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THE CORRELATION OF SEASONALITY OF BIRTH IN PARENTS AND THEIR CHILDREN

SUMMARY — In this work seasonality of birth in parents and their children is studied, the data of a group of families from Olomouc (North Moravia, Czechoslovakia) being used. Both simple identity of seasonality of birth of the whole group of parents and their children and the identity of the part of the year of births of father and mother and their children within a certain family are examined.

MATERIAL AND METHOD

The data of 3,041 families from Olomouc (North Moravia, Czechoslovakia) collected by means of anonymous questionnaires were studied. The total sum was 12,896 persons, 3,041 being mothers, 3,041 fathers, 4,795 daughters and 2,019 sons. The higher number of daughters is caused by the fact that the research was made at secondary schools with a majority of girl-students. For statistics it was possible to use the data concerning families with 1—4 children, because families with more children were very rare.

The following groups were formed for statistical comparisons: parents — P, children-CH, fathers — F, mothers — M, all sons — in the following text only "sons" — S, and all daughters — in the following text only "daughters" — D. As to the succession of children in the family also the groups 1st — 4th son and 1st — 4th daughter were formed.

The rank of a child's birth was determined in two variants as shown in *table 1*. In the left column of the table there is the family pattern, i.e. all possible combinations of sons and daughters in a family with 4 children. In the next two columns 2 variants

of evaluating ranks are shown. Variant I determines the rank of the child as to the succession in the family and within the rank secondly sex is distinguished — Rank, Sex (R). Since the rank is determined first, e.g. the first child — a son is marked 1S, the second child — a daughter is marked 2D etc. Variant II gives the sex of the child first and among children

TABLE 1. *Determination of birth rank of children in a family*

Rank number of family patterns	Family patterns				Variant I R, S(R) Birth rank, sex within the rank				Variant II S, R(S) Sex, birth rank within the sex			
1	D	D	D	D	1D	2D	3D	4D	D1	D2	D3	D4
2	D	D	D	S	1D	2D	3D	4S	D1	D2	D3	S1
3	D	D	S	S	1D	2D	3S	4S	D1	D2	S1	S2
4	D	S	S	S	1D	2S	3S	4S	D1	S1	S2	S3
5	D	D	S	D	1D	2D	3S	4D	D1	D2	S1	D3
6	D	S	D	D	1D	2S	3D	4D	D1	S1	D2	D3
7	D	S	D	S	1D	2S	3D	4S	D1	S1	D2	S2
8	D	S	S	D	1D	2S	3S	4D	D1	S1	S2	D2
9	S	D	D	S	1S	2D	3D	4S	S1	D1	D2	S2
10	S	D	S	D	1S	2D	3S	4D	S1	D1	S2	D2
11	S	D	S	S	1S	2D	3S	4S	S1	D1	S2	S3
12	S	S	D	S	1S	2S	3D	4S	S1	S2	D1	S3
13	S	D	D	D	1S	2D	3D	4D	S1	D1	D2	D3
14	S	S	D	D	1S	2S	3D	4D	S1	S2	D1	D2
15	S	S	S	D	1S	2S	3S	4D	S1	S2	S3	D1
16	S	S	S	S	1S	2S	3S	4S	S1	S2	S3	S4

of the same sex the rank is distinguished — Sex, Rank(S). As sex comes first, the first child — a son is marked S1, the second child — a daughter is marked D2 etc. In the case of a family pattern DSDS in variant I the rank numbers of daughters are 1 and 3 and those of sons 2 and 4. In variant II for the same family pattern the rank numbers of daughters are 1 and 2 and those of sons 1 and 2 as well.

The theoretical frequency of different ranks of brothers and sisters is shown in *table 2*. It is evident that the definition of rank of birth of a child in variant I results in a different, more equable presence of individuals in the groups than the definition of rank of birth in variant II.

The data of numbers of births in different months were standardized as to the lenght of the corrected month, i.e. the period of 30.4375 days and they are expressed in three months moving averages.

When comparing the seasonal curves of parents and their children, the following method was applied: e.g. the group "3rd daughter" was compared only to those mothers who gave birth to a third daughter. This group "3rd daughter" was not compared to all mothers. A similar method was applied also for other comparisons. The value of the correlation coefficient is shown in the figures at the bottom right. It is the cross — correlation of the curves of seasonality; high correlation means a similar seasonal course of natality in both the compared groups.

RESULTS

Variant I

The comparison of the seasonal distribution of births of parents and children is shown in *fig. 1—4*.

In this comparison no attention was paid to the fact in which family the child was born. When comparing the curves of seasonal distribution of parents to
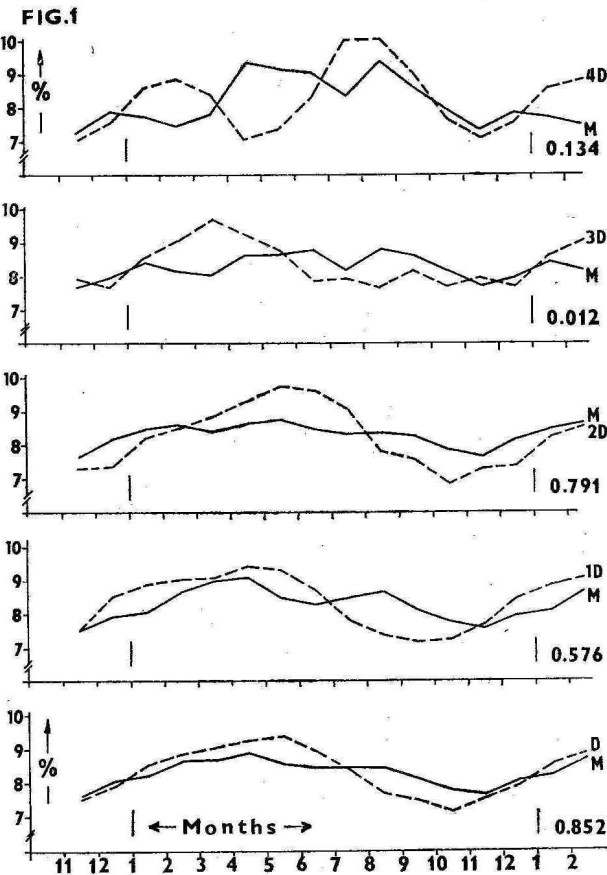
FIGURE 1. *Comparison of seasonal distribution of births of mothers and their daughters (Variant I).*

TABLE 2. *Frequency of different ranks of brothers and sisters within families*

	Variant I — R, S(R)			Variant II — S, R(S)	
Category of rank of a child	Frequency of family patterns (see tab. 1) belonging to a certain category	Numbers of patterns including the category of birth rank	Category of rank of a child	Frequency of family patterns (see tab. 1) belonging to a certain category	Numbers of patterns including the category of birth rank
1st daughter 1D	8	1—8	1st daughter D1	15	1—15
2nd daughter 2D	8	1—3, 5, 9—11, 13	2nd daughter D2	11	1—3, 5—10, 13, 14
3rd daughter 3D	8	1, 2, 6, 7, 9, 12—14	3rd daughter D3	5	1, 2, 5, 6, 13
4th daughter 4D	8	1, 5, 6, 8, 10, 13—15	4th daughter D4	1	1
1st son 1S	8	9—16	1st son S1	15	2—16
2nd son 2S	8	4, 6—8, 12, 14—16	2nd son S2	11	3, 4, 7—12, 14—16
3rd son 3S	8	3—5, 8, 10, 11, 15, 16	3rd son S3	5	4, 11, 12, 15, 16
4th son 4S	8	2—4, 7, 9, 11, 12, 16	4th son S4	1	16

TABLE 3. *Difference between the month of parents' birth and the month of their own children's birth*

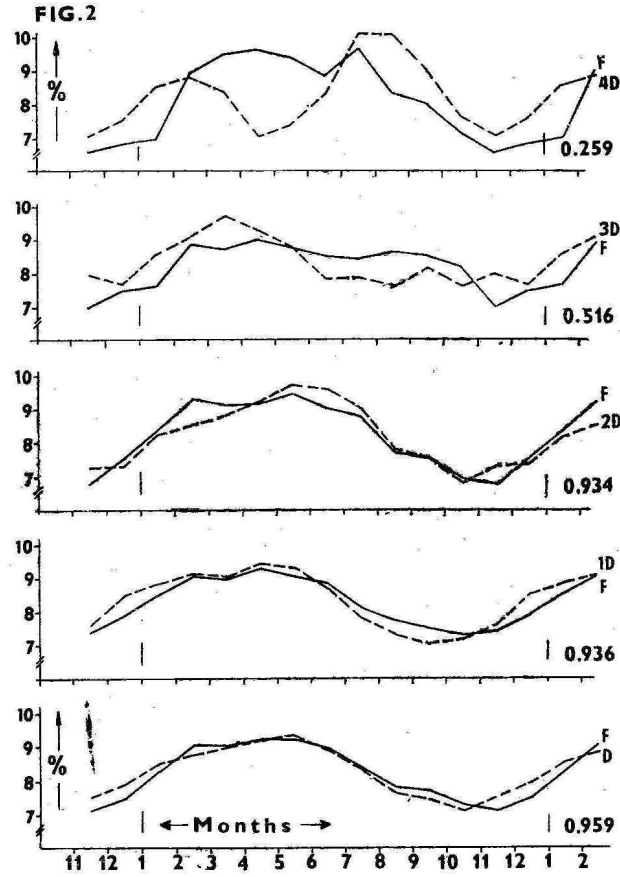|			Variant I							
Parents	Children	n	Differences							χ^2
			0	1	2	3	4	5	6	
Mother	1st daughter	2,241	204	387	345	400	364	343	198	9.63
	2nd daughter	1,819	168	299	301	343	300	289	119	14.79
	3rd daughter	604	56	105	99	78	111	107	48	7.50
	4th daughter	131	11	35	15	13	27	19	11	15.24
Father	1st daughter	2,241	204	322	379	382	385	374	195	9.82
	2nd daughter	1,819	141	328	298	276	304	335	137	10.05
	3rd daughter	604	53	105	113	86	98	105	44	5.02
	4th daughter	131	17	9	32	25	28	17	3	24.68
Mother	1st son	800	75	151	127	126	128	137	56	6.33
	2nd son	821	71	139	116	135	152	136	72	5.20
	3rd son	334	27	69	50	60	44	56	28	6.59
	4th son	79	8	12	15	12	12	15	5	1.51
Father	1st son	800	63	132	129	145	129	132	70	1.79
	2nd son	821	77	141	149	131	122	136	65	4.31
	3rd son	334	29	63	57	46	61	47	31	4.95
	4th son	79	4	12	11	17	14	16	5	3.63

FIGURE 2. *Comparison of seasonal distribution of births of fathers and their daughters (Variant I).*
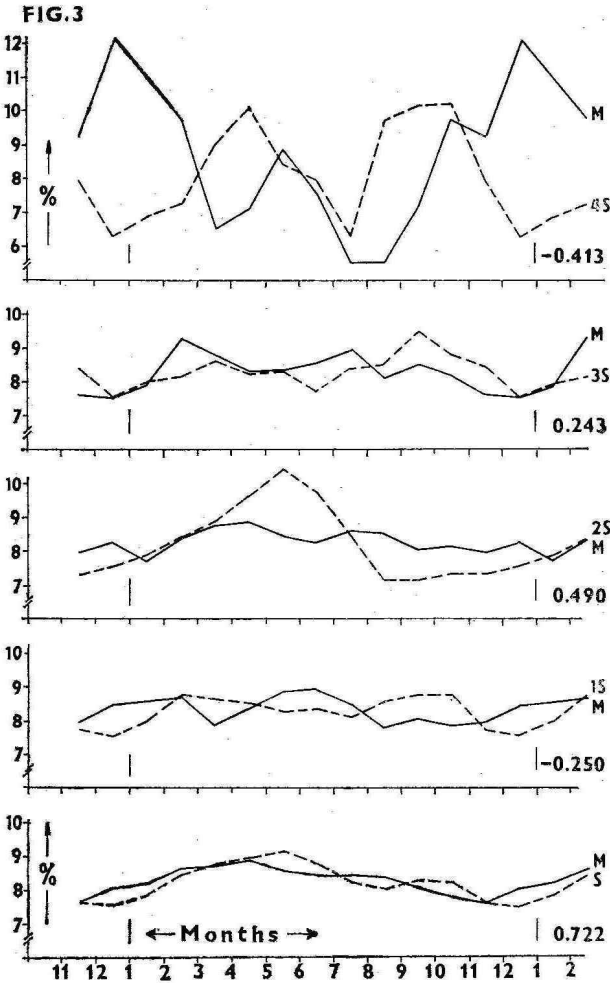
FIGURE 3. *Comparison of seasonal distribution of births of mothers and their sons (Variant I).*

Is this comparison no attention was paid to the fact in which family the child was born. When comparing the curves of seasonal distribution of parents to the analogical curves of daughters (fig. 1 and 2) we observe high correlation of curves of both mothers and fathers with the group "daughters" and also with the 1st and 2nd daughter. Comparisons with the 3rd and 4th daughter show evidently lower values of the correlation coefficient. The same comparison of the curves of parents with those of sons (fig. 3 and 4) shows the highest correlations within the comparison of mothers to the group of "sons" and to the 2nd son, for fathers it is the comparison to "sons" and the 4th son. Correlations between parents and sons are mostly lower than those between parents and daughters. At the same time it is possible to say that the correlations between fathers and children are higher than those between mothers and children.

Fig. 5 shows the correlation of curves between parents and children, mutual correlation between parents and mutual correlation between sons and daughters. The highest correlation is between parents and children, the lowest correlation is between sons and daughters.

Also the situation inside different families was studied so that the season of the year of the father's
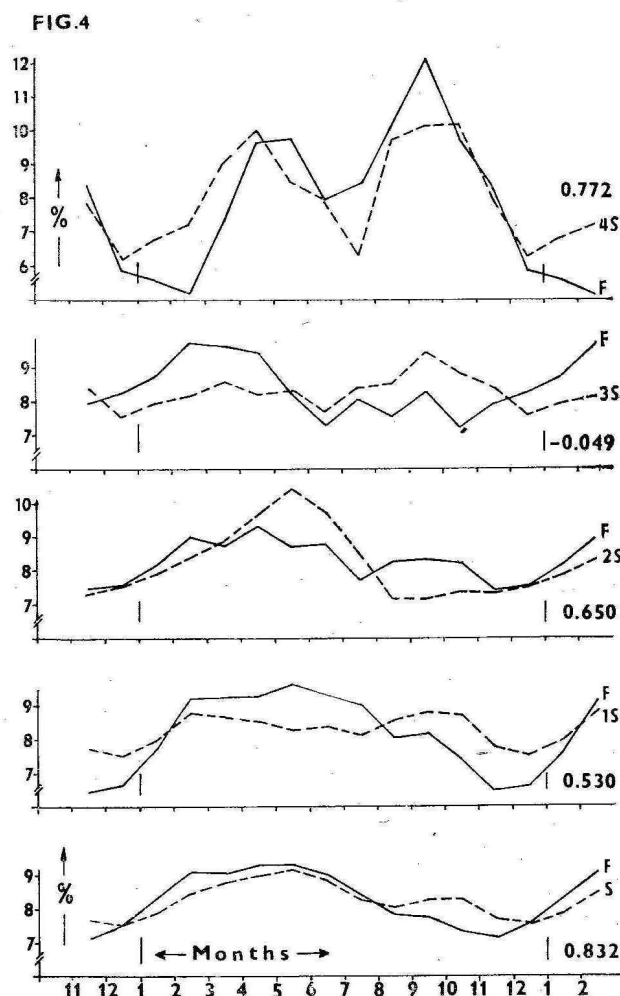

FIG.4

FIGURE 4. *Comparison of seasonal distribution of births of fathers and their sons (Variant I).*
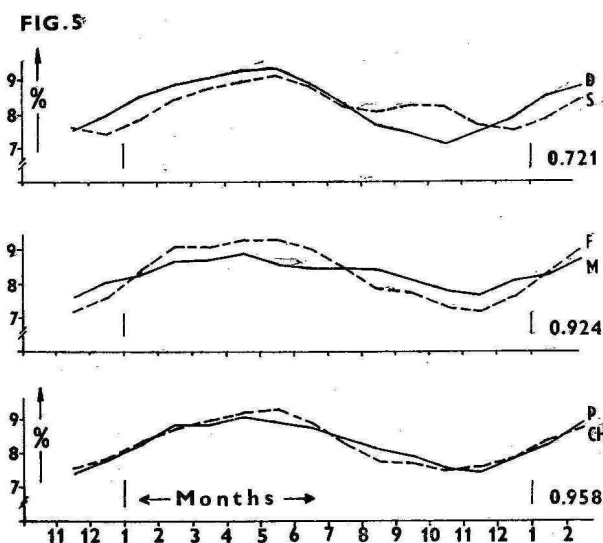

FIG.5

FIGURE 5. *Comparison of seasonal distribution of births of different members of the family.*

or mother's birth was compared to that of their own child. The difference between the father's or mother's month of birth and the month of birth of their child may be from +6 to —6 months. This difference is considered as a circle difference. The situation is shown in *table 3*. Frequency "n" in this table is the number of couples compared. The biological hypothesis "there is no relation between the month of birth of a parent and a child" was proved by χ^2 test by Hajn and Komenda 1982. The critical value of χ^2 test for 6 degrees of freedom is equivalent to 12.59. It means that the values of χ^2 test higher than 12.59 prove a statistically significant identity. Thus *tab. 3* shows that no relation between the month of birth of parents and their children was proved. Among 16 possibilities only three times the value of χ^2 test was higher than the value 12.59 indicating significance.

Variant II

The comparison of seasonal distribution of births of parents and children is shown in *fig. 6—9*. Also in this comparison no attention was paid to the fact which family the child comes from. As we explained in the paragraph "Material and method" in this variant the birth rank was distinguished within the sex group. That is why the groups "4th daughter" and "3rd and 4th son" are not taken in consideration here because the result of the method is that they have become little frequent (*tab. 2*). When comparing the curves of parents to those of daughters a high correlation was observed. There is a decay in the value of correlation in the rank 1st — 3rd daughter both in comparison to mothers and to fathers. When comparing the curves of parents with those of sons we find lower values of the correlation coefficient than we did in daughters. The correlation increases in the rank 1st — 2nd son both in comparison to mothers and to fathers. The tendency is opposite to that in daughters. Like in variant I the correlation between fathers and children is higher than that between mothers and children.

TABLE 4. *Difference between the month of parents' birth ad the month of their own children's birth*

Parents	Children	n	Variant II							χ^2
			Differences							
			0	1	2	3	4	5	6	
Mother	1st daughter	2,906	255	498	454	527	477	460	235	8.25
	2nd daughter	1,516	152	251	247	262	260	240	104	10.49
	3rd daughter	333	31	65	54	42	58	53	30	7.37
Father	1st daughter	2,906	255	455	485	484	495	490	242	2.75
	2nd daughter	1,516	127	247	259	225	261	279	118	6.89
	3rd daughter	333	30	60	68	50	52	54	19	6.92
Mother	1st son	1,616	136	292	237	263	286	272	130	7.17
	2nd son	362	34	72	61	63	43	62	27	8.22
Father	1st son	1,616	137	274	269	267	261	267	141	0.71
	2nd son	362	33	62	72	62	52	53	28	4.81

The difference between the month of birth of the parents and their own children within individual families is shown in tab. 4 which is arranged in analogy to *tab. 3*. In this table too frequency "n" is the number of couples compared. In analogy, the differences between a parent and his or her child are evaluated and the value of χ^2 test is counted. In
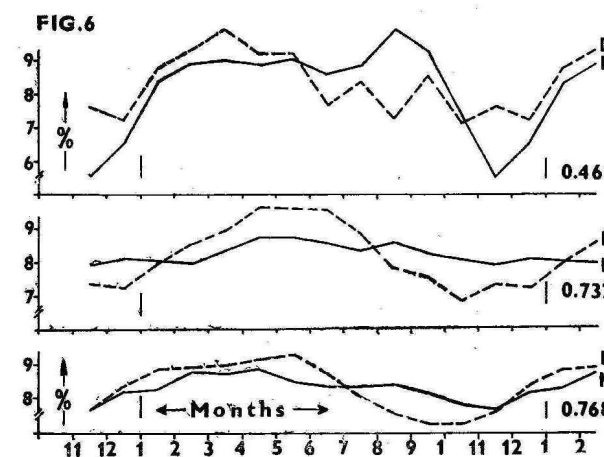

FIG.6

FIGURE 6. *Comparison of seasonal distribution of births of mothers and their daughters (Variant II).*
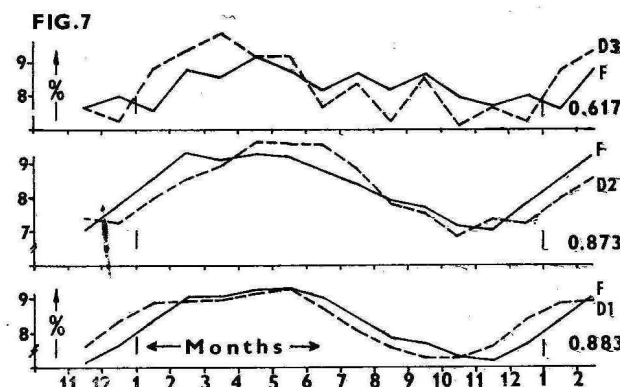

FIG.7

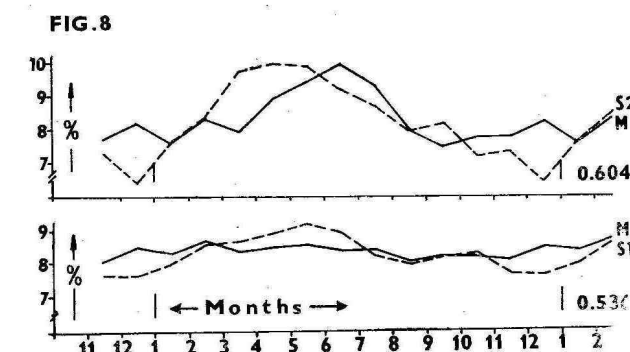FIGURE 7. *Comparison of seasonal distribution of births of fathers and their daughters (Variant II).*

FIG.8

FIGURE 8. *Comparison of seasonal distribution of births of mothers and their sons (Variant II).*
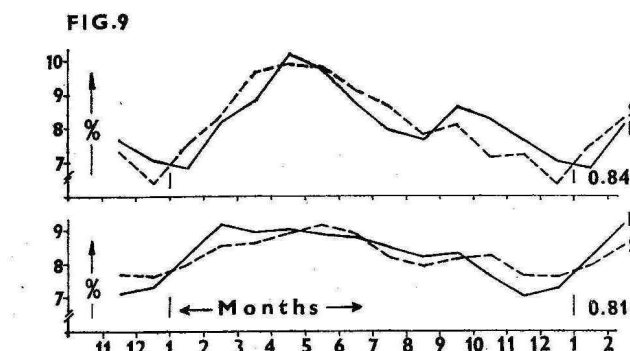

FIG.9

FIGURE 9. *Comparison of seasonal distribution of births of fathers and their sons (Variant II).*

none of the compared pairs the value of χ^2 test reaching 12.59 was found. This means that neither in this variant identity of month of birth of a parent and his or her child was proved.

CONCLUSIONS

By comparing the curves expressing the seasonal distribution of births of different groups of parents and children we have studied the possibility of identity

of the month of the parents' birth and children's birth. Both in variant I and variant II similarity of the curves of parents with those of children was proved, similarity between the curves of fathers and children always being higher than similarity between the curves of mothers and children.

Also the differences between the month of a mother's or a father's birth and the month of their own child's birth were analysed. By χ^2 test no relation was recorded between the month of the parents' birth and that of their children.

The above mentioned results thus prove that although the frequency structure of births according to months has similar features in both generations the month of a child's birth is in no relation to the month in which either his(her) father or his (her) mother was born.

LITERATURE

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