations in tests on 21 MZ pairs of twins

Variable	All 21 pr r		Female 13 pr r		Male 8 pr r
Sex index	.04		*.49* [1]	>	*–.83* [1]
Soc index	.35		.20	<	.51
BSRI	.55 [2]		*.94* [3]	>	*–.32*
C+CMPS	.84 [3]		*.94* [3]	>	*.51*
NESI N	.66 [2]		*.75* [2]	>	*.04*
NESI E	.49 [1]		*.54*	>	*.43*
NESI S	.39		*.48*	>	*.30*
NESI I	.62 [2]		*.68* [1]	>	*.56* [1]
NESI L	.44 [1]		.48	<	.57 [1]

Confidence levels: [1] $p \leq 5\%$; [2] $p \leq 1\%$; [3] $p \leq 0.1\%$ (one-tailed).

Notes: Sexual index = Szondi major-minor test reactions in percent [37]. Scores are presented as percentages (in minor terms; thus a subject's major % = 100 – minor % [2-4].
Social index = social-positive and social-negative test reactions in percentual proportion [37].
BSRI = Bem Sex Role Inventory [1].
C+CMPS = a combination of scales (a total of 9) measuring the dimension dominance-submissiveness in the Cattell and CMPS questionnaires [4, 9, 10].
NESI = the Finnish version of Eysenck's Personality Inventory [32]. The inventory comprises the following scales: NESI N = Neuroticism (24 items, thus maximum score 24 points), NESI E = Extraversion (42 items), divided into NESI S = Sociability (21 items) and Impulsiveness (21 items); and NESI L = so-called lie scale (10 items).

As can be seen from Table 1, the correlations among females are, with a few exceptions, higher than those among males. This finding is particularly significant because the results of the earlier material [3] showed precisely the same trend:

	All 21 MZ pr		Females 13 pr		Males 11 pr
Sexual index	r = + .40***	<	*+ .48****	>	*+ .17*

It would thus appear that the congruence observed in the whole material derives primarily from the female pairs. What is involved is not a phenomenon brought out by the Szondi test alone; other tests have indicated its presence.

The problem

In most twin studies the constant difference observed between the sexes in test results is simply passed over. There are nevertheless some reports which try to find an explanation to the competition between partners. The most noteworthy is the model proposed by

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Carey [7], which seeks out explanation from the imitation/contrast dynamic of siblings in general, where twins, and particularly identical twins are located towards the most intensive pole of the continuum. It is regrettable that Carey's model takes no account of the sex variable. Another approach which suggests the possible explaining role of competition is the empirical study of MacKinnon et al. [28], where the sex variable is taken into account [see also 22, 11, 39]. It should be noted that Eysenck's schools appear to play down the meaning of competition as an explaining factor [14, 15].

Why is the congruence in male pairs of twins on Szondi's sexual index and in results of certain other tests clearly less marked than that among female twins?

Hypothesis

The lower degree of congruence in male as opposed to female pairs of twins primarily derives from the fact that role competition between partners, particularly in the sphere of dominance – which our studies have shown to lower congruence – is a masculine or major-tonality trait. Thus the more major-disposed partner there is in a pair reared together, the greater will be the likelihood of differences within the pair on the sexual and presumably also on the social index. Since men are in general more prone than women to evince major tonality, competition for dominance will make for lower congruence in male pairs of twins. The same will apply to female pairs of predominantly major-tonality disposition. Since there is a similarly oriented difference between female and male pairs in other tests (Table 1), we may assume that the same factors are involved.

MATERIALS AND METHODS

For the purposes of this study the twin materials were combined, i.e. 41 MZ pairs, mean age 26.3 years; range 13-69 years; and 21 MZ pairs, mean age 40.9 years; range 35-55 years, giving a total of 62 MZ pairs of twins. In addition, 23 DZ pairs of twins of the same sex were available for comparison; mean age 29.7 years; range 16-63 years [3].

In the first material the MZ/DZ definitions were established by Professor Lehtovaara, the Finnish pioneer in twin studies, and his students [3]. The second (21 MZ), is a sample from the Finnish twin registry [24].

These pairs were subjected to the Szondi test 6 times (in 21 DZ 5 times). According to the present author's findings, 5-6 sessions would seem to be sufficient to determine the sexual and social index.

The measures of congruence/incongruence employed were the correlations between partners in sexual and social index scores and the means and standard deviations calculated from the eigen-values for within-pair differences.

In order to test the hypothesis, the pairs were placed in order starting from the pair which contained the most conspicuously major-disposed partner and ending with the pair containing the least markedly major-disposed, i.e. the most markedly minor-disposed partner. This order was cut at mid-point, giving 31 MZ pairs at the major end of the continuum and 31 at the minor end. The congruence of major and minor sections was assessed, first both sexes together, then separately. This procedure was repeated with the DZ material.

RESULTS

In order to allow a comparison, figures from the author's previous study [2] have been included at the bottom of Tables 2 and 3.

Particular attention should be given to the greater deviations in the MZ distributions shown in the present study compared to the 1988 results, especially if we consider the MZ means on the sexual index; these would appear to be more « androgynous » (falling around 50%) than in the 1988 study (Table 2).

The MZ twin distributions follow fairly closely the pattern of the 1988 material, particularly in the case of females. The deviation in male MZ pairs is considerable (Table 3).

The congruence on the sexual index may again be ascribed (Table 4) to female pairs. With regard to the social indexes, MZ and DZ pairs would appear to behave in opposite manner; in the MZ pairs no congruence is apparent, while in the DZ material it is manifest.

The hypothesis is borne out by the results (Table 5); the differences between partners are greater at the major than at the minor end of the scale in all groups. However, only the results for MZ males and for MZ and DZ in the whole material are statistically significant. It will be observed that the considerably greater incongruence at the major as compared with the minor tonality end of the scale in the MZ material as a whole is clearly a consequence of this difference for the most part among the MZ males (the same may be also true for the DZ cohort). The MZ differences in the t-test were indeed striking; the values set out in the table are one-tailed (in our hypothesis the direction of differences was predetermined), but even in two-tailed tests they prove statistically highly significant.

On the social index the congruence is less marked at the major than at the minor end, and again among the MZ males (Table 6).

Table 2 - Percentage distributions, means and standard deviations on the sexual index

Group	n	1 Minor tonality % 0 – < 20	2 20 – < 40	3 40 – < 60	4 60 – < 80	5 80 – 100	$\bar{x}$ %	s
MZ F & M	124	6.4	25.0	36.3	23.4	8.9	*50.7*	*20.8* [2]
MZ F	86	4.7	30.2	29.1	26.7	9.3	*51.3*	*20.9* [2]
MZ M	38	10.5	13.2	52.6	15.8	7.9	*49.4*	*20.5* [1]
DZ F & M	46	13.0	19.6	37.0	17.4	13.0	50.7	*23.0*
DZ F	22	18.2	9.1	40.9	4.5	27.3	54.7	*27.9*
DZ M	24	8.3	29.2	33.3	29.2	0.0	45.6	16.7
Borg 1988, 93-94								
F	210	0.5	10.0	35.7	40.5	13.3	60.8	16.6
M	182	2.2	17.6	39.6	29.1	11.5	55.9	17.5

Confidence levels: $(S_1^2 / S_2^2, f)$; [1] $p \leq 5\%$; [2] $p \leq 1\%$.

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Table 3 - Percentage distributions, means and standard deviations on the social index[a]

Group	n	1	2	3	4	5	$\bar{x}$	s
		Social index, + %					%	
		0 – < 20	20 – < 40	40 – < 50	50 – < 75	75 – 100		
		below normal		normal	above normal			
MZ F & M	124	8.1	30.6	23.4	33.9	4.0	43.1	16.2
MZ F	86	4.7	30.2	25.6	36.0	3.5	44.2	14.6
MZ M	38	15.8	26.3	23.7	28.9	5.3	40.7	*19.0* [1]
DZ F & M	46	2.2	52.1	10.9	34.8	0.0	42.1	15.7
DZ F	22	0.0	59.1	13.6	27.3	0.0	39.8	15.3
DZ M	24	4.2	45.8	8.3	41.7	0.0	44.3	15.9
Borg 1988								
F	210	3.3	32.9	24.3	35.2	4.3	45.7	15.3
M	182	2.2	37.4	26.9	32.9	0.6	43.5	12.7

Confidence level: (f), 1 p ≤ 1%

[a] As regards the social indexes, Szondi's conception is that scores of 40-50% show normal, "average" sociability and under 40% a deficiency in social competence, with scores over 50% suggesting more than average competence. The double-peaked pattern of the social index distributions (Table 3) is a consequence of the class intervals employed (it may be noted that the interval 40-<50 is shorter than the rest). The MZ distributions are here – particularly among the females – markedly similar to those in the comparable distributions from the 1988 study. The other (DZ) distributions betray instability in pattern, presumably as a direct consequence of the small size of the group.

Table 4 - Intrapair differences within and correlation between partners

Group	Pairs n	Sexual index			Social index		
		intrapair difference $\bar{x}d$	sd	between-partner correlation r	intrapair difference $\bar{x}d$	sd	between-partner correlation r
MZ total	62	18.0	17.4	*+.31* [2]	17.7	13.5	+.06
MZ female	43	17.0	14.6	*+.49* [2]	16.6	11.6	+.04
MZ male	19	20.3	22.8	–.10	20.0	17.1	+.10
DZ total	23	23.7	22.3	.00	12.7	8.5	*+.52* [2]
DZ female	12	30.8	28.0	–.12	14.6	10.3	*+.38* [1]
DZ male	11	17.1	13.5	+.17	11.0	6.6	*+.69* [2]

Confidence level: [1] p ≤ 5%; [2] p ≤ 0.1% (one-tailed).

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Table 5 - Associations of major tonality on sexual index with intrapair differences and correlation between partners

Group	pairs: n	Intrapair difference: major pole $\bar{x}$, s	minor pole $\bar{x}$,s	n	t-test one-tailed t =	Correlation: major pole r_d	minor pole r_m	diff. r_d-r_m one-tailed z =
MZ M + F	31	24.2 ± 19.8 >	11.7 ± 11.9	31	*2.96*[3]	*–.15 <*	*+ .21*	*–1.42*
MZ F	21	20.1 ± 16.6 >	13.9 ± 12.1	22	1.36	–.04 <	+ 0.02	–0.17
MZ M	10	32.9 ± 24.0 >	6.4 ± 10.3	9	*3.01*[3]	–.32 <	+ .44	–1.65[1]
DZ M + F	11	34.9 ± 24.6 >	13.4 ± 14.1	12	*2.48*[2]	–.46 <	+ .45	–2.25[1]
DZ F	5	46.9 ± 31.4 >	17.5 ± 17.5	6	1.78	–.45 <	+ .43	–1.40
DZ M	6	24.9 ± 12.6 >	9.3 ± 9.6	6	*2.20*[1]	–.53 <	+ .52	–1.85[1]

Confidence levels: [1] p ≤ 5%; [2] p ≤ 1%; [3] p ≤ 0.1% (one-tailed).

Table 6 - Intrapair differences on the social indexes, with correlations of partners at the major and minor ends of the scale

Group	pairs: n	*Intrapair difference*: major pole $\bar{x}$, s	minor pole $\bar{x}$,s	n	t-test one-tailed t =	Correlation: major pole r_d	minor pole r_m	diff. r_d-r_m one-tailed z =
MZ M + F	31	17.5 ± 13.2 ~	17.8 ± 14.0	31	– 0.09	–.10 <	+.20	– 1.19
MZ F	21	15.0 ± 9.2 <	18.2 ± 13.6	22	– 0.87	+.20 >	– .03	+ 0.75
MZ M	10	*22.7 ± 18.7 >*	*16.9 ± 15.7*	9	*0.69*	*-.58 <*	*+ .56*	*– 2.66*[2]
DZ M + F	11	10.0 ± 6.2 <	15.2 ± 9.8	12	– 1.43	+ .69 >	+ .40	+ 0.98
DZ F	5	11.0 ± 9.4 <	17.7 ± 10.7	6	– 1.00	+.91 >	+ .09	+ 2.15[1]
DZ M	6	9.2 ± 2.2 <	12.7 ± 9.1	6	– 0.84	+.79 >	+ .63	+ 0.54

Confidence levels: [1] p ≤ 5%; [2] p ≤ 1% (one = tailed).

DISCUSSION

Table 4 shows that, after combination of the materials (62 MZ pairs), an inter-partner correlation of + .31 is obtained for the sexual index scores. Again the difference between sexes is marked; among the females (43 pairs) the correlation rises further to +.49. Among the males the correlation is insignificant: r = – .10. Within-pair differences reflect the same in reverse; incongruence derives more markedly from the males.

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Tables 5 and 6 were decisive in confirming our hypothesis. The distributions (Table 2), too, point in the direction envisaged in the hypothesis. The sexual and social indexes have not in fact been standardized – here Szondi's life work was left unfinished. Nevertheless from Szondi's and his coworkers' study it emerges that in normal circumstances the distributions on the sexual index should be skewed; in either sex the frequencies should accumulate in the direction of the respective sex represented – *females towards the minor and males towards the major pole* [37]. All the distributions obtained here for twins' sexual indexes would appear to level out in that the quality normally characteristic of the opposite sex tended to be reinforced, with the result that the distributions spread somewhat (i.e. the deviations increased). This may be concluded from a comparison with the distributions described in Table 2. The distributions obtained in 1988 (university staff and students) were in the case of female subjects precisely what Szondi's empirical studies [37] would lead one to expect; the majority of the frequencies tended in the direction of the minor tonality pole. The deviation was less marked than in the twin distributions. In the corresponding male material, on the other hand, the cumulation of frequencies was likewise towards the minor tonality pole, albeit less markedly than in the females. Here, too, the deviation was less pronounced than in the twin frequencies. It may be surmised [3] that the tendency of the male distributions towards the minor pole derives from what is possibly a characteristic of "university males" – a predominance of feminine – type individuals. In theory the distributions among twins ought to coincide with those of other males and females; that this was not the case – that the pattern of distributions among the twins was strikingly different – may be assumed to derive from differentiation brought about by competition in some, especially major-type, twin pairs. In such cases one of the partners will appear to have "shifted" in the opposite direction – i.e. minor tonality. Hence the greater deviation observed.

Is this a general phenomenon among twins? Let us see Table 7.

At least in the central EPQ personality variables [16], all deviations, (as indeed also the means except in Neuroticism among the females), among twins lie systemically in the same direction. They are every time greater than those in the distributions among the population at large. This phenomenon also emerges in every group separately (i.e. MZF, MZM, DZF and DZM, and also in DZO, that is, dizygotic twins of opposite sex, in dimensions E, N, P, but not in L. The only exception was in MZF s = s other people in P). All the above applies likewise when the English subjects are replaced by "other Finnish people" as comparison group [17] (Table 5). Further evidence has emerged. Nearly all groups, males and females (EZ, DZ, DZO, the only exception DZF in 5% level, British) differ statistically highly significantly in dimensions E and P in homogenous test of variances ($t = \bar{x}_1 - \bar{x}_2 / \sqrt{S_1^2/n_1 + S_2^2/n_2}$) from those in the distributions among the population at large, British and Finnish. It is indeed a question of a general phenomenon associated with all twins reared together (apparently also DZO pairs). In twin pairs, competition may lead one partner to gain higher scores in test results compared to the other. It is presumably one partner in particular (the subjected one?) who gives rise to the deviation in the group means. In such cases the deviation is greater than it would be if a similar divergence from the mean were attributable to both partners evenly.

However, too many EPI-EPQ twin-researchers have omitted from their reports the means and deviations, thus making these papers useless for comparison of deviations. Moreover, twin studies have to an increasing extent been utilizing short form scales (i.e.

Table 7 - Means and standard deviations of twins on EPQ as against corresponding figures for a general population

	Twins (Martin & Jardine 1986) (MZ+DZ+OZ), number of pairs 3810),				Other (Eysenck & Haapasalo 1989) n = 895	
	n_1 (indiv.)	$\bar{x}_1$	s_1	s_2	$\bar{x}_2$	n_2
Extraversion						
males	2745	12.89[3a)]	*4.97* >	*4.88*	11.45	562
females	4875	12.45[2]	*4.96* >	*4.53*	11.67	333
Neuroticism						
males	2745	9.12	*5.1* >	*4.79*	8.87	562
females	4875	11.32[1]	*5.2* >	*4.91*	11.95	333
Psychoticism						
males	2745	4.15[3]	*2.7* [2b)] >	*2.21*	2.46	562
females	4875	2.79[3]	*2.02* >	*1.97*	1.73	333

Confidence levels: (f), [1] $p \leq 5\%$; [2] $p \leq 1\%$; [3] $p \leq 0.1\%$ also in t-test ($\bar{x}$).

a) Also when "other" are Finnish ([3] or at least [2] in extraversion and psychoticism).

b) Also when "other" are Finnish (males [2], females [1] in P), n = 949.

9-10 items per dimensions). Once again comparison of distributions with those among the general population is at the least considerably hampered.

The social indexes show a differentiation resembling that on the sexual index, that is, more marked incongruence towards the major-tonality pole, again among the MZ males (Table 6). The MZ male deviation (Table 3) may be a consequence of this.

It may be observed from the results set out in Table 4 that among identical twins the correlation on the sexual index (MZ females) is greater than that on social indexes. Among non-identical twins the converse holds; the correlation is greater on the social index. This would point in the direction of Szondi's surmise that above all the sexual index is largely subject to hereditary factors [37].

Although intelligence and many personality traits are evidently markedly determined by heredity, the environment nevertheless exerts an influence on them. This is assumed to imply that among twins reared apart test correlations should be less considerable than among twins reared together, since the former will inevitably have different environmental backgrounds. In the studies so far available, however, no such difference emerges [15, 18]. In a number of them it has indeed been observed that twins reared apart resemble each other more than those reared together [18, 25, 38].

Our competition hypothesis would in fact also appear to offer an explanation for these at first sight paradoxical findings. Explanations must be sought in all the influcences involved in twins growing up together and apart. Twins reared apart lack the

mutual interaction which, especially in some pairs reared together, evidently involves differentiating forces of rivalry. Such a circumstance would surely lead to the impression that twins reared apart bear a closer resemblance to each other than twins reared together.

The situation of identical twins is indeed precisely such that each partner is to the other a genetically identical, crucial environmental factor. Nevertheless these genetically similarly equipped counterparts may in fact exert an influence on each other whereby potentials which are in themselves hereditarily determined are reinforced in one and weakened in the other partner [13]. According to these researchers the genes affect personality in part directly, regardless of the presence of the other partner, partly again indirectly, in which case the presence of the other in the same social environment will be of crucial significance. This indirect influence of genetic heredity takes two forms. Identical genes may reinforce each other and result in a pronounced development of a given trait in both partners in the companionship. On the other hand the genes may promote a given phenotype in one of the partners and simultaneously hamper its expression in the other, the result being differentiation between them.

Twins (triplets etc.) and particularly identical twins, are not always born with equally viable potential – this for a variety of reasons. Difference in status may be due for example to the fact that some MZ twins have a common blood circulation, so that even before birth one of them may be in constant danger of malnutrition [40]. Such dissimilarity in physical viability may well lead to a reactive quality in the mutual interaction between the partners. Dominance in the physical dimension is often also manifested in the psychic. Dominance is also cumulative; one partner may become increasingly forceful and more competent partly in reaction to the increasing helplessness and submissiveness of the other, which latter is in its turn a reaction to the overbearing nature of the other. The process of differentiation takes hold and progresses. What is interesting from the standpoint of the present results is that a number of researchers [40] have in fact noted *that such differentiation, even to the point of hostility, is particularly characteristic of male pairs of twins*. The meta-analysis of McCartney et al. [30] brought out that the similarity between adult twins progressively diminishes with age. This development is not uniform with respect to all traits; differentiation is most marked in the *activity-impulsiveness and feminity-masculinity domains*. Identical twins differentiate with age more conspicuously than non-identical twins, a fact which – according to McCartney – may derive from the explicit need of identical partners to create differences between them. From earlier results [3, 4], we know that in addition to major-tonality dominance there is also a minor-toned form of it. The more feminine partner is more dominating, but in minor-tonality terms. This would suggest an "aura" of dominance, a mode of leadership which does not apparently compete to subjugate in the way major-toned dominance functions. Instead, this minor-tonality form is probably above all considerate of social relations and disposed to empathy. Such a conception indeed finds justification.

Leinonen [26], explaining the results of a personality study of identical twins, concludes that there must be a distinctive feminine and a distinctive masculine mode of interaction (in general and also among twins). Hauser [27] summarizes the styles of interaction as enabling and constricting or restrictive. The mode characteristic of females – particularly among themselves – is of the former type, that of males – again especially among themselves – is the latter [8]. According to Rose and coworkers (1988, 161-171),

the amount of mutual contact between twins would appear to enhance their likeness. This effect is, however, more pronounced among females, who also have more frequent intrapair social interation than males [8] (Table 2). Such a conception is well in keeping with the present findings. Minor-tonality dominance is thus one manifestation of the minor-tonality (i.e. enabling) mode of interaction, just as major-tonality dominance shows major-tonality (i.e. constricting or restrictive) interaction.

Leinonen [26] seeks an explanation for the divergence between the male and female pairs of twins in their respective styles of interaction. In female pairs mutual empathy and in general a common handling of experience are more prominent than among males. Hence, for example, female subjects are better equipped than males to deal with personality questionnaires – a point which is worthy of consideration.

Many researchers have drawn attention to such a difference among twins – in Finland one recent work is that of Moilanen [31]. The differences prevail in both sexes; Moilanen has evidently also observed them in non-identical pairs. The present author's prediction here would be that major-tonality dominance is to be found more frequently among MZ male pairs than among females, and conversely minor-tonality dominance more frequently among female pairs. In the case of female pairs, minor-tonality dominance may be expected to approach in frequency the proportion of major-tonality dominance among females. The congruence between female partners is after all higher than among male twins. Why should this be so? The most likely reason is that minor-tonality dominance is not so competitively subjugative as its major-tonality counterpart. It may indeed be that even in major-dominated pairs of females this characteristically male mode of dominance is less pronounced than among males [8, 27].

To confirm such a concept, however, substantially more discriminative approaches are called for than the Bem BSRI.

The main finding in the present study was the following: the male or female matricular sex of twins does not provide sufficient explanations to the differences observed in test results. What is essential is the degree to which male and female pairs – and the partners over against each other – are "of their own gender", i.e. preponderantly major- or minor-toned.

With an eye to further investigations, the present findings imply in first place that studies of twins reared together must treat the sexes separately and, without exception, supplement findings with an analysis of the major-minor (masculine-feminine) tonality of either sex. *Thus two sex variables must be employed: external and internal in parallel.* The problem is only to set out a sufficiently precise definition of "internal sex". Desirable for twin studies is the use of as large samples as possible [15]. Large samples level out the representation of major and minor tonality among twins and serve to bring out the average proportion of mutually dominant/submissive pairs among all the twins, males and females. It is for most part such pairs – and especially one partner in them – who cause divergence in means and particularly in deviations (Tables 2, 3 and 7). *It is evidently internal sex (gender) which underlies this phenomenon. Hence references to possible sex differences in test results are imprecise; what causes such differences is variation specifically in the gender domain, variation, that is, which transcends the borderlines of the matricular sex.* The more markedly a test is "gender-bound", the more frequently the above-depicted phenomenon will emerge. In cognitive tests such a phenomenon would be expected to emerge, particularly in spatial ability, and also in verbal

ability. In spatiality this is indeed seen: [19] differences in Wisc-R Block design test, where a deviation greater than that in the norm group was also observed [see also 22, 33]. One particularly prominent example of gender-bound personality traits is extraversion. It would appear that a disposition to extraversion is a predominantly major-tonality trait. The average scores of males on the extraversion scale have varied. If a sample happens to contain markedly major-toned individuals, a swing will be observed in the direction of extraversion. If on the other hand minor-toned subjects predominate – as in the present author's sample of university males (Table 2: sex i. > 50%) – the trend will be towards introversion: E males < E females, this difference was highly significant [2]. The theoretical foundation for this context was formulated by Szondi in 1956 [36, experimental verification 5 and 23].

The BSRI method does, it is true, allow treatment of large samples, but its application remains in other respects problematic, especially in the current situation of sex role controversy. The BSRI is designed primarily to define sex roles, which are only one aspect of internal sex or gender [20]. The BSRI yields information chiefly on what a given individual would like to be. The Szondi test is evidently better imbued to sound the depth and extent of internal sex. As to its limitations, they are primarily technical; the test can apparently only be applied to the individual context (5-6 times per subject). Nevertheless the use of small study groups could well make it possible to check, by using Szondi's test, the major – minor distribution within either sex and the effect this has on results. The current dismissive attitude to the Szondi test and Szondi's theory is indefensible.

All in all, Carey [7] is right; *sibling competition is a relevant component in genetic models for personality.*

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