



Dominance and Submissiveness Between Twins I. Perinatal and Developmental Aspects

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Abstract. Factors predicting dominance and submissiveness between twins were analyzed in a longitudinal study of 234 twin pairs. Boys were found to be physically dominating, while the girls more often were psychically dominating and in the role of the spokesman. Low birth weight, to be second born, or low Apgar score tended to predict submissiveness, but not significantly. The same was true concerning perinatal asphyxia and hypoglycemia, which also showed some potential cumulative effect when occurring simultaneously. Those having developed faster or with higher intelligence were more often the leaders of the twin pair. Probably good neonatal care in modern hospitals tends to prevent perinatal damage, and therefore the previous findings of second born or small birth weight twins being most submissive was not fully established.

Key words: Dominance, Submissiveness, Perinatal morbidity, Neurological damage, Development, Intelligence

INTRODUCTION

A tendency towards a polar dominance-submissiveness relationship is typical of pairs of twins, and the higher incidence of severe psychiatric disorders in the more submissive members of such pairs [6,7] makes this relationship an important focus for research. The predisposing factors associated with the development of such a situation have not been very extensively studied, however.

This work has been supported financially by the Yriö Jahansson Foundation and the Alma and KA Foundation.

The purpose of this paper is to examine perinatal and neurological factors involved in the development of the dominance-submissiveness relationship on the basis of a follow-up study.

MATERIAL AND METHODS

The basic series of cases consists of 335 consecutive twin deliveries which occurred at the Oulu University Central Hospital during the years 1965-73. About 70% of the twins had perinatal complications: one-third had suffered from intrauterine growth retardation (IGR), one-third had been born prematurely, and one-third had suffered from perinatal asphyxia and/or respiratory distress syndrome (RDS). Neonatal hypoglycemia had been found in 22% of the infants and hyperbilirubinemia in 7% [1].

The first follow-up study was performed in 1975-76 [4]. A questionnaire concerning development, personality features and intertwin relationships was sent to the parents of all the living twins. In addition one-third of the twins were subjected to a thorough, mainly neurological, examination including EEG and psychological tests using the Wechsler Intelligence Scale for Children (WISC) [8], and the Bender [2] and Goodenough [3] tests.

A second follow-up was performed in 1985 by means of a questionnaire sent to the parents and the twins themselves. All the pairs in which both twins were still alive are included in the analysis. These numbered 234 pairs, of which 66 were both girls, 77 both boys and 91 mixed pairs. Three aspects of the dominance-submissiveness relationship were inquired about from the parents and the twins themselves [6]: dominance in physical strength, psychic dominance and the role of spokesman. The answers took the form of numerical scores, the value for a highly dominant member being 1 and that for a highly submissive member 5. The scores in each of the three aspects, as given by the parents and by the children themselves were summed separately to provide two figures for overall submissiveness.

The statistical analyses were performed using standard statistical packages (SAS and BMDP).

RESULTS

The factor most clearly predicting the development of a polar intertwin relationship of dominance-submissiveness was sex (Table 1), the boys being physically dominant, while the girls are psychically dominant and more often appear in the role of spokesman. In the parents' opinion the girls are often totally dominant, but this feature is not seen in the children's own evaluations.

As sex affects this intertwin relationship and the boys' birth weights usually are higher than those of the girls, the effect of birth weight was analysed separately for the different types of pair (Table 2). No significant difference in mean birth weight was found between the dominant, intermediate or submissive twins in the same-sex pairs. In the mixed pairs, those placed in the intermediate dominance group by the parents had the highest birth weights and those viewed by themselves as the most submissive ones tended to have the lowest birth weights. This same result emerged for the whole group of twins.

Birth order did not affect the development of a dominance-submissiveness relationship (Table 3), although the second-born twins showed a nonsignificant tendency to view themselves as the submissive member. Those twins who had suffered from IGR showed a nonsignificant tendency to be the submissive member in the parents' opinion ($\chi^2 = 4.4231$, $df = 2$, $P = 0.1095$).

Those who felt themselves to be dominant twin showed a nonsignificant tendency to have

Table 1. Intertwin relationships in girls and boys, mean values. The significances of the difference are obtained by the median test

	Girls	Boys	P
<i>Parents' View:</i>			
Physical submissiveness	3.11	2.90	0.0352
Psychic submissiveness	2.79	3.19	0.0002
"Spokesman" submissiveness	2.87	3.12	0.0051
Overall submissiveness	8.77	9.21	0.0004
<i>Children's Own View:</i>			
Physical submissiveness	3.15	2.52	0.0001
Psychic submissiveness	2.78	3.04	0.0008
"Spokesman" submissiveness	2.70	2.88	0.4858
Overall submissiveness	8.63	8.44	0.2308

Table 2. Birth weight and development of submissiveness between twins, by sex. Mean birth weights of dominant, intermediate and submissive twins are given. The significances of the differences are obtained by an analysis of variance

Overall submissiveness	Mean birth weight (kg)			F	P
	Dominant	Inter-mediate	Submissive		
<i>Girl-Girl:</i>					
Parents' view	2.45	2.59	2.43	0.65	0.5228
Own view	2.75	2.55	2.38	1.53	0.2204
<i>Boy-Boy:</i>					
Parents' view	2.78	2.85	2.70	0.45	0.6364
Own view	2.85	2.82	2.91	0.16	0.8546
<i>Boy-Girl:</i>					
Parents' view	2.54	2.84	2.48	4.77	0.0096
Own view	2.83	2.79	2.38	3.41	0.0352
<i>Total:</i>					
Parents' view	2.59	2.77	2.54	4.27	0.0145
Own view	2.82	2.73	2.57	2.18	0.1147

Table 3. Birth order and development of submissiveness between twins

	First born N	Second born N	
<i>Parent's View:</i>			
Dominant	12	18	$\chi^2 = 2.400$
Intermediate	203	203	df = 2
Submissive	18	12	P = 0.3012
<i>Children's Own View:</i>			
Dominant	39	24	$\chi^2 = 4.781$
Intermediate	186	195	df = 2
Submissive	10	15	P = 0.0915

had a higher Apgar score at the age of 1 min (mean 7.68, 7.19, 7.24, respectively, for dominant, intermediate and submissive ones, $F = 2.32$, $P = 0.0995$). Those thought by the parents to be the dominant one showed a nonsignificant trend for a higher Apgar score at both 1 min (mean score 7.37, 7.30, 6.80, respectively, $F = 1.36$, $P = 0.2589$) and 15 min (mean score 7.97, 7.89 and 7.69, $F = 2.32$, $P = 0.0998$).

The three most typical perinatal diseases, ie, perinatal asphyxia and/or RDS, hypoglycemia and hyperbilirubinemia, were analysed in relation to the development of the dominance-submissiveness relationship. The twins who had suffered from perinatal asphyxia and/or RDS showed a nonsignificant tendency to regard themselves as the most submissive ($\chi^2 = 3.3286$, $df = 2$, $P = 0.1893$), and the same was true of those who had suffered from neonatal hypoglycemia ($\chi^2 = 3.5039$, $df = 2$, $P = 0.1734$), but no such trend was found in the parents' replies. The twins who had suffered from both asphyxia and hypoglycemia tended to feel themselves to be the most submissive ($\chi^2 = 9.5995$, $df = 6$, $P = 0.1505$) and were more often submissive than those who had suffered from neither asphyxia nor hypoglycemia ($P = 0.0358$, Fisher exact probability test), although, again, no such pattern emerged from the parents' replies. Prematurity potentiated the effect of asphyxia, so that the premature twins with perinatal asphyxia or RDS most often felt themselves to be submissive members of their pair ($\chi^2 = 12.9557$, $df = 6$, $P = 0.0437$). Neonatal hyperbilirubinemia was not reflected on this intertwin relationship.

The most dominant twins had learned to walk and speak earlier than their submissive counterparts (Table 4).

The neurological status of the twins did not have any predictive value with regard to the intertwin dominance relationship. One significant EEG finding was that those who now felt themselves to be the most submissive ones had more often had focal activity in their EEG ten years ago (mean estimation of focal activity 1.29, 1.15 and 2.00 for dominant, intermediate and submissive members, respectively; $F = 4.17$, $P = 0.0175$). Intelligence (WISC) had some predictive value with regard to dominance as perceived by the twins themselves (Table 5), but the score in the Bender test did not have any predictive value for the development of this intertwin relationship.

DISCUSSION

The are not many studies available concerning the development of the polar dominance-

Table 4. Motor and speech development vs overall submissiveness. Mean values for the age of first walking unaided and first producing words are given for the children in dominant, intermediate or submissive groups, where submissiveness is estimated by the parents or the twins themselves. The significance of the differences is obtained by an analysis of variance

	Mean age (months)			F	P
	Dominant	Inter- mediate	Submis- sive		
<i>Parents' View:</i>					
First walking	13.1	12.7	15.6	14.69	0.0001
First words	16.1	14.8	18.0	6.08	0.0025
<i>Child's Own View:</i>					
First walking	12.8	12.6	15.7	12.29	0.0001
First words	14.9	15.0	17.9	4.04	0.0184

Table 5. Intelligence (WISC) as a predictor of the development of an overall dominance-submissiveness relationship. Mean values for intelligence are presented for the dominant, intermediate and submissive children, where submissiveness is estimated by the parents or the twins themselves. The significance of the differences is obtained by an analysis of variance

	Mean IQ			F	P
	Dominant	Inter- mediate	Submis- sive		
<i>Parents' View:</i>					
WISC verbal	111.4	101.5	106.4	1.89	0.1569
WISC performance	110.5	105.6	101.8	1.13	0.3277
WISC full scale	112.2	103.8	104.7	1.60	0.2080
<i>Child's Own View:</i>					
WISC verbal	104.4	102.7	88.0	1.04	0.0576
WISC performance	113.6	105.3	84.5	5.79	0.0044
WISC full scale	109.9	104.4	85.0	3.26	0.0432

submissiveness relationship between twins. Submissiveness is usually seen as one of the sequelae of being the second born or lighter twin at birth [6,7], perhaps indicating some perinatal trauma, and is often associated with later submissiveness. No more thorough perinatal analyses have been performed, however, as is natural since perinatal medicine is quite a new branch of pediatrics, and neonatal hypoglycemia, for example, has only been recognized as a potential cause of perinatal damage since the 1960's. The present longitudinal study on twins, beginning from their birth records and extending up to the age of 12-20 years, offers a unique possibility to examine the causes lying behind the development of submissiveness.

The emergence of sex as the most important factor explaining dominance and submissiveness in twins is easy to understand, as boys are usually physically stronger and the girls' skills lie in the verbal area.

Low birth weight has earlier been seen as an important predictor for submissiveness in twins [6,7], but no difference was found here when studying same-sexed pairs. It was only in the parents' evaluations of the boy-girl pairs that the dominant member proved to have been lighter at birth than the intermediate ones, a result which can be seen to be affected by the sex of the twin as well, in that the girls in such pairs are usually lighter at birth and become the dominant member later. Here, however, the most submissive ones of all were the lightest at birth. The children's own estimations of overall submissiveness were not dependent on sex, although, again, those who now felt themselves to be most submissive had been lightest at birth. This result may indicate some effect of low birth weight on the development of submissiveness, possibly because of some perinatal damage typical of low birth weight infants.

The previous finding of later domination by the first born twin [6,7] was not confirmed here. The second-born twin experiences a longer delivery time than the first-born, and is thus more susceptible to perinatal damage. The present result may indicate the success of modern neonatal units in preventing perinatal damage, and consequently submissiveness.

The information on Apgar scores at 1 min and 15 min had been stored during the perinatal phase of the follow-up study by combining scores of 8-10 and assigning them a value of 8. This reduces the mean values somewhat, but there is no reason to suspect that it alters the relations between the submissiveness classes. As an Apgar score is a continuous variable, it was found reasonable to calculate the results concerning it in terms of mean values and an analysis of variance. The finding that the most dominant twins had the highest Apgar scores supports to some extent the previous hypothesis of possible perinatal damage leading to feelings of insecurity and thus submissiveness, especially in the eyes of the twins themselves.

As twins have a high rate of perinatal morbidity, they make a very suitable population in which to study the later effects of this morbidity, and the development of intertwin dependency relations in the same series has been found to be greatly affected by perinatal complications, which even show a potential cumulative effect when occurring simultaneously [5]. The development of submissiveness in the present series also showed some tendency to be affected by perinatal complications, including the potential cumulative effect of asphyxia and hypoglycemia when occurring simultaneously, as also asphyxia and prematurity. One explanation for such tendencies to be weaker here, may be that these twins are quite often mutually dependent. The development of submissiveness is more complicated, and is mainly affected by sex, temperament and the abilities of the twins, so that perinatal factors show through only in certain cases. Perhaps later research on larger populations will reveal higher correlations concerning perinatal factors affecting the development of submissiveness.

It is natural that development and intelligence should be reflected in dominance between a pair of twins, as seen here concerning motor and speech development and also intelligence according to the WISC. As the results of the Bender test for brain damage did not correlate with the twins' dominance-submissiveness relationships, the twins' skills and temperament evidently have the highest predictive value for this polar intertwin relationship in most cases, and perinatal damage may be implicated only in certain isolated cases.

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