

### 3. A DESCRIPTIVE SYSTEM OF AGGRESSIVE AND NON-AGGRESSIVE BEHAVIOUR

#### 3. 1. Execution of the investigation

##### 3. 1. 1. *Methods*

For the same reason as in Part I (p. 46) the method chosen for gathering the material for the study of aggressive and nonaggressive behaviour was that of rating. As an investigation was preferred of somewhat older children than those (aged 5—6) studied in Part I, particularly on account of the analysis for verbal responses in Problem B, the rating method was to be adapted for a study of those of school age. The relationship between a child and his teacher changes as the child leaves the kindergarten and starts going to school. For this reason the situations become less frequent in which a teacher can make observations of a child's spontaneous behaviour.

In many cases peer ratings furnish more useful information than teachers' ratings (Cronbach, 1960). Although, according to the studies by Tuddenham (1952), Walker (1967), Werdelin (1966), et al., the intercorrelations of peer ratings and teachers' ratings of different personality traits are fairly high, the assumption can be made that particularly in ratings of aggressive behaviour peers' observations cover a greater variety of roles and stimulus conditions than teachers' ratings. In a school milieu it is difficult to obtain ratings of pupils from more than one teacher, and therefore the reliability of ratings often remains unestimated. The employment of peer rating eliminates this problem. And as Walker (1967) has proved that after one year's interval the scale scores for peer ratings are more stable than those for teachers' ratings, *peer rating* was the very method chosen in advance by which the subjects for the study of Problem B were to be selected. The peer rating method was modified from the Guess-who technique originally presented by Hartshorne & May (1929), the details of which are given in Chapter 3. 1. 3. *Teacher rating* was employed along with peer rating in order to find out the invariance of the descriptive system when the groups of raters and methods of rating are varied. As in Part I, the main emphasis was given to boys' aggressive behaviour, but since the school classes consisted of boys and girls, it was appropriate, for the practical adminis-

tration of the tests, to gather the material for Problem A so as to involve both sexes.

Variables for the main dimensions of the descriptive model (Figure 4, p. 107) were included both in peer ratings and in teachers' ratings. In addition, the subjects were given the *Junior Eysenck Personality Inventory* developed by Eysenck (1965) as the version (*Junior NESI*) translated and modified by Mäkinen in the Institute of Psychology of the University of Jyväskylä, and the *Personality Inventory for the Lower Forms of the Primary School (KTK 1)*<sup>1</sup> standardized by Ylinentalo (1965, 1967) from the personality questionnaire developed by Cattell and Coan (1959). Self-ratings have usually (Walker, 1967; Werdelin, 1966) correlated rather poorly with peer ratings and teachers' ratings, wherefore the value of the inventory scales as reference variables was not expected to be very high. But since the two-dimensional descriptive model is, on the basis of previous investigations (Eysenck, 1960, 1967; Kline, 1967; Gorsuch & Cattell, 1967; Konttinen, 1968) as useful in the description of common variance of questionnaire variables as in that of rating, this measurement technique was employed here along with the method of rating.

The methods of study for Problem B are given in Chapter 4. 1.

### 3. 1. 2. *Subjects*

The subjects were drawn from the second-grade pupils of the elementary schools in Jyväskylä as a sample of classes. The number of classes under investigation was 12 (out of 28). They represented three schools. One of them was located in the town center, and all of its six second-grade classes were included in the sample. The other two schools were located in the suburbs, and of them six classes were drawn at random. All of the classes were mixed. The subjects of the investigation comprised 183 boys and 169 girls.

The choice of the subjects from the above mentioned subject group for the examination of Problem B is explained in Chapter 4. 3. 1.

### 3. 1. 3. *Variables and procedures*

The ratings consisted of variables for aggressive and nonaggressive behaviour as well as reference variables concerning the main dimensions of the descriptive model.

The sampling of the aggression variables was performed by employing the descriptive model of aggression presented in Part I. The content categories were constructed by varying the direction, aim and mode of aggression, and twelve variables were chosen to represent them. The variables were formulated by applying some of the previous investigations in which the method of peer rating has been employed (Lesser, 1959; Walder et al., 1961; Banta & Walder, 1961; Wiggins & Winder, 1961; Takala et al., 1964; et al.).

<sup>1</sup> KTK 1 is the only personality inventory standardized in Finland for subjects of this age.

In the sampling of the nonaggression variables an attempt was made to take into account, according to the hypotheses, controlled expression of impulses as well as controlled and uncontrolled inhibition of impulses. The total number of nonaggression variables was 12 (Appendix A. 2).

The reference variables were chosen for the dimensions 'number of overt responses' and 'control of behaviour'. In addition, two variables were selected on the basis of the results of the factor analysis carried out by the writer from the peer rating material gathered by Takala et al. (1964). One of them was thought to be a good measure of socially acceptable activity, and the other of anxiety. Two variables were chosen for secondary motivation of aggression. They were assumed to correlate positively with the habit of offensive aggression.

The above mentioned variables (33) were given as concrete a formulation as possible in order to make their meaning unambiguous. In the teachers' ratings the variables were exactly similar. In addition, the teachers were asked to rate the subjects' impulsiveness, anti-social behaviour, excessive withdrawal, and stable general impression. In order to obtain information about the subjects' school achievements the teachers were asked to rank their pupils, and for the rating of the social status the profession of each pupil's father (mother) was requested.

For *peer rating* a block was prepared for each subject with 35 similar pages numbered 1—35. Thus an answer was given to each question on a separate page (the two first tasks were exercises). The girls' blocks contained the first name and, if necessary, the first letter of the surname of each girl in the class, duplicated in capital letters. The boys' blocks contained the name of each boy in the class correspondingly.

In the instruction<sup>1</sup> the number of peers to be chosen for each question was left relatively undefined, although stress was laid on the importance of at least three names in each answer. According to Bjerstedt (1963), lower-grade pupils are usually capable of making at least three choices. A fixed number was not considered necessary, since (1) the aim was to separate in each question the potential extreme individuals from the whole sample, (2) the sizes of the groups varied 12—21 from class to class, and (3) some forms of aggression may, particularly in girls' behaviour, be so unusual that answering with a fixed number of choices would have proved difficult, and would consequently have strengthened the halo effect.

In order to motivate the subjects they were promised sweets after testing provided that they had performed their task carefully. In each class the material was gathered by the writer. The ratings took one lesson.

In *teacher rating* the questions as well as the response blocks were the same as in peer rating. The procedure was, however, different. Girls and boys were rated separately by writing number 3—0 after the name of each pupil. Number 3 was to be given to those pupils in whom the characteristic in question was very prominent, i.e., only to extreme individuals, and 0 to those pupils in whom the teacher had never observed the characteristic in question. The behaviour of the girls/boys was to be compared with that of girls/boys of the same age in general.

The time allowed for rating was two weeks at the teachers' wish, since in

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<sup>1</sup> The instruction is obtainable mimeographed.

many cases rating required more accurate observations of the pupils' behaviour than the teachers had at the time of peer rating. To obtain more material the teachers made observations of their pupils voluntarily during breaks.

*Personality inventories: Junior NESI.* The original version of The Junior Eysenck Personality Inventory consists of 60 items, of which 24 measure neuroticism, 24 extraversion, and 12 constitute a lie scale. Mäkinen has prepared additional items to this inventory and divided the extraversion scale into two subscales called impulsive extraversion and social extraversion (Eysenck & Eysenck, 1963). Within the present investigation the total number of items was 94, of which 31 measured neuroticism, 20 social extraversion, 26 impulsive extraversion, and 17 constituted a lie scale.

The Personality Inventory for the Lower Forms of the Primary School (*KTK 1*) consists of 108 items divided into 12 scales so that each of them consists of 9 items. The scales are presented in Appendix A. 2.

The inventories were administered to the school classes orally by the writer. The answers were recorded by the subjects on separate answer sheets. The answers to Junior NESI are given on a yes-no basis. In *KTK 1* there are two alternatives of which one (a or b) is chosen. Example: »Question 1, Which would you prefer, a) playing schools or b) playing cowboys and indians?» In the instructions special stress was laid on personal answers. Those who would concentrate on the task carefully were promised some sweets after the test.

Each inventory required one lesson. They were given at an interval of at least three days. The order in which they were given varied from class to class. On the first day peer rating was carried out after the presentation of the inventory and a break. The tests were performed during the first lessons of the day. The material was gathered in the middle of the spring term 1968.

### 3. 1. 4. *Reliability of the variables*

*Reliability of the ratings.* In order to estimate the reliability of the peer ratings both the girls and boys in each class were divided into two arbitrary subgroups. The distribution of choices was studied in each subgroup. The subjects' subscores, i.e. the number of choices given to them in each variable, were expressed in percentages of the maximum number of choices (of the number of subjects in subgroup — 1). The correlation coefficients were calculated between the percentages in order to estimate the agreement of the subgroups in their choices. The reliabilities for the ratings were estimated by correcting the correlations according to the Spearman-Brown formula (McNemar, 1955).

The agreement of the teachers' ratings and peer ratings was estimated by correlating the scores for the teachers' ratings with the total scores for the peer ratings expressed in percentages. The boys' peer ratings, particularly those concerning aggressive behaviour, were on the average more reliable than the girls' ratings (Table 11). The median of the reliability coefficients for the boys was .75, which can be considered satisfactory as far as the interpretation of the results is concerned, and which corresponds to those obtained by Tuddenham (1952), Walker (1967), et al. The median for the girls was .66. The lowest reliability (+.22 — +.30) was that of variable 16 (find it a joke if somebody

Table 11. The reliabilities and means<sup>1</sup> for the ratings

Variables	Peer ratings				Teachers' ratings			
	Reliability		Mean %		r with peer ratings		Mean	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Aggression								
1. Hurt	.87	.68	20.1	18.0	.71	.23	0.78***	0.20
2. Wrangle	.69	.54	19.2	20.6	.46	.21	0.78***	0.46
3. Sulk	.72	.47	18.4	20.7	.26	.18	0.57	0.54
4. Tease smaller peers	.85	.67	19.7	16.6	.55	.34	0.77***	0.29
5. Displaced toward objects	.73	.64	16.2	16.2	.39	.15	0.46***	0.20
6. Tease behind smby's back	.82	.61	20.6	18.5	.46	.26	0.70***	0.29
7. Sneak	.70	.66	19.3	22.9	.46	.49	0.81	0.65
8. Attack	.83	.64	21.0	17.3	.57	.02	0.59***	0.14
9. Say naughty things	.76	.62	19.5	19.7	.68	.19	0.58***	0.26
10. Make faces	.80	.68	19.4	18.3	.50	.22	0.66***	0.24
11. Take possessions	.86	.61	15.6	16.0	.48	.15	0.27	0.11
12. Tell lies	.79	.69	20.4	21.4	.51	.26	0.63*	0.42
Nonaggression								
13. Act reasonably	.77	.69	20.5	24.5	.43	.40	1.27	1.58**
14. Negotiate	.45	.41	20.5	23.6	.34	.32	1.22	1.56**
15. Side with smaller	.77	.76	19.9	24.2	.47	.37	1.08	1.23
16. Find attack a joke	.30	.22	18.9	20.7	.03	.04	0.99	0.85
17. Peaceable	.71	.75	20.5	25.1	.59	.37	1.28	1.69***
18. Reliable	.75	.78	19.4	23.9	.52	.42	1.31	1.59**
19. Quit	.65	.60	20.7	27.0	.51	.24	1.25	1.54**
20. Never quarrel	.74	.77	19.2	24.7	.47	.26	1.28	1.63***
21. Cry if treated nastily	.80	.69	16.3	18.6	.40	.38	0.64	0.73
22. Afraid of others	.61	.47	16.5	16.7	.30	.24	0.53	0.49
23. Apologize	.52	.51	18.3	23.5	.21	.26	1.09	1.13
24. Plan revenge	.43	.53	20.4	22.2	.37	.20	0.66**	0.44
Reference variables								
25. Be busy and play	.50	.48	24.0	25.0	.35	.40	1.56	1.67
26. Silent	.75	.58	19.4	21.8	.26	.51	0.83	0.96
27. Labile	.73	.52	21.5	22.1	.34	.29	0.85**	0.65
28. Always friendly	.59	.56	20.4	26.4	.42	.37	1.38	1.54
29. Fit for leadership	.82	.75	21.7	23.2	.59	.58	0.89	0.97
30. Unfit for leadership	.82	.78	23.8	24.2	.31	.51	1.34	1.18
31. Cry at the dentist's	.75	.77	17.1	18.6	.44	.33	0.87	0.61
32. Disobey the teacher	.89	.73	18.1	18.1	.67	.45	0.69***	0.17
33. Make fun	.79	.42	20.4	20.4	.60	.27	0.85***	0.38
36. Anti-social symptoms							0.39*	0.19
37. Too withdrawn							0.36	0.61*
38. Unsteady							0.95***	0.54
39. Stable general impression							1.77	1.82

<sup>1</sup> There were few significant differences between the variances.

\* The difference between the means for boys and girls significant at .05 level,

\*\* at .01 level,

\*\*\* at .001 level.

Table 12. The reliabilities, means, and standard deviations for the scales of KTK 1 and Junior NESI

a) KTK 1	Reliability		Ylimentalo		Pitkänen		
	1	2	Boys N=130	Girls N=140	Boys N=183	Girls N=169	
				M			
46. Masculinity vs. femininity (—)	.89	.91	M	2.77	7.34	2.35	6.64
			$\sigma$	1.90	1.24	1.76	1.66
47. Anxiety	.35	.56	M	4.36	5.10	4.54	5.71
			$\sigma$	1.77	1.48	1.91	1.50
48. Fearfulness	.37	.50	M	2.77	2.47	2.68	2.75
			$\sigma$	1.63	1.53	1.56	1.73
49. Attitude toward school	.69	.57	M	4.62	2.43	4.67	2.62
			$\sigma$	2.11	1.58	1.95	1.72
50. Dominance vs. submissiveness (—)	.68	.80	M	4.39	7.04	4.36	6.75
			$\sigma$	1.98	1.36	1.71	1.68
51. Self-confidence vs. inferiority feelings	.62	.49	M	4.85	5.04	4.63	4.59
			$\sigma$	1.94	2.04	1.89	2.00
52. Altruism vs. egoism	.69	.61	M	5.40	6.91	5.45	6.54
			$\sigma$	2.14	1.73	1.86	1.80
53. Emotionality	.67	.37	M	5.45	6.16	5.61	6.17
			$\sigma$	2.20	2.08	2.27	2.26
54. Restlessness	.73	.66	M	3.63	2.04	3.28	1.64
			$\sigma$	2.07	1.56	2.09	1.46
55. Sensitivity	.45	.49	M	7.00	5.65	7.28	5.85
			$\sigma$	1.50	1.64	1.47	1.69
56. Co-operativeness	.28	.26	M	5.59	6.14	5.58	5.56
			$\sigma$	1.69	1.66	1.72	1.89
57. Dependency	.65	.56	M	5.48	7.42	5.44	7.27
			$\sigma$	2.21	1.37	1.96	1.55

b) Junior NESI	Reliability		Mean		Standard deviation	
	Boys	Girls	Boys	Girls	Boys	Girls
42. Neuroticism	.83	.81	13.81	13.42	6.25	6.03
43. Lie scale	.71	.63	7.89	9.62	3.70	3.34
44. Impulsive extraversion	.33	.51	11.60	8.63	3.80	3.23
45. Social extraversion	.16	.24	11.84	11.73	2.35	2.67

1 = split-half reliabilities  
2 = test/retest reliabilities

attacks), the peer ratings of which, likewise, did not correlate with the teachers' ratings.

The correlations between the teachers' ratings and the boys peer ratings were, on the average, higher than those between the teachers' ratings and the girls' peer ratings. The median of the correlations for the boys was +.46 and for the girls +.29. The girls' and teachers' ratings of the girls' aggressive behaviour correlated especially poorly with each other.

The differences between the means for the girls' scores and those for the boys' scores, obtained by teacher rating, were significant in several variables regardless of the instructions. The differences between the means for the boys' and girls' scores, obtained by peer rating, expressed in percentages, were not, however, significant. This could have been the case, because the number of choices was not strictly defined in the instructions.

*Reliability of the personality inventories.* The reliabilities for the scales included in *KTK 1* have been estimated by Ylinentalo (1967) for the corresponding age level in connection with the standardization of the inventory. The methods employed had been 'split half' and 'test/retest' (interval one year), and an analysis of the inner consistency of the scales had been made. The split half and test/retest reliabilities for the scales, as well as the means and standard deviations for the responses of the second-grade pupils obtained by Ylinentalo and those obtained by the writer, are presented in Table 12 a.

The means for the boys in each scale as well as the intercorrelations of the scales were very much the same in both investigations. More variation occurred in the means for the girls.

For *Junior NESI* the split half reliabilities were estimated as shown in Table 12 b. The reliability coefficients for the neuroticism and lie scales corresponded to those obtained by Eysenck (1965) for subjects aged 8 (neuroticism scale: boys .79, girls .80; L-scale: boys .64, girls .67), but the extraversion scales, the social extraversion scale in particular, proved to be more unreliable in the present investigation (in Eysenck's study: boys .58, girls .63), which may be due to the fact that the inventory is in Finland still under standardization, and the scales employed here were preliminary versions.

### 3. 1. 5. *Analysis of the results*

The first problem of the investigation dealt with the two-dimensional description of aggressive and nonaggressive behaviour. Four samples were gathered for the solution of the problem. The  $55 \times 55$  intercorrelation matrices of the following variables were calculated as product moment coefficients:

- a) The boys' peer ratings in the 33 variables (1—33, Appendix A. 2). The subjects' scores, i.e. the number of choices given to them in each variable, were expressed as percentages of the maximum number of choices (of the number of subjects in group —1). In addition, the battery included the 6 teachers' ratings of the boys (36—41) and the 16 scales of the personality inventories (inventory scales 42—57).
- b) The corresponding variables for the girls' peer ratings, teachers' ratings of the girls, and inventory scales.
- c) The teachers' ratings of the boys in the 39 variables, and the boys' scores for the 16 inventory scales.

- d) The corresponding variables for the teachers' ratings of the girls and the girls' scores for the inventory scales.
- e) The  $55 \times 55$  matrix of the average intercorrelations was obtained from the matrices a—d through the  $r$  to  $z$  transformation developed by Fisher (McNemar, 1955).

The matrix of the average intercorrelations was factor analysed by the principal factor method. As the descriptive model being tested was two-dimensional an examination was first made into how the common variance of the variables can be described in terms of the first two factors (cf. p. 52). The loadings of the variables on the first principal factor were plotted graphically against those on the second principal factor. This figure was the starting point of the examination of Hypothesis A.

In order to study the invariance of the two-dimensional structure with different raters and subjects of different sexes, four factor analyses were carried out. All the analyses involved the 33 rating variables. The inventory variables were included in the same batteries as the peer ratings:

- a<sup>1</sup>) the boys' peer ratings and scores for the inventory scales (33 + 16),  
 b<sup>1</sup>) the girls' peer ratings and scores for the inventory scales (33 + 16),  
 c<sup>1</sup>) the teachers' ratings of the boys (33 + 6),  
 d<sup>1</sup>) the teachers' ratings of the girls (33 + 6).

The factor structures of both the aggression and nonaggression variables were analysed separately from each sample (a—d). The purpose was to examine the proportion of the common variance of both the aggression and nonaggression variables explained by the two main dimensions of the descriptive model, i.e., to examine what other dimensions can be found to explain the interindividual differences.

The problem of explaining the common variance was also studied at a more general level of description, by rotating the factor matrix extracted from the average intercorrelations by the varimax method with different numbers of factors. An attempt was herewith made to take all the common factors into account.

In the research project peer rating was chosen as the very method by which to choose the subjects for the study of Problem B. In order to obtain information about the invariance of the factor structure of the 33 ratings with different raters and subjects of different sexes, the boys' and girls' peer ratings as well as the teachers' ratings of the boys and girls in the 33 variables were factor analysed separately. The invariance of the factor configurations was investigated through a symmetric transformation analysis model (Mustonen, 1966).

## 3. 2. Results

### 3. 2. 1. *Structure of the variables in terms of two main dimensions*

#### 3. 2. 1. 1. The main dimensions

It was predicted in Hypothesis A (p. 107) that the habits of aggression and nonaggression adopted for coping with thwarting situa-



tions may be described in terms of two orthogonal dimensions called number of overt responses and control of behaviour.

In the factor analysis from the average intercorrelations (p. 121) eight factors were extracted. Their proportion of the total original (estimated) communality was 97.2 %. The corresponding percentage for the first two principal factors was 57.0. The first two factors extracted from the four samples (a<sup>1</sup>—d<sup>1</sup>, p. 121) accounted for larger percentages (60.8 %—71.5 %) of the total variances than those extracted from the average intercorrelations, particularly when the inventory scales were excluded from the battery (from the batteries c<sup>1</sup> and d<sup>1</sup> concerning teachers' ratings, p. 121).<sup>1</sup>

The eigenvalues of the factors were sharply reduced after the first factor. The differences between the eigenvalues of the second and third factor were not great. A similar reduction in the eigenvalues was found in the different samples. After the fourth factor the eigenvalue percentages of the number of variables remained altogether rather small, smaller than 3.5.

For a study of the correspondences between the principal factors Tucker's coefficients of congruence (Harman, 1967, p. 270) were calculated between the corresponding factors extracted from the different samples (example: comparison between samples a<sup>1</sup> and b<sup>1</sup>: I/I; II/II; . . . ; VII/VII) over the common variables of the samples under comparison.<sup>2</sup> The most stable factor was the first principal factor (.90 — .99); more variation could be found in the coefficients of congruence for the other factors. According to Tucker (Harman, 1967, p. 271), a value under .46 for a coefficient of congruence does not indicate similarity between a pair of factors. This criterion value was exceeded by the coefficients for the first five factors in the comparison between the teachers' ratings of the boys and girls, and also in that between the boys' and girls' peer ratings. In the comparisons between the peer ratings and the teachers' ratings the criterion value was exceeded only by the coefficients for the first three factors. The difference between the above results of the teachers' ratings and peer ratings was possibly due to the fact that the inventory scales were excluded from the batteries in which the teachers' ratings were included.

On the basis of the coefficients of congruence it can be expected that dimensions spanned by the inventory scales are not included in

<sup>1</sup> The table presenting the eigenvalues of the factors is obtainable mimeographed.

<sup>2</sup> The table is obtainable mimeographed.

the structures of the rating variables. A detailed examination and interpretation of these dimensions is presented in Chapter 3. 2. 2.

A considerable proportion of the common variance was accounted for by the first two factors (57—72 %). The coefficients of congruence also indicated that the first two principal factors were very stable with different raters, methods, and subjects of different sexes. The variables were plotted on a plane on the basis of their loadings on the first two principal factors (Figure 6; average intercorrelations).

In Figure 6 the axes are rotated to a position in which the y-axis is parallel with the line which goes through the pair of reference variables (25, 26) representing the number of overt responses. The original position of the axes is shown by a dotted line.<sup>1</sup>

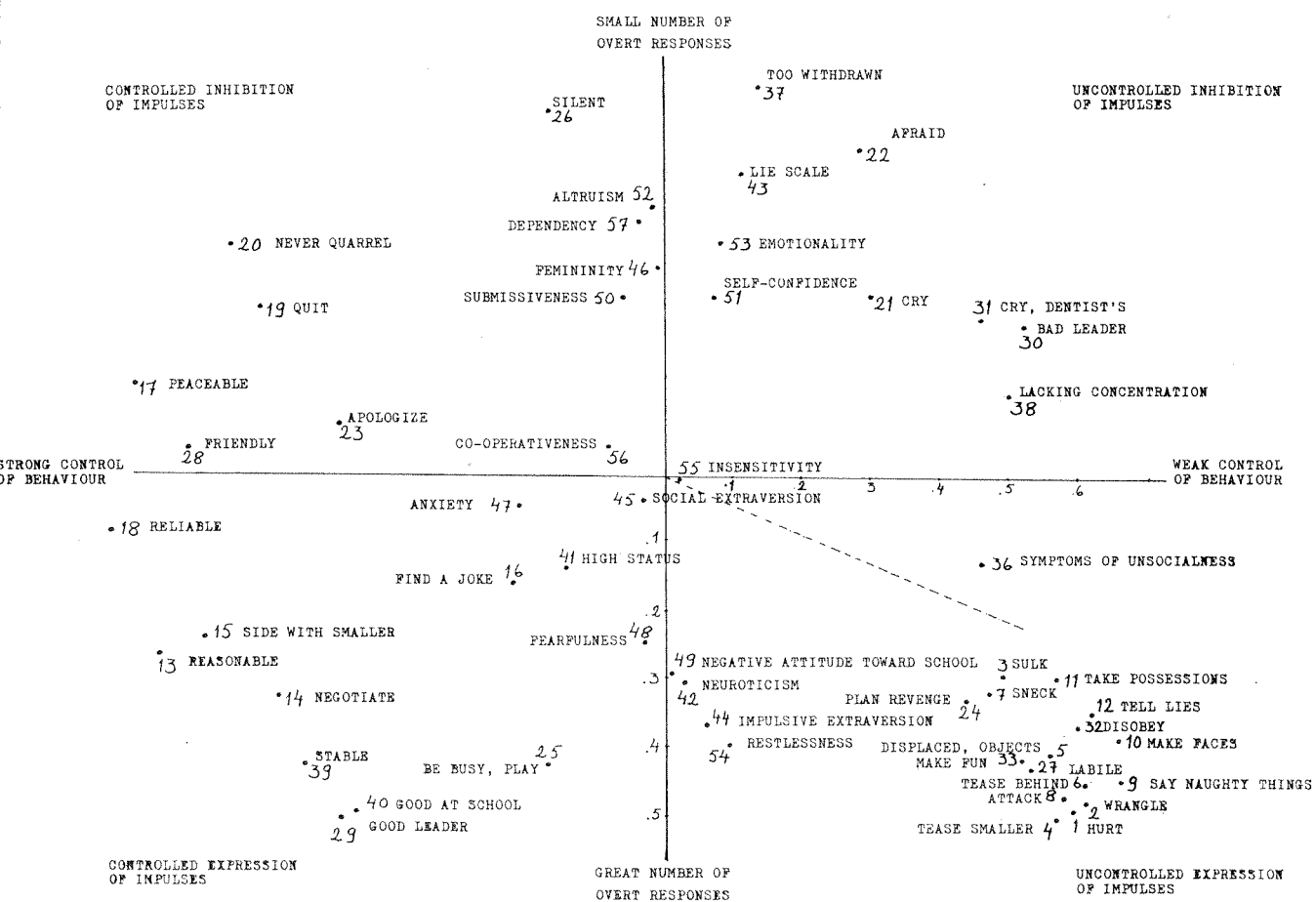


Figure 6. The variables plotted on a plane on the basis of the first two principal factors, average intercorrelations.

<sup>1</sup> The two-dimensional figures for the different samples ( $a^1$ — $d^1$ ) are obtainable mimeographed. Rotations of the same size are made in these figures.

The variables were divided among all the quadrants in Figure 6, which supports Hypothesis A. When rotated according to the variable pair (25, 26) representing the number of overt responses, the axes were interpretable on the basis of the highest loadings as the dimensions '*number of overt responses*' and '*control of behaviour*'.

A *great number of overt responses* was manifested both by the variables for socially acceptable behaviour and by those for less acceptable behaviour. This pool of the dimension was spanned not only by its reference variable (be busy and play with others), but also by the aggression variables, the reference variables for secondary motivation of behaviour, fitness for leadership, good school achievement, and negotiation in conflict situations. Of the inventory scales restlessness (KTK 1) and impulsive extraversion (Junior NESI) had the highest loadings.

The pool of the dimension '*small number of overt responses*' was spanned not only by its reference variable (be silent and not care to be busy) but also by excessive withdrawal rated by a teacher, fearfulness, and nonparticipation in quarrels. Of the inventory scales the highest loadings were found in the lie scale (Junior NESI), altruism, dependency, cheerfulness, and femininity (KTK 1).

The other axis constituted the dimension '*control of behaviour*', as expected. One pool of it was loaded by the variables of disobedience to the teacher, making fun in order to attract attention, symptoms of antisocialness, unsteady attentiveness, unfitness for leadership, inclination to cry, and fearfulness. The axis connected the patterns of behaviour of uncontrolled expression and inhibition of impulses as expected. According to the hypothesis, the common components of the variables were interpretable as *weak control of behaviour*. The reference variable (27, labile) for weak control of behaviour did not prove independent of the number of overt responses. It is possible that the reference to occasional touchiness had directed the ratings toward aggressive behaviour more than intended. It is also probable that observable changes of mood generally correlate with an abundance of overt responses. Weak control of behaviour as a characteristic independent of the dimension '*number of overt responses*' might be better operationalized by a more general rating variable for unreliability.

*Strong control of behaviour* independent of the number of overt responses was measured by reference variable 28 (try to be always friendly), and also by reliability, peacefulness, nonparticipation in quarrels, reasonableness of action, negotiation in conflict situations, and siding with smaller and weaker peers which represents socially

acceptable aggression. The inventory scales had no significant loadings on the dimension 'control of behaviour'.

As far as the interpretation of the axes is concerned, the results of the different samples corresponded to each other and also to the results based on the average intercorrelations, although differences could be found in the loadings of individual variables.

Of the reference variables it can be said that the teachers' ratings of the number of overt responses were more independent of the dimension 'control of behaviour' than the corresponding peer ratings. In the girls' ratings the variable of being busy and playing with others (25) was coloured by strong control of behaviour, whereas in the boys' ratings low activity (26) correlated with strong control of behaviour. In the teachers' ratings fitness and unfitness for leadership (29,30) correlated with the number of overt responses and were more independent of the dimension 'control of behaviour' than in the peer ratings. According to the peer ratings, unfitness for leadership (30) was very closely connected with weak control of behaviour.

A considerable proportion of the common variance of the variables could be described in terms of the dimensions 'number of overt responses' and 'control of behaviour', as hypothesized. The principal factors themselves could not be identified as the hypothesized main dimensions; they could be described in terms of combinations of these dimensions. The above interpretation was based on the orthogonal rotation of the axes.

### 3. 2. 1. 2. Structure of nonaggressive behaviour

It was predicted in Hypothesis A that the habits of aggression and nonaggression adopted for coping with thwarting situations can be classified into controlled expression, controlled inhibition, and uncontrolled inhibition of impulses.

*Controlled expression of impulses* was assumed to be the kind of behaviour characterized both by a great number of responses and by strong control of behaviour. As hypothesized, the variables in the quadrant of these reference axes were.

13. try to act reasonably even in annoying situations
14. think that if one negotiates, everything will be better
15. side with smaller and weaker peers (socially acceptable aggression)
16. think that it is just a joke if somebody attacks.

The lowest loading was that of variable 16, which was also the least reliable. The variable had more common variance with the other variables of the same group in the teachers' ratings than in the peer ratings.

Controlled expression of impulses was assumed to be motivated by an individual's desire to behave in a socially acceptable manner. Observations of overt behaviour can furnish information about an individual's motives only indirectly, but the study of Problem B is expected to give additional support to the assumption. The study also deals with the assumptions on the background factors of this pattern of behaviour.

There were differences between the samples in the division of the variance of variables 13—16 among the dimensions 'number of responses' and 'control of behaviour'. In general, strong control of behaviour accounted for a larger proportion of the variance than a great number of overt responses (particularly in the teachers' ratings of the boys). The distribution of the variance was most even in the teachers' ratings of the girls.

*Controlled inhibition of impulses* was assumed to represent the kind of behaviour most contrary to aggression, i.e. strong control of behaviour and a small number of overt responses. The variables chosen to measure this pattern of behaviour were

17. be peaceable and patient
18. be a reliable classmate
19. dislike squabbling company and leave it for something else
20. never quarrel with others.

All the forms of behaviour were emphasized more by strong control of behaviour than by a small number of overt responses, possibly because of the halo effect which had heightened the intercorrelations of favourable traits. With the exception of the variable of reliability (18) the cluster differed, however, from that of controlled expression of impulses and represented behaviour most contrary to aggression, as hypothesized.

The hypotheses included the assumption that in an individual characterized by controlled inhibition of impulses awareness of the emotional state is blocked by cognitive appraisal of the situation. The observations of overt behaviour can support the assumption only indirectly; appreciable weakness of aggressive habits suggests that arousal of anger and the expressive responses connected with it have not been conditioned to thwarting situations, which in turn implies that an individual is capable of controlling his emotional arousal. Although the weakness of aggressive habits may reduce the frequency of conflict situations cumulatively, it is unlikely that any member of a group of children could completely avoid stimuli that instigate aggression. The study of Problem B is expected to give additional support to the above assumption.

As in controlled expression of impulses differences could be found between the samples in the amount of the variance of variables 17—20 accounted for by the main dimensions. The interindividual differences in the dimension 'number of overt responses' had been organized most clearly in the teachers' ratings of the boys. The slightest proportion of the variance explained by the dimension 'small number of overt responses' was found in the girls' peer ratings.

*Uncontrolled inhibition of impulses* was assumed to include avoidance responses with negative affects, anxiety, and intentions of revenge. Of the variables

21. start easily crying if others treat nastily
22. be afraid of other children
23. apologize readily even if have done nothing very wrong
24. think of revenge but never do anything

only the first two measured the characteristics of small number of overt responses and weak control of behaviour as expected. Contrary to expectations, variable 23, which had been assumed to measure aggression anxiety, correlated with strong control of behaviour. The relationship was interpretable either in terms of the habits of socially approved behaviour or by considering the aspect on the hypothesized psychic processes underlying overt behaviour. Readily arising feelings of guilt possibly ensue from intensive attempts to suppress (not only to inhibit) impulses of aggression. The latter interpretation was supported by the fact that variable 23 had more common variance with controlled inhibition than with controlled expression of impulses.

Variable 24, which had been assumed to describe the process of anger arousal but inhibition of aggressive expressions, correlated with the variables for aggressive behaviour in all of the samples, probably because it is difficult for an outsider to make valid observations of an individual's emotional reactions. An analysis of the subjects' verbal responses to thwarting stimuli, presented in the study of Problem B, is assumed to provide further information about inhibition of the extrinsic aspect of impulses.

In spite of the location of some individual variables in the *two-dimensional* figures contrary to assumptions, *the results supported Hypothesis A as regards the nonaggressive patterns of behaviour.*

As a considerable proportion of the common variance was ignored in the two-dimensional description, the question arose whether such further, possibly essential, interdependences of the variables occur which cannot be found if the number of factor analysed variables is

great. In order to solve the problem *the nonaggression variables (13—24) were factor analysed separately in each sample.*

The first two principal factors, whose proportion of the total original communality was, in the different samples, 79—89 %, could be given the same interpretation as those extracted from the average intercorrelations. The first factor could be identified as the dimension 'control of behaviour' (the variables for controlled expression and controlled inhibition of impulses had loadings of the same sign; the opposite sign was in the loadings of the variables for inclination to cry and fearfulness), and the second as the dimension 'number of overt responses' (controlled and uncontrolled inhibition of impulses had loadings of the same sign; the opposite sign was in the loadings of the variables for controlled expression of impulses and for intentions of revenge).

The total original communality was explained by four factors (Table 13). The first three factors extracted from the different samples corresponded to each other. The composition of the fourth factor varied according to the groups of raters.

*Factor I* was interpreted as *controlled expression of impulses*. The factor had common variance with controlled inhibition of impulses and with variable 18 in particular. The common variance could be interpreted as a consequence of strong control of behaviour.

*Factor II* represented *uncontrolled inhibition of impulses* and it was slightly bipolar with controlled expression of impulses. In the boys' peer ratings a proportion of the variance of variables 23 was explained by Factor II as expected.

*Factor III* contained *controlled inhibition of impulses*. A contrary variable was that of intentions of revenge, which behaved in the same way as the aggression variables in the factor analysis from the average intercorrelations.

*Factor IV* extracted from the peer ratings was spanned by variables 24 (think of revenge) and 16 (think it is just a joke if somebody attacks), and the factor extracted from the teachers' ratings by variables 16 and 23. Figure 7 suggests that Factor IV extracted from the peer ratings was coloured by aggression, and that extracted from the teachers' ratings by strong control of behaviour. A possible explanation of the specific Factor IV extracted from the peer ratings is the fact that in children's aggression intentions of revenge may be more transient and playful than in adult behaviour, for which reason variables 16 and 24 have had specific common variance.

The separate analysis for the nonaggression variables did not yield additional dimensions essential to the interpretation. The common variance was explained by the first three factors as the two-dimensional structure suggested. The dependences revealed by the fourth factor were rather specific.





### 3. 2. 1. 3. Structure of aggressive behaviour

It was predicted in Hypothesis A that the variance of the aggression variables is divided among the main dimensions as follows. (1) Indirect aggression is most independent of the dimension 'number of overt responses' but represents weak control of behaviour; (2) direct defensive aggression without offensive aggression represents a great number of overt responses but is relatively independent of the dimension 'control of behaviour'; and (3) offensive aggression and intense defensive aggression connected with it represent both a great number of overt responses and weak control of behaviour, i.e., most clearly: uncontrolled expression of impulses.

The aggression variables plotted on a plane on the basis of the first two principal factors (Figure 6) were located as expected in the quadrant of the dimensions 'weak control of behaviour' and 'great number of overt responses'. The common variance of the aggression variables was strong, and the figure indicated that only some of the assumed differentiation took place. The structure of the variables differentiated, however, when the aggression variables were factor analysed separately, as shown below.

There were slight differences between the aggression variables in the dimension 'number of overt responses': the variables closest to the axis of weak control of behaviour were 11 and 12 for indirect offensive aggression, 7 and 5 for indirect defensive aggression, and 3 and 10 for mimic aggression. The highest loadings on the dimension number of overt responses were found in the variables for direct physical and verbal defensive aggression (1 and 2), direct physical and verbal offensive aggression (8 and 9), and, contrary to the hypothesis, in variables 4 (tease smaller and weaker classmates when angry at something) and 6 (tease others when they do not notice). Variables 4 and 6 had been assumed to measure indirect defensive aggression, but they were probably more emphasized by offensive aggression. In the formulation of the variables (4,6) it would have been appropriate to lay stress on displacement of aggression (e.g., tease smaller peers when dare not be cross at the original instigator), but as complex formulations of the variables were avoided, this perhaps necessary epithet was excluded.

The location of the aggression variables in the two-dimensional figure was as a whole similar for the different samples, but some differences occurred between the individual variables. The greatest of them concerned the variable of sneaking (7): sneaking suggested uncontrolled inhibition of impulses more clearly in boys' than in girls' behaviour. It is possible that sneaking has a greater

component of prosocial aggression (worry about observance of directions) in girls' than in boys' behaviour, wherefore in girls' behaviour this form of aggression does not indicate general lack of behavioural control.

*The structure of the aggression variables* was studied also by carrying out a *separate factor analysis for variables 1—12 in each sample*. In order to make the relations of the factors to the reference axes interpretable, variables 25 (be busy and play eagerly during breaks and after school hours) and 31 (cry easily e.g. at the dentist's) were also included in the factor analyses. Of the variables common to all the samples 31 had the most stable location close to the axis of weak control of behaviour.<sup>1</sup>

The total original communality was explained by four factors (Table 13, p. 129). The rotated factors for the boys' peer ratings and the teachers' ratings of the boys corresponded well. The fourth factor extracted from the girls' peer ratings had no corresponding factor in the other samples.

*Factor I* was very general for all the samples. The order of the variables on the basis of the average loadings is given below.

	Average loadings
8. Attack without reason . . . . .	.80
4. Tease smaller and weaker peers when angry . . . . .	.78
6. Tease others when angry when they do not notice . . . . .	.78
1. Hurt another child when angry . . . . .	.70
9. Say naughty things to other children . . . . .	.70
11. Take other children's possessions . . . . .	.67
5. Displaced toward objects . . . . .	.62
10. Keep sneering at others . . . . .	.61
12. Exaggerate or tell lies about other children . . . . .	.60
2. Quarrel with others for a slight reason . . . . .	.53
3. Start sulking easily . . . . .	.36
7. Sneak . . . . .	.28

Compared with the aggression factors obtained in Part I, the largest proportion of the variance of the general aggression factor was explained by offensive aggression and intense defensive aggression connected with it. The loadings were, however, also high in most other variables, particularly in those for indirect aggression. In Part I global rating of the trait of aggressiveness was determined by the habit strength of both offensive and indirect aggression, which also had the highest loadings in the dimension of the intensity of aggression (Figure 2). Factor I was thus interpretable as a *general aggression factor*.

*Factor II*. The largest proportion of the variance of the reference variable 31 (cry easily e.g. at the dentist's) was explained by Factor II. Of the aggression variables the ones most closely connected with it were displacement of aggression toward objects in the environment, sulking, sneaking, and sneering. The other variables for verbal aggression also had relatively high loadings. Variables

<sup>1</sup> The mimeographed figures, see footnote p. 123.

4 and 6 for indirect defensive aggression were not included in the factor except in the teachers' ratings of the girls (see p. 130).

The variance of the aggression variables, revealed by Factor II and independent of the general aggression factor, contained both indirect display of aggression and attempts to inhibit aggression (sulk) so apparently that the factor could be considered as meeting the expectations concerning *indirect aggression* representing weak control of behaviour.

*Factor III.* The reference variable loaded on Factor III was 25 (be busy and play eagerly with other children). The factor accounted for a proportion of the communality of verbal defensive aggression. Other variables for direct defensive aggression loaded on the factor were sulk extracted from the peer ratings and physical defensive aggression on the factor extracted from the teachers' ratings. The factor extracted from the girls' peer ratings contained also sneaking (cf. the above interpretation of the component of prosocialness in girls' sneaking).

The fact that the contribution of the factor to the total variance was smaller than expected on the basis of Part I was probably due to the exclusion of the different degrees of intensity from the variables for defensive aggression that had been taken into account in Part I. The sampling of the variables was based on the descriptive model of aggression, but to keep the number of variables convenient for the peer ratings different degrees of intensity were not included in it. The extraction of Factor III in a separate analysis showed, however, that *direct defensive aggression* differentiated partly from offensive aggression as hypothesized.

*Factor IV* extracted from the boys' peer ratings and teachers' ratings of the boys could be interpreted as *verbal aggression*. It corresponded most closely to the verbal defensive aggression factor obtained in Part I which also accounted for a considerable proportion of the communality of sneaking. The regression analyses and canonical correlations revealed that this factor predicted the ratings of low frustration tolerance and was independent of the global ratings of aggressiveness vs. peacefulness.

Factor IV extracted from the teachers' ratings of the girls was also considered interpretable as an indicator of low frustration tolerance. The loaded variables were inclination to cry, displacement of aggression toward objects, and direct verbal and physical defensive aggression. On the basis of Part I the variance of low frustration tolerance, independent of the general halo dimension, was accounted for by the above mentioned forms of aggression in particular.

Factor IV extracted from the girls' peer ratings differed from the factors interpreted above: it was spanned mainly by one variable: offensive aggression displayed toward another person's possessions. The rating had slight common variance with verbal offensive aggression.

Aggressive behaviour was divided into three factors that could be given the same interpretation in the different samples. In addition to the general aggression factor, two other factors were obtained, of which one reflected weak control of behaviour and the other a great number of overt responses. The factor structure supported both the assumption and the earlier results concerning interindividual differences in aggressive behaviour attained in Part I.

### 3.2.2. Further common factors of the variables

The preceding chapter dealt with the description of the structure of the variables in terms of the two principal factors. The factor matrix extracted from the average intercorrelations was also rotated by the varimax method with different numbers of factors, starting with two. The interpretation was based on the six-factor rotation.<sup>1</sup> The eigenvalue of the seventh factor was only 1.16 and the percent of the total variance 2.11. Factor VII was spanned by the two variables for fitness for leadership, and thus it was not interpretationally essential.

As far as the ratings are concerned, an increase in the number of rotated factors revealed no such essential dimensions in the interdependences of the variables which the two-dimensional structure would not already have suggested. The inventory scales, however, divided into two factors (III, V) and were almost completely separated from the ratings. The separation was understandable: compared with the intercorrelations of each variable group the correlations between the inventory scales and the ratings were very low (average intercorrelations  $\leq \pm .25$ ).

In order to facilitate the treatment of the slight relationships between the inventory scales and the ratings, the factors spanned by the inventory scales and their relations to the ratings are discussed first. Factors III and V explained all of the communalities of the inventory scales with the exception of the slight loadings on the lie scale (43) and the anxiety scale (47) on Factor IV. The inventory variables were plotted on a plane (Figure 7) on the basis of their loadings on Factors III and V. As to three quadrants and the main dimensions, Figure 7 corresponds very well to the two-dimensional descriptive model (p. 107) summarizing Hypothesis A.

*Factor III.* The factor was bipolar and it could be interpreted as a dimension for subjective conception of the control of behaviour. One pole was spanned by the emotionality scale (cheerfulness vs. depression), the lie scale, and the scales of self-confidence vs. inferiority feelings, altruism vs. egoism, dependency (helpfulness), sensitivity (tough-mindedness vs. sensitiveness), and co-operativeness, the other by the scales of neuroticism, fearfulness, restlessness, impulsive extraversion, and anxiety. The factor divided the inventory scales very unambiguously, reflecting a *positive or a negative self-concept*. It was nearly independent of the ratings. The highest loadings (.12) were found in variables 31 (cry easily e.g. at the dentist's) and 38 (be unsteady and lack concentration in work and attentiveness), which had the same sign as the scale of neuroticism.

<sup>1</sup> The rotated factor matrix is obtainable mimeographed.

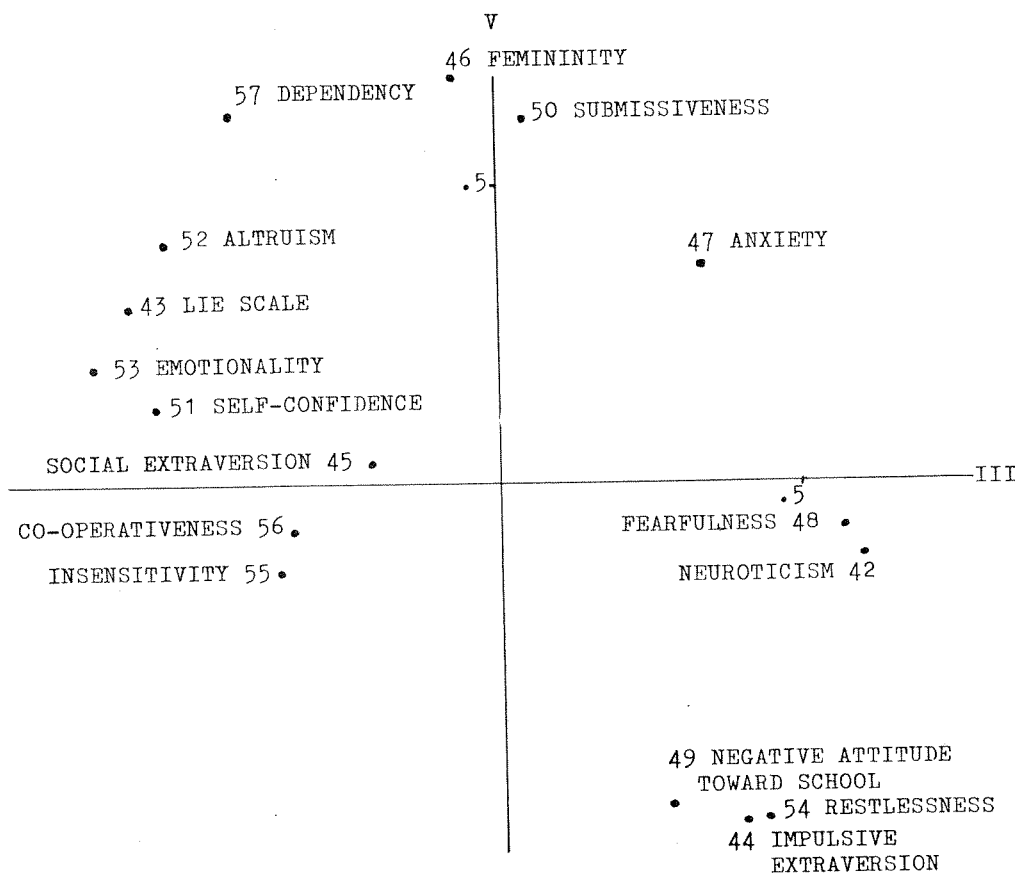


Figure 7. The structure of the inventory scales in terms of Factors III and V.

*Factor V.* The factor was bipolar and it could be interpreted as a dimension for subjective conception of the number of overt responses, i.e., as *social cautiousness vs. impulsiveness*. The high scores opposite to those for the scales of femininity vs. masculinity, dependency, submissiveness vs. dominance, altruism, and anxiety were for the scales of impulsive extraversion, restlessness, and reluctant attendance at school. The factor was somewhat more closely related to the ratings than factor III, even though their loadings on it were but directive: the pool of femininity was loaded positively by variables 23 (apologize readily), 21 (start easily crying if others treat nastily), and 7 (sneak), and that of impulsive extraversion by variable 32 (tend to disobey the teacher) and by those for fitness for leadership.

The correlation coefficients between the inventory scales and the ratings<sup>1</sup> revealed some slight but consistent relationships. Factor V (social cautiousness vs. impulsiveness) differentiated, to some extent, the subjects in the behavioural dimension 'controlled inhibition/uncontrolled expression of impulses', whereas the relations of Factor III

<sup>1</sup> The correlation matrix is obtainable mimeographed.

(positive vs. negative self-concept) to overt behaviour were weaker and more complex. For example, the anxiety scale correlated positively ( $p < .01$ ) with the ratings for controlled expression of impulses, and negatively with those for anxiety. The lie scale correlated with the same ratings inversely.

*The inventory variables differentiated into a logical structure, but their relations to the ratings were very weak, particularly in the dimension positive vs. negative self-concept.*

Four factors were composed of the *rating variables*.

*Factor I: Aggression vs. controlled inhibition of impulses.* An inspection of the changes in the factor following an increase in the number of rotated factors revealed that it adopted its final composition in the three-factor rotation, in which its common variance with the inventory scales, shown by the first principal factor, was explained by a separate factor. After this an increase in the number of factors did not change the loadings more than some hundredths. The order of size of the loadings of the aggression variables corresponded in general to that of the loadings of the general aggression factor; only the range was smaller (+.62 — +.83). The loadings of the ratings for controlled inhibition of impulses were negative, varying —.52 — —.36. The factor was identifiable as one of the diagonal axes in Figure 6 (p. 123).

*Factor II: Strong control of behaviour.* Like the other diagonal axis in Figure 6, Factor II yielded by the two-factor and three-factor rotations was a bipolar factor for controlled expression of impulses (socially approved activity) vs. uncontrolled inhibition of impulses (anxiety). In the four-factor rotation the common variance of the anxiety variables was explained by a separate factor. At the same time the loadings of the variables for controlled inhibition of impulses were strengthened on the factor for socially approved activity, and the factor was extended into a more general factor for strong vs. weak control of behaviour, on which the highest negative loadings were found in variables 38 (be unsteady and lack concentration in work and attentiveness) and 32 (tend to disobey the teacher). An increase in the number of factors did not change the loadings of Factor II yielded by the four-factor rotation more than  $\pm .02$ .

*Factor IV: Uncontrolled inhibition of impulses (anxiety).* The factor was a rather broad factor for small number of overt responses, yet coloured mainly by avoidance responses with negative affects. The highest loadings were found in variables 37 (excessive withdrawal), 22 (fearfulness), and 21, 31 (inclination to cry). The factor was to some extent bipolar with controlled expression of impulses. The highest negative loadings were found in school achievement, stable general impression, and fitness for leadership. The factor explained the low communality of the variable of socio-economical status of the family: it revealed that a low socio-economical status was related positively to anxiety in behaviour. An increase in the number of factors did not change the loadings of the anxiety factor yielded by the four-factor rotation more than  $\pm .02$ .

*Factor VI: Lack of concentration.* The sixth factor had a more narrow scope than the preceding factors. It accounted for the (largest) proportion of the

communality of variable 38 (be unsteady and lack concentration in work and attentiveness) that had not been explained by the preceding factors containing different kinds of weakness of behavioural control. The factor was also loaded by ratings 25 (be busy and play eagerly with others), and 30 (be unfit for leadership). The loadings with the opposite sign were found in ratings 39 (stable general impression), 40 (good school achievement), 32 (tend to disobey the teacher), 36 (symptoms of antisocialness), and 17 (be peaceable and patient). The proportion of the variance of variable 38 described by Factor VI is perhaps interpretable as some kind of infantile impulsiveness not connected with more serious weaknesses of behavioural control.

An inspection of the communalities of the variables after the two-factor and six-factor rotations revealed that the factors between them accounted for the variance of the aggression variables (1—12) an additional 6 %, and for the variance of the ratings for controlled expression of impulses (variables 13—16), controlled inhibition of impulses (17—20), and uncontrolled inhibition of impulses (21—22), 12.5 %, 17.3 %, and 25 %, respectively. The increase in the communalities of the anxiety variables and of the variables for small number of overt responses in general, involved especially Factor IV which could be considered the third dimension in the structure of the ratings. The anxiety variables had both common variance with the other ratings as expected, shown by projections on a plane (Figure 6), and also specific variance. At least one proportion of the specific variance may be related to scholastic abilities, as suggested by the high negative loading of the school achievement variable on Factor IV.

The two-dimensional description is simplifying and accounts for but a proportion of the common variance of the variables, but it facilitates the organization of the interrelations of complex phenomena, which was also the aim of the present investigation of the structure of variables. On the whole, the results supported the assumptions on the interrelationships of aggressive and nonaggressive habits.

### 3. 2. 3. *The invariance of the factor structures of the ratings*

According to the research project the subjects for the study of Problem B were to be chosen on the basis of the results yielded by the boys' peer ratings. The mentioned ratings in the 33 variables were factor analysed by the principal factor method. The eigenvalues of the factors reduced sharply: the contribution of Factor V to the total variance was only 1.7 %. The rotations of the factor matrix by the varimax method with 2—5 factors revealed that the interpretationally essential proportion of the common variance was explained by

four factors. The specific fifth factor was spanned only by variables 16 (think it is just a joke if somebody attacks) and 24 (think of revenge but never do anything).

Of the first four factors the first two could be given the same interpretation as Factors I and II extracted from the average intercorrelations.

*Factor I: Aggression vs. controlled inhibition of impulses*

*Factor II: Strong control of behaviour*

*Factor III: Anxiety vs. socially acceptable activity.* The factor did not cover introvert behaviour as extensively as Factor IV, and it was also more apparently bipolar with controlled expression of impulses than Factor IV extracted from the average intercorrelations containing a greater number of variables (e.g. the six teacher rating variables). The teachers' ratings in the background variables had loaded rather heavily on Factor IV. A further difference between these factors was that Factor III for the boys' peer ratings was more coloured by weak control of behaviour: it was loaded by the variable of sneaking and by those for mimic aggression.

*Factor IV: Number of overt responses independent of behavioural control.* The factor contained both controlled aggression (think of revenge but never do anything; sulk; side with smaller and weaker peers) and socially acceptable activity (negotiate; be fit for leadership). The other pool of the factor was spanned by the variables for small number of overt responses.

The changes resulting from an increase in the number of rotated factors corresponded to those found in the analysis for the average intercorrelations. The first two factors were clearly bipolar and interpretable as uncontrolled expression/controlled inhibition of impulses, and controlled expression/uncontrolled inhibition of impulses. In the three-factor rotation the latter factor was extended into a more general factor of strong control of behaviour. At the same time the bipolarity of the aggression factor was slightly decreased. The variance of the anxiety variables was removed to the third factor, still to some extent bipolar with controlled expression of impulses. The fourth factor explained the proportion of the common variance of the variables most independent of the dimension 'control of behaviour'.

In order to obtain information about the invariance of the factor structure of the 33 variables with different raters, methods, and subjects of different sexes, the girls' peer ratings and the teachers' ratings of the boys and girls were also factor analysed separately. The invariance of the factor configurations was investigated through the symmetric transformation analysis model (Mustonen, 1966). The transformation matrices  $L$  ( $B$ ,  $S_i$ ) are presented in Table 14 a.

*The structural invariance* shown by the transformation matrix and the residuals (Table 14) proved to be good between the boys' and girls' peer ratings. Greater variability occurred in the transformation matrix coefficients for the teachers' ratings. Particularly the  $L$ -coeffi-



Table 14. Transformation matrices

(a) Matrices  $L(B, S_i)$ , transformation matrices, and matrices  
 $\text{Diag } E(B, S_i)' E(B, S_i)$ , residuals by factors

B = factors for the boys' peer ratings  
 S = factors for each of the other samples (i)

Boys' peer ratings	Girls' peer ratings				Teachers' ratings of boys				Teachers' ratings of girls			
	I	II	III	IV	I	II	III	IV	I	II	III	IV
I	1.00	01	-02	-10	90	-10	-17	40	99	01	-08	-13
II	-02	98	09	-16	07	99	-12	04	-03	99	-07	14
III	02	-09	1.00	-02	-12	08	76	63	13	12	89	43
IV	10	16	03	98	-42	-07	-61	66	08	09	-45	88
Residuals by factors	0.44	0.53	0.69	0.38	1.29	0.93	0.74	0.48	1.14	0.88	0.95	1.00
Total residual	2.04				3.44				3.97			

(b) Matrices  $L(S_i, S_j)$ , transformation matrices, and matrices  
 $\text{Diag } E(S_i, S_j)' E(S_i, S_j)$ , residuals by factors

$S_{i \dots j}$  = factors for the other samples as for the boys' peer ratings

Girls' peer ratings	Teachers' ratings of girls				Teachers' ratings of boys				Teachers' ratings of girls	Teachers' ratings of boys			
	I	II	III	IV	I	II	III	IV		I	II	III	IV
I	99	00	-10	-03	85	-13	21	47	I	84	03	01	-55
II	-02	97	-22	-04	02	95	-30	09	II	-13	98	04	-15
III	10	22	86	45	-15	17	73	65	III	-12	-08	97	-18
IV	-02	-07	-45	89	-51	-22	-58	59	IV	52	19	22	80
Residuals													
$j \rightarrow i$	0.94	0.81	1.01	0.93	1.29	0.90	0.64	0.81		0.68	0.49	0.22	0.97
$i \rightarrow j$	0.92	0.88	1.02	0.87	0.91	1.10	1.03	0.60		0.67	0.51	0.22	0.69
Total residual	3.69				3.64				2.36				

cient of Factor IV extracted from the teachers' ratings of the boys indicated slight correspondence with the factors for the boys' peer ratings. The stated fourth factor was spanned by the variables for both aggression and anxiety. When the factor configurations for the teachers' ratings were represented in the factor space for the boys' peer ratings, the residual of Factor IV was, however, small, and the factor structures were in general much the same as the structure of the boys' peer ratings.<sup>1</sup>

The total residuals indicated that the correspondence between the factor structures of the boys' peer ratings and the teachers' ratings of the boys was somewhat better than between the former and the teachers' ratings of the girls. The greatest difference between the residuals of the factors was found in the fourth factors. Factor IV extracted from the teachers' ratings of the girls was loaded by the variables for direct verbal and indirect defensive aggression more highly than that extracted from the teachers' ratings of the boys.

Detailed information on divergent transformation is obtainable from the *residuals of individual variables*.<sup>2</sup> Each of the residuals can be broken down into two components: (1) the difference between the lengths of the counterpart vectors, and (2) the angle extended by these two.

An inspection of the residuals of individual variables yielded by the transformation analysis for the boys' and girls' peer ratings revealed that the greatest residuals were those of variables 7 (sneak) and 25, 26 (the reference variables of the dimension 'number of overt responses'). The residuals were due to the differences in direction rather than in length. The angular separation of the variables was shown already in the two-dimensional figures, and the interpretation of them has also been discussed earlier (p. 125 and 130).

The great residuals of individual variables, obtained in the transformation analyses for the boys' peer ratings and the teachers' ratings, were limited to some variables. They were mainly due to differences in direction. The angular separation was rather great for variables 26 (be silent) and 30 (be unfit for leadership), as the two-dimensional figures also indicated. The differences have been discussed earlier in connection with the interpretation of the main dimensions. Somewhat smaller residuals were found in the reference

<sup>1</sup> The rotated factor matrix for the boys' peer ratings (B), and the matrices (S) L (S, B) are obtainable mimeographed.

<sup>2</sup> The table for the residuals of the individual variables is obtainable mimeographed.

variables 25 and 29, and in variable 16 (think it is just a joke if somebody attacks). Differences in length could be found in variables 32 (tend to disobey the teacher) and 1 (hurt another child), when the factor configuration for the teachers' ratings of the girls were represented in the factor space for the boys' peer ratings. The communalities of these variables were clearly smaller in the teachers' ratings of the girls than in the boys' peer ratings.

The factor structures obtained from the other samples were also compared with each other through transformation analysis. The transformation matrices and the residuals by factors are presented in Table 14 b.

In general, the results of the transformation analyses showed that the invariance of the factor structures was more dependent on raters and rating methods than on the sex of subjects: divergent transformation was smallest between the structures of the boys' and girls' peer ratings, and almost equally small between the structures of the teachers' ratings of the boys and girls.

When all the performed transformation analyses are taken into account it can be said that, with the exception of sneaking, there was but small structural variability in the rating variables for aggression. As far as the variables for nonaggressive behaviour are concerned, great residuals could be found in two variables (16, 23). Structural variability was greater in the reference variables particularly for the dimension 'number of overt responses' (25, 26) and for fitness for leadership (29, 30). According to the teachers' ratings, fitness for leadership depended on general activity/passiveness, whereas the peers had given more emphasis on behavioural control. Similarly, the variables for general activity/passiveness (number of overt responses) were more independent of behavioural control in the teachers' than in the peers' ratings.

The information provided by the transformation analyses on structural invariance can be utilized in further investigation. The factor structure of the rating variables, obtained from the boys' peer ratings, proved very similar to those obtained from the other samples irrespective of rater, rating method, and sex. The choice of subjects for the study of Problem B on the basis of the factor scores for the factors extracted from the boys' peer ratings can be considered to have structural validity.