THE DEVELOPMENT OF PATTERNS OF MALADJUSTMENT

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I. Theoretical background and methodological considerations
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Abstract

Bergman, L. R. and Magnusson, D. The development of patterns of maladjustment. I. Theoretical background and methodological considerations*. Individual development and environment. Department of Psychology, University of Stockholm. Report nr 50, 1983.--This study has been performed within the project 'Individual development and environment'. It constitutes the first part of an investigation into developmental patterns of maladjustment. This report presents the theoretical background, as well as, methodological considerations. Three basic orientations are fundamental to this investigation, namely (1) the interactional perspective, (2) the view that maladjustment is not just a lesser degree of adjustment, and (3) an emphasis on systematic observation and description. The aim of the investigation is to provide a bird's eye view of the development of maladjustment. To some extent the detail or depth of a concentrated effort within limited area is sacrificed to enable us to study the totality of an individual's maladjustment reaction. A tentative taxonomy of maladjustment is presented which applies to the time period from middle childhood to early adolescence. The taxonomy is designed for the specific purpose of this project. In the concluding sections of this report various methodological problems are discussed, such as the construction of indicators of maladjustment, the detection of syndromes of maladjustment, and the effect of errors of measurement on the results.

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PURPOSE OF THE PROJECT

This project aims at studying the development of patterns of maladjustment from middle childhood to adult age. The emphasis is on a description of patterns of maladjustment, and how these evolve. Other variable domains will be included in the study, only to the extent they are necessary for providing a meaningful description.

It is the aim of the project to obtain information that makes it possible to make statements about the prevalence of the syndromes that are studied, and about the relationship between various forms of maladjustment in childhood and in adulthood. The emphasis is on general patterns of individual maladjustment rather than on single aspects of a syndrome. This study should be seen as complementary to the ordinary more specific studies. To some extent the detail or depth of a concentrated effort within a limited area is sacrificed to enable us to study the totality of an individual's maladjustment reaction.

The focus of this project is on maladjustment of various kinds in everyday life viewed from a developmental perspective, and a thorough psychiatric description is beyond the scope of the project. We use the term 'maladjustment' in a rather broad sense, including both extrinsic and intrinsic maladjustment (Magnusson, Dunér, & Zetterblom, 1975). With 'extrinsic maladjustment' we mean that the individual's behavior does not meet the demands or standards of others, for instance, conduct problems, peer problems delinquency or underachievement. With 'intrinsic maladjustment' we mean that there is a disagreement between the individuals needs, motives, and evaluations on the one hand, and on the other the rewards he gains as experienced by himself, for instance, prolonged feelings of misery, very low self-esteem.

The general aim of this project can be divided into several subsets which will be studied successively:

1. To develop a theoretical background including a taxonomy of maladjustment in middle and late childhood and to solve certain methodological problems.
2. To describe the patterns of maladjustment at different age stages.
3. To study the development of patterns of maladjustment with emphasis on the relationship between maladjustment in childhood and in adulthood.

The present report concerns aim (1) above, and later reports will cover (2) and (3).

THEORETICAL PERSPECTIVES

Three perspectives are fundamental in the project, namely (1) the interactionistic perspective, (2) the view that maladjustment is not just a lesser degree of adjustment, and (3) an emphasis on systematic observation and description.

(1) An interactional perspective

The interactional perspective means among other things that we have to look at the interaction between the person and the environment in which a certain behavior occurs in order to understand that behavior (Magnusson, 1980; Magnusson & Endler, 1977). Recently the need for an interactional perspective in the study of psychological development has again been pointed out (Magnusson & Allen, 1983). There, logical arguments, evidence, and examples are given which point to the limitations in a conventional trait or variable approach to the study of development (see also Magnusson & Stattin, 1983).

The interactional emphasis in the person-centered approach is crucial (Magnusson & Allen, 1983 a,b). In this approach the person is conceptualized as an integrated totality, rather than as a summation of variables. The aim is to understand individuals by trying to discover (a) the distinctive configuration or pattern of organization of psychological functions that will satisfactorily characterize each person, and (b) the lawful way in which he interacts with his environment, across situations and across developmental stages, in a continuous
bidirectional, interactive process. This viewpoint leads to the conclusion that the *persons* rather than the *variables* should be the central organizing principle. Thus, our main interest is in studying groups of individuals who are homogenous with respect to syndromes of maladjustment, and to study how these syndromes evolve rather than, for instance, studying the correlations over time for different variables.

Lamiell (1982) has criticized interactionistic developmental psychology for relying on various group statistics, for example, the correlation coefficient. He contends that choosing such analytical tools together with inadequate measurement models allows no valid statements to be made about individual development. However, much of his criticism appears to be exaggerated, for instance, his insistence that group statistics are of no relevance for understanding individual development. It is true that a correlation coefficient of, say, 0.90 for a characteristic measured at two points in time for a group of individuals does not permit us to say anything about any specific individual's development, but the figure contains very useful information about the stability of most person's individual development. It is true that a lower correlation, say 0.40, makes it difficult to say anything about most individuals' development, but this is due to the result structure, and is not an argument against the method per se. Nevertheless, Lamiell's criticism lends support to our basic emphasis on persons rather than on variables—for us the grouping of persons according to syndromes is more important than group statistics for variables.

One aspect of Lamiell's criticism which is relevant in this context is his emphasis on the danger of any kind of relative measures in which one person's score is in some way dependent on the scores of other persons. He advocates the construction of variables measured on absolute scales and standardized only with regard to the theoretical minimum and maximum of the scales. With our person oriented perspective, the limitations of using relative measures are obvious. These limitations become particularly serious when using relative measures in empirical studies of change (see, for instance, Bergman, 1971, 1972a; Woolwill, 1980). However, some important factors in individual development are best measured by ordinal data, e.g., popularity among peers. Generally, it is our intention to use absolute scales as far as they are reasonable and useful.
Focusing on maladjustment rather than on the whole adjustment spectrum makes the task of obtaining absolute measures somewhat easier, since we do not attempt to discriminate over the whole adjustment continuum.

(2) Maladjustment or adjustment--a matter of kind or degree?

From our interactional standpoint, which emphasizes the study of individuals as totalities, it is natural to view maladjustment as a syndrome of individual characteristics in which, normally, several symptoms of maladjustment are involved. How these symptoms are grouped together in individual patterns of maladjustment and how these patterns evolve is the subject of the present research.

The view that a certain type of maladjustment is characterized by a particular constellation of symptoms implies, among other things, that one single symptom, even in extreme cases may not be an indicator of maladjustment. It is in combination with other symptoms that it becomes an indicator of what we define as maladjustment.

The limitations of considering only single factors in the study of maladjustment is obvious also for environmental factors operating in the development of maladjustment. For example, low socioeconomic standard in the home of a child, does not predispose for later maladjustment in itself. Most children raised in such environments do not develop symptoms of maladjustment. However, low socioeconomic standards may increase the probability that weak social norms and/or bad social relations among the family members, etc., lead to maladjustment.

The view of maladjustment as a pattern of symptoms manifested in syndromes has implications for the planning and carrying through of empirical research and for the interpretation of results of such research. Two points will be made here.

1. Since each specific person factor or environmental factor is not the only indicator of maladjustment or predictor of later maladjustment, we cannot expect high coefficients for the relation between data for single factors and data for molar criteria of maladjustment, such as alcoholism, criminality, and mental illness.
2. When entering single factors into our research it is the negative aspect that is of particular interest for our study of symptoms of maladjustment. Generally, we do not expect any positive aspect of the possible operating factors to be included in the syndromes of maladjustment that we are studying. Therefore, theoretically and empirically our interest is in the discrimination among individuals in that part of a distribution of data for a specific symptom that can have symptom value with respect to maladjustment.

It follows from the above that we are interested in the strength of different symptoms of maladjustment, i.e., we are interested in the negative end of the continuum of the adjustment variables. There are several reasons for why one should concentrate the research effort in this way when maladjustment is the focus of interest:

Firstly, it is a truism that a child normally is very sensitive to strong reactions from the environment to his behavior. To many forms of maladjusted behavior, society reacts very strongly—a reaction which is quite absent within the region of good to normal adjustment or even in the region of normal to rather bad adjustment. For instance, recurrent very aggressive behavior toward peers often results in strong reactions from involved parents, peers, and the teacher. These reactions may have implications for the development of other person characteristics of the child. The significance of the difference between very low and medium habitual aggression may thus be very different from the significance of the difference between medium and very high habitual aggression with regard to the development of the whole adjustment spectrum.

Secondly, the processes that lead to maladjustment may also be different both in kind and degree from those that lead to good or normal adjustment. For instance, habitual, very aggressive behavior is the central symptom for some children with conduct problems. The determinants of such behavior are imperfectly understood, but it may well be not just a question of 'more' of a set of negative circumstances also present in the determination of normally aggressive behavior. The development of inhibited nonaggressive behavior may also involve other processes than the development of very aggressive behavior (see, for instance, Bandura, 1973; Wiggins et al. 1976). Thus, there are reasons to believe that aggressiveness in the region of 'low' to 'medium' can
have quite a different relationship to other psychological characteristics than aggressiveness in the region of 'medium' to 'high'. The problem of kind or degree has also been touched upon by Rutter (1981), and he gives an example concerning the development of criminality, which for the sake of brevity is not referred here.

In the following, two additional technical points are made with regard to methodological problems that may arise if complete adjustment scales are used in the study of maladjustment:

1. The most obvious set of problems are the methodological, technical problems introduced by non-linear relationships. For instance, in a Swedish study in our program, Zettergren (1979) found that boys with high peer status tended to fall in the medium range of aggressiveness as rated by the teacher. The difference between the mean aggression level of children with high peer status and children with medium peer status was negligible, but children with low peer status were more aggressive. In another study within the same program the results illustrated in Figure 1 were found with regard to the relationship between a child's peer status and his parents' positive or negative relations to each other.

Relations between parents

![Diagram showing the relationship between peer status and relations between parents.](image)

Figure 1. Peer status and relations between parents.
(For details - see Magnusson, Dunér, & Zetterblom, 1975, p.240)
2. Consider next the study of the development of maladjustment. Let us assume that one symptom we then want to study is the development of aggressive behavior in boys, a subject that has been the focus of much interest in recent years (see Olweus, 1979, for a review). As an example, take a simple study of the stability over time of aggressive behavior. Often correlations between measures taken at different points in time for the same individuals are used as indicators of the degree of stability, and these coefficients are often around 0.50 - 0.60, when not corrected for attenuation. What does this say about the stability over time of maladjusted, very aggressive behavior? If, for instance, those who are very low on the aggressivity scale also are very stable in this behavior, there need not be any stability at all in maladjusted, very aggressive, behavior in order to achieve stability coefficients around 0.50. Now we are not saying that this is the case but merely pointing out that when maladjustment is the focus of the study only statistics and scales should be used that are pertinent to the problem.

Perhaps it should be pointed out that the interactional standpoint does not mean that we consider it necessary or even suitable to always use all indicators of an individual's maladjustment in the same analysis. Sometimes it is preferable to use just a few variables, and the important thing is that such a simple analysis fit into a larger plan of analysis in which interactive relationships are taken into account.

(3) Systematic observation and description

The project is oriented toward systematic observation and description. This orientation has two reasons.

The first reason is that the broad scope of the project together with the empirical aim of providing information about the prevalence of maladjustment makes it very difficult to adopt a specific theoretical orientation. Indeed, such an orientation would demand something of an amalgamation of theoretical propositions in different research traditions such as developmental psychology, child psychiatry, and criminology. Apart from the obvious difficulty of such a task it would almost certainly mean that a good deal of the available longitudinal information would have to be poured down the drain, since it would not fit in the theoretical model.
The second reason for emphasizing systematic empirical observation and description rather than theoretical formulations or the testing of hypotheses has to do with the present author’s bias. We simply believe that careful empirical description (by all means guided by theories) often is an important and basic task both in its own right, and in order to form the solid basis for the formulation of effective theories.

The above should not be taken as indicating that this work will be a-theoretical. Theories and facts from several research traditions will also be the buildingstones of the structure of the description of maladjustment, as well as the background for its interpretation. The following statement by Cronbach (1975) expresses as well our orientation:

"The goal of our work, I have argued here, is not to amass generalizations atop which a theoretical tower can some day be erected... . The special task of the social scientist in each generation is to pin down the contemporary facts." (p. 126)

EARLIER LONGITUDINAL RESEARCH

This review is not intended to be complete in the sense that all major longitudinal studies are presented and discussed. Our aim here is to review studies that are important for our planning or to provide a matrix for the interpretation of our results. Thus, methodological as well as substantial aspects will be of importance in the present connection.

Description of current longitudinal program

We start with a presentation of the longitudinal program on which the present project is based. The program is named 'Individual development and environment'. For more comprehensive information about this longitudinal program the reader is referred to Magnusson, Dunér, and Zetterblom (1975) or to Magnusson and Dunér (1981). Our presentation here serves the dual purpose of introducing the reader to some of the longitudinal data that are available to this project, and to some initial results which are important for planning purposes.
The main purpose of the longitudinal study was already from the beginning a broad study of behavioral development in individuals from middle childhood to adult age. Of special interest was the relation between early maladjustment, and maladjustment at adult age, particularly as it was reflected in alcohol abuse, criminality, and mental illness.

A cohort of approximately 1,000 pupils who were born in 1955 and who were third-graders in the public school in Örebro during the school year 1964-65 has been followed up to present (the main group). The survey also includes a pilot group consisting of the Örebro pupils who were born in 1952 and who were sixth-graders in 1964-65; they also have been followed into adulthood. Certain instrumental tests and pilot studies have been and are being carried out on this group. A pilot study was also made on pupils in Örebro who were eighth-graders in 1964-65, but this group has not been followed up any further. Table 1 provides a schematic illustration of the course of the project until 1975.

Table 1. Survey of the project 1965-82.

<table>
<thead>
<tr>
<th>Year</th>
<th>Pilot group born 1952</th>
<th>Main group born 1955</th>
</tr>
</thead>
<tbody>
<tr>
<td>1965</td>
<td>Whole of grade 6</td>
<td>Whole of grade 3</td>
</tr>
<tr>
<td></td>
<td>960 pupils</td>
<td>1032 pupils</td>
</tr>
<tr>
<td>1966</td>
<td></td>
<td>Intensive survey of social relations, grade 4, 90 pupils</td>
</tr>
<tr>
<td>1968</td>
<td>Grade 9: The educational and vocational choice process</td>
<td>Grade 6: Total group survey. The educational and vocational choice process</td>
</tr>
<tr>
<td></td>
<td>Self-reported delinquency, boys</td>
<td>Medical examinations, random sample of 250 pupils</td>
</tr>
</tbody>
</table>
Table 1. Survey of the project 1965-82. Continuation.

<table>
<thead>
<tr>
<th>Year</th>
<th>Pilot group born 1952</th>
<th>Main group born 1955</th>
</tr>
</thead>
<tbody>
<tr>
<td>1971</td>
<td>Grade 3, upper sec.: The educational and vocational choice process. Intelligence, creativity</td>
<td>Grade 9: Total group survey. Follow-up from 1965. The educational and vocational choice process. Self-reported delinquency, boys</td>
</tr>
<tr>
<td>1972</td>
<td>Post-sec.: Educational and vocational choice (technical line only)</td>
<td>Grade 1, upper sec.: Upper secondary school questionnaire. Transition to new type of school. Random sample of all school-leavers from Grade 1: interview</td>
</tr>
<tr>
<td>1973</td>
<td>Post-sec.: Employment and study conditions Postal questionnaire to former upper sec. students</td>
<td>Grade 2, upper sec.: Educational and vocational choices 2-yr-lines of upper sec. school. Values. Leisure occupations</td>
</tr>
<tr>
<td>1975</td>
<td>Post-sec.: Employment and study conditions Pupils leaving school in 1968: Postal questionnaire</td>
<td></td>
</tr>
<tr>
<td>1981</td>
<td></td>
<td>Post-sec.: Employment and study situation. Postal questionnaire</td>
</tr>
<tr>
<td>1982</td>
<td></td>
<td>Special study of medical sample with interviews, tests, and a medical examination</td>
</tr>
</tbody>
</table>
The data which have been collected for the studies may be classified into three groups:

(a) **Basic information** on total groups. Data have been collected on pupils at the ages of 10, 13, and 15 years, respectively, (grades 3, 6, and 8) for the following main areas using the following main methods for data collection:

<table>
<thead>
<tr>
<th>Area</th>
<th>Method for data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic background, domestic situation</td>
<td>Parental questionnaire</td>
</tr>
<tr>
<td>Intrinsic adjustment satisfaction etc.</td>
<td>Pupil questionnaire</td>
</tr>
<tr>
<td>Classmate relationships</td>
<td>Sociometric methods</td>
</tr>
<tr>
<td>Extrinsic adjustment: behavior in school</td>
<td>Teacher ratings</td>
</tr>
<tr>
<td>Extrinsic adjustment: behavior at home</td>
<td>Parental questionnaire</td>
</tr>
<tr>
<td>Extrinsic adjustment: behavior in society</td>
<td>Public records</td>
</tr>
<tr>
<td>Intelligence, knowledge</td>
<td>Tests and grades given on report cards</td>
</tr>
<tr>
<td>Attitudes and values</td>
<td>Semantic differential</td>
</tr>
</tbody>
</table>

(b) **Information concerning special problems** collected in the course of subprojects and applying to total groups, e.g.:

<table>
<thead>
<tr>
<th>Area</th>
<th>Age</th>
<th>Method for data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norms</td>
<td>15</td>
<td>Situation inventory</td>
</tr>
<tr>
<td>Symptoms (girls)</td>
<td>15</td>
<td>Questionnaire</td>
</tr>
<tr>
<td>Criminality (boys)</td>
<td>16</td>
<td>Questionnaire, self-reported delinquency</td>
</tr>
<tr>
<td>Study and vocational decisions</td>
<td>13-19</td>
<td>Questionnaires</td>
</tr>
<tr>
<td>Goals, values in life</td>
<td>18</td>
<td>Semantic differential</td>
</tr>
</tbody>
</table>

(Note that school start is at age 7. Grades 1-9 are in comprehensive school. In grade 3 most children are 10, in grade 6 they are 13, and in grade 9 they are 16. Upper secondary school (gymnasium) has three grades, the students are 17-19 years old.)

(c) **Information concerning special problems** collected in the course of subprojects and concerning random samples from the total group (used when expensive methods are necessary), e.g.:

<table>
<thead>
<tr>
<th>Area</th>
<th>Age</th>
<th>Methods for data collection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social relations (N=90)</td>
<td>10-12</td>
<td>Interview etc.</td>
</tr>
<tr>
<td>Biological variables (N=225)</td>
<td>13-15</td>
<td>EEG, hormone analysis, ossification measurements, physical achievement capacity</td>
</tr>
<tr>
<td>Drop-out problems</td>
<td>16-17</td>
<td>Interview, questionnaire</td>
</tr>
</tbody>
</table>
It is not meaningful to try to summarize all results so far in the longitudinal study with regard to adjustment variables. In the following, some results will be given which indicate the degree of stability of measures of maladjustment, and the relationship between early indicators of maladjustment and maladjustment at age 16.

As was pointed out earlier, stability coefficients are of limited value in the present connection, and such results will not be presented.

The relation between timidity and adjustment has been studied by Hencz and Jansson (1974). They defined as timid children who had a rating of at least 5 on a 7-points scale of timidity as rated by their teachers. At age 10, this was the case for 93 boys (23%) and 119 girls (27%). At age 13, 39 boys and 43 girls were still rated as timid, i.e., 42% of the boys and 36% of the girls that were timid at age 10 were stable in this respect. At age 10, timidity was associated, although not very strongly, with bad peer relations and with some conduct problems such as distraction with regard to school work and lack of school motivation (both behaviors rated by teachers). Timidity was also associated with tenseness (overambition) and disharmony as rated by the teachers. No strong association was found with the children's self-reported adjustment. To some extent timid girls were underachievers at age 10. Timidity at age 10 was associated with various adjustment problems for girls at age 15-16, and these problems were more pronounced for those who were timid also at age 13. For instance, they had lower schoolmarks in their mother tongue, lower peer status, and lower self-evaluated adjustment and peer status. For boys, only tendencies were found in this direction.

Sillén (1972) studied the relationship between hyperactivity and adjustment for boys. She defined as 'hyperactive' boys who had a standardized score of at least Z=0.80 on a hyperactivity scale. This was the case for 97 out of 413 boys (23%). 46 boys of these were still rated so at age 13, i.e., 47% were stable in this behavior between age 10 and 13. At age 10 it was found that hyperactivity was related to various conduct problems such as aggression and lack of school motivation, and this relationship continued at age 13, and at age 15-16 for boys with stable hyperactivity. At the ages 10 and 13, but not at age 15-16, boys with stable hyperactivity had lower peer status. The same tendency was found for self-evaluated adjustment.
Broman (1974) studied children with very low peer status at age 10 (rejected children). Rejected children numbered 54 boys (11%) and 48 girls (10%). At age 13, 44% of the rejected boys were still classed as rejected, the corresponding figure for girls was 46%. At age 15, 75% of those who were rejected at both age 10 and 13 still had a very low peer status (this was true for both boys and girls). Boys and girls who were rejected both at age 10 and 13 had a low self-esteem and various conduct problems. The girls also often stated they did not like school.

Stattin (1979) studied the development of relative achievement from age 10 to age 16 for children characterized by different degrees of delinquent behavior at age 16. He found that those criminally active at age 16 had a negative development of relative achievement through school. Already at age 10 did they underachieve, and this problem was aggravated when they grew older.

Söderberg (1976) attempted to predict adjustment at age 15-16 from adjustment at age 10 and 13. He used both an extreme group design and a regression analytical design, but the relationships he found were usually very weak. This may have depended on his reliance on either a single variable approach, where relationships were studied for one or only a few variables at a time, or a regression analytical approach with no provision for interactional effects. With the extreme groups design he found that conduct problems for girls at age 10 were among the few variables having predictive power for a composite adjustment variable at age 15-16.

Söderberg also used a stepwise regression analytical procedure to study how adjustment for girls at age 15 could be predicted from adjustment at age 10 or 13, and he found some significant relationships, although rather weak. The dependent variables were taken from a personality inventory (factor scores). 'Asociality' was predicted to some extent by 'lack of school motivation', and by 'parents' education', both variables from age 10. 'Psychosomatic reaction' was predicted to some
extent from 'psychosomatic reaction' and 'IQ' at age 10. 'Anxiety was predicted to some extent from 'school adjustment' (self-stated) at age 10 and 'motor disturbance' at age 13. As Söderberg points out, the reliability of many of the variables he used are either low or moderate which naturally attenuates the relationships.

From our viewpoint his study has certain limitations, mainly a negligence of interactional relationships and syndromes. However, since he recognized the importance of measuring maladjustment rather than adjustment we found his study useful. It also gives, something of a background and the lack of strong, simple, relationships is an intriguing starting point for a more sophisticated, interactional, study.

One analysis which is interactional to some extent has already been performed on this data for boys (Duner, 1976). He grouped the boys at age 10 in adjustment syndromes by means of latent profile analysis (Lazarsfeld & Henry, 1968; Magnusson, Dunér, & Zetterblom, 1975; Mårdberg, 1967). In this analysis three adjustment patterns were distinguished:

(a) boys badly adjusted with regard to both extrinsic and intrinsic adjustment with emphasis on conduct problems,
(b) a mixed group of boys with timidity and lack of school motivation as central symptoms,
(c) well adjusted boys.

The adjustment at age 15-16 was then studied for the three groups of boys, and as expected it was found that Group (a) had lower means in all measures of adjustment than Group (c) - both with regard to intrinsic and with regard to extrinsic adjustment. Most of these differences were significant. The largest differences were found for asociality-criminality and for peer relations. He also found that Group (a) - children at age 16 had worse relations to adults (self-stated) than Group (b)- or (c)-children. It should be observed that Dunér's aim was to study adjustment, not maladjustment. This had implications
for his research design which make the results less useful to us. Among other things his classification of the boys cannot be presumed to give syndromes of maladjustment (see the previous discussion in the section 'theoretical perspectives'). Nevertheless, his results point to the fact that stronger relationships over time might be expected when syndromes are used as independent variables rather than single variables, as in Söderberg's study.

**Other Swedish longitudinal studies**

Several longitudinal Swedish studies have been performed in which psychological development is investigated. Usually, the sample sizes are large, and great care has been taken to obtain representative samples. In our opinion, most Swedish studies are in this respect superior to most American studies.

There is only one study, except ours, which from a psychological viewpoint contains developmental data covering most aspects of maladjustment, and that is a study of 212 children from a suburb of Stockholm (Karlberg et al., 1968). The children were followed from their birth to age 18 with regard to both physical and psychological development. A wide range of information that relates to adjustment has been collected at several points in time. Many publications have resulted from this project, but we have only found one publication by Klackenberg (1969) that deals with the development of maladjustment. He studied changes in the development of psychiatric symptoms between the ages 4 and 7. If possible, we may attempt to cross-validate some of our findings on this sample in the future.

Andersson (1969) studied the development of adjustment, as expressed by the child, in grades 8 and 9. However, he was primarily interested in developmental shifts at a group level, not individual development. He concluded that his results did not allow of any general conclusions on whether feeling of well-being at school and degree of adjustment had increased or decreased.
In a large sociological longitudinal project (Project Metropolitan), Janson (1981a) has followed all children born in 1953 and living in the Stockholm area in 1963 (N=15,117). The collected data include delivery records, various information about the parents (including criminal record of family head, family income, social class), school marks, way through the school system, draft board data (boys), police records and social register data. Great care has been taken to avoid both partial and total drop out, and this very large and representative Stockholm cohort is a great asset also from a psychological point of view, especially with regard to the study of low-frequency phenomena. Studies within the Metropolitan project which are pertinent to us are, for instance, the development of a longitudinal model of juvenile delinquency. Originally, Project Metropolitan was planned to have sister projects in the other Scandinavian capitals, but for various reasons only a Danish study of a Copenhagen cohort was implemented.

Results from other Swedish longitudinal studies will of course be of value to us, especially with regard to the anchoring of some variables, but these studies will be introduced in the appropriate context, and will not be reviewed here.

Other longitudinal studies

We are primarily interested in longitudinal studies of maladjustment with fairly large samples, and which are reasonably representative of a general population. This excludes the vast majority of studies, which from our point of view suffer from serious defects in sampling, and often also with regard to measurement (for a review, see Wall & Williams, 1970).

In the following a few longitudinal studies will be reviewed which cover broad aspects of adjustment/maladjustment and/or exemplify interesting methodological or research strategic principles. Results from many other studies will of course be of use to us, but these will be presented in the appropriate context.
In a large British longitudinal study (N=5,362), children born in 1946 were followed from birth to adult age (Atkins et al., 1981). Great care was taken to obtain a representative sample, and information was collected with regard to both physical and psychological development. Information relevant to the study of maladjustment was collected at several points in time. During the school years this information was mostly collected from teachers and parents, and at adult age from the participants themselves.

Results from this study illustrate the fact that several negative events before school age have important implications for later maladjustment. For instance, Douglas (1975) found that hospital admissions between the ages 0:6 and 3:6 were related at age 13 and 15 to troublesome (but not nervous) behavior in school, according to teachers' ratings, and to low reading scores at age 15. Wadsworth (1979) found that a broken home before the age of 4 was significantly associated with later delinquency in boys. A study by Douglas et al. (1968) indicated that only for children with a syndrome of maladjustment at age 15 with regard to conduct problems and personality problems, did a progressive deterioration of test performance occur during the school years. They also studied the validity and reliability of teachers' ratings, both experimentally and by comparing the ratings with information from the children's mothers. They concluded that teachers' ratings was a very useful research instrument.

A British study similar to the one reviewed above has been carried out with about 17,000 children born in 1958 (Fogelman & Wedge, 1981). A wide range of studies have been performed on data from the project such as a longitudinal analysis of social factors associated with changes in educational attainment (Fogelman & Goldstein, 1976), and studies of longitudinal patterns of behavior at home and at school (in progress).

In 1964-65 the Isle of Wight studies were initiated (Rutter et al., 1970). The aim was to study educational, psychiatric, and physical disorders in children aged 9 to 11 years. One aim was to provide epidemiological information about various disorders, and mass screening methods
were applied to a population of 3,500 children to pick out children having one or more handicaps or disorders. All children selected in this way, and a control group, were then individually examined (about 1,000 children).

At age 14-15 the Isle of Wight children with some kind of handicap or disorder were followed up, and a new cross-sectional study was applied to the whole population. It was found that 8% showed a handicapping psychiatric disorder (Graham & Rutter, 1973), a figure that was slightly higher than the figure when the children in the population were aged 10-11. Children with conduct disorders fared worst - 3/4 of them still had a disorder at age 14-15 (mostly a conduct disorder but in quite a few cases an emotional disorder). The prognosis for a child with an emotional disorder at age 10-11 was better than for a child with a conduct disorder, but nearly half still had problems in adolescence although not conduct problems. As usual in this field, large sex differences were found with the incidence of disorder being twice as high for boys depending on their much higher rate of conduct disorders.

A study comparable to the above involved children aged 10, and attending state schools in Inner London (Rutter et al, 1976). It was found that for this sample behavioral deviance, and psychiatric disorder were about twice as common as in the Isle of Wight sample.

An interesting methodological approach has been used by Block (1971) when studying longitudinal patterns of personality development from early adolescence to adulthood. He started by pooling school age data from two different longitudinal studies in order to improve the representativeness of the data. Then he collected new data for those in his sample from adulthood by means of extensive interviewing and testing.

Block used a Q-sort multiple-judge rating procedure to obtain comparable data for persons belonging to different original samples, and for measurements taken at different points in time with different instruments. The Q-set consisted of a set of personality-descriptive statements, and for a given individual each judge ordered the statements in
a specified set of categories according to how well each statement fitted the person. Naturally, they had access to all information about the person to be judged.

This approach is ideographic in the sense that each person was compared to himself with regard to the relative degree he exhibits different personality characteristics, but the results can be treated in a normative way as shown by Block.

Out of his large result section two important items should be mentioned: (i) Block found that some individuals are changers with regard to personality characteristics, and others are not, and (ii) male changers between junior and senior high school tended to have what we call internal adjustment problems, (this was not true for female changers).

THE PROBLEM OF A TAXONOMY OF MALADJUSTMENT

Empirical studies

Maladjustment has been studied within different research traditions, and the study has been focused on very different aspects of maladjustment.

Using a psychiatric perspective various aspects of maladjustment have been studied. Often pupils' questionnaires or teachers' ratings have been used as screening instruments, and children indicated by these instruments as having problems have been subjected to an intensive follow-up ening in a psychiatric classification. This approach was, for instance, used in the earlier mentioned longitudinal study by Rutter (1981). In this case one aim was a general epidemiological description, but in other cases the aim may be, for instance, the classification of individuals at risk for schizophrenia (Lewing, Watt, & Grubb, 1981).

Rutter (1978, 1981) concluded from his own studies, and from those of others, that longitudinal studies have validated the differentiation between the long term indications of conduct disorders and emotional
disturbances, respectively. Emotional disorders have been shown to have a much better prognosis (cf. the previous section). Rutter finds it questionable whether there are valid distinctions within the broad conduct disorder and emotional disorder groupings. With valid distinctions he means that there are meaningful differences in the relationship to other variables between categories, especially with regard to prognosis.

Rutter discussed a finding by Jenkins et al (1977) where they showed that delinquents with a 'socialized disorder' had a better prognosis than delinquents with other kinds of disorders. He made the interesting point that it is uncertain whether the finding reflects a distinction between syndromes or rather depends on different levels of intensity for variables present in all children. Is it a difference in type or in degree which explains the differences noted in prognosis between the psychiatric groupings?

Lindholm and Touliatos (1981) studied the development of behavioral problems using a cross-sectional design covering the age span from kindergarten to the eighth grade. They used the Quay Behavior Problem Checklist in which five types of behavioral problems are scored, based on teachers' ratings. The five scales include 'conduct problems' and 'personality problems'. It was found that 'conduct problems' and 'personality problems' increased from kindergarten to the third grade, declined from the third to the sixth grade, and then levelled off from the sixth through eighth grade. Boys experienced more behavior problems than girls, and children coming from homes with a low SES were more maladjusted than children coming from homes with a high SES.

The decline in behavioral problems which Lindholm and Touliatos found between middle childhood and adolescence is not consistent with, e.g., Rutter's findings. This may depend on cultural differences, but may also depend on biased sampling. It is possible that the drop out at adolescence was more biased with regard to behavior problems than the drop out at earlier ages and due to the cross-sectional design this may have introduced systematic errors in the comparison between ages.
An epidemiological study of health and adjustment at the age of 10 was carried out by Mellbin, Sundelin & Vuille (1982) using a large Swedish sample of residents in Uppsala kommun (N=5,491). Specially trained nurses interviewed school health nurses and teachers. For a subsample of the children, data were also available from a medical check-up at age 4. They used the following grouping of children's health and adjustment problems:

- Health problems (13 indicators)
- Sensoric problems, speech problems, and mental retardation (4 indicators)
- Achievement problems (6 indicators)
- Psychological and social problems ('Aggression', 'Anxiety', 'Concentration problems', 'Dependence', 'Peer problems', 'Other behavior problems', and 'Social problems in the family').

Although the psychological data are somewhat crude, many interesting facts were reported from this study. As is usually found, boys were more often reported having problems at age 10 almost regardless of the area investigated. Reading difficulties were reported for 7% of the boys and 2.5% of the girls. According to the teachers and school health nurses, the boys had adjustment problems ('medium difficult' or 'difficult') with the following prevalences (figures for girls within brackets): 'Aggression' 4.8% (1.3%), 'Anxiety' 3.7% (1.9%), 'Concentration problems' 9.2% (2.8%), 'Peer problems' 1.8% (1.0%). The figures for 'Peer problems' is surprisingly low, but this may partly depend on the fact that the school health nurses' rating is one component in the construction of the maladjustment variables, and they sometimes did not know about the children's peer problems (this line of reasoning also may apply to the other maladjustment variables).

When data at age 4 were related to data at age 10, it was found that the stability was fairly low for 'Language difficulties' and 'Motoric difficulties'. Also for maladjustment variables such as 'Aggression' and 'Anxiety', the predictive power was not high. For instance, only 28.4% of the children who were judged by the physician to be anxious at age 4 were rated as anxious at age 10, 19.1% of the children who were rated as anxious at age 10 were also anxious at age 4. However, the fairly low
stability indicated by these figures may partly depend on the somewhat crude measures. These measures also differed for the different ages. That a higher stability is found for 'Anxiety' than for 'Aggression' is somewhat contradictory to findings for older children where conduct problems exhibit a higher degree of stability than personality problems. Perhaps this reflects a genuine difference between different stages of development. Another possibility is that the measures of aggression at the different ages were not sufficiently comparable. At age 4 the main source of information was the parents, and at age 10 the main source of information was ratings by the teachers and school health nurses.

Achenbach and Edelbrock (1978) have reviewed studies concerned with the classification of childhood psychopathology. They conclude that four syndromes of psychopathology are well documented, namely, 'Aggression', 'Delinquency', 'Hyperactivity', and 'Schizophrenia'. Another four syndromes have empirical support, namely, 'Anxiety', 'Depression', 'Social withdrawal', and 'Somatic complaints'. Apparently they are more optimistic than Rutter about the usefulness of finer categories, but this may depend on Rutter's orientation towards a longitudinal perspective, where the prognostic value of the syndromes is at the focal point.

Large sex differences are found with regard to childhood psychopathology, and without going into details we summarize that conduct problems are much more common in boys than in girls. Before adolescence personality problems are also more common for boys than for girls (Eme, 1979). This it is important to study the sexes separately in this area.

Quay and Quay (1965) studied behavior problems, as rated by the teachers, during early adolescence. Using factor analysis they found three main factors, namely 'Conduct problems', 'Personality problems', and 'Immaturity'. It thus appears that the broad categories or syndromes of conduct problems and personality problems are well supported by empirical findings. These two syndromes correspond rather well to the
concepts of 'extrinsic' and 'intrinsic' adjustment which were central in the planning of the longitudinal study the present project is based on (Magnusson, Dunér, & Zetterblom, 1975).

Leaving the field of psychopathology, a vast number of studies have been performed with regard to other kinds of maladjustment such as specific reading disability, underachievement, truancy, delinquency and so on. We have not been able to locate any systematic attempt to provide a taxonomy for the whole field of maladjustment; one reason for this being that normally only a specific area of maladjustment is the focus of a single study.

Environmental aspects

In an interactional model for behavior, the environment, 'as it really is' and as it is perceived and assigned meaning to by the individual, plays an important role. This makes some comments on the environmental frame of reference for the present study necessary.

Maladjusted behavior takes place in actual situations. Each situation is characterized by physical properties, possible social relations, cultural norms, rules and roles, and situation's biological and psychological meaning for the individual (see Magnusson, 1981). The main physical environments that are of specific interest in this study, where attention is directed to maladjustment during childhood and early adolescence, are the following:

1. The classroom
2. The school yard
3. The dining hall
4. The way to and from school
5. The home

The school system in Sweden offers all children the same general school environment. In the community where the present study was carried out there are no private schools; all children attend the same
Table 2. Outline of a taxonomy of maladjustment.

**EXTRINSIC MALADJUSTMENT**

**Conduct problems**

- Hyperactivity
- Aggressive behavior
- Generally disturbing/disobedience
- Major breaks of rules (habitual truancy, delinquency)
- Abuse of alcohol, drugs, etc.

**Other kinds of extrinsic maladjustment**

- Lack of concentration
- Low school motivation
- Underachievement

**POOR SOCIAL RELATIONS**

- Poor relations to parents
- Poor relations to other adults
- Poor peer relations, mobbing
- Poor peer relations, rejection

**INTRINSIC MALADJUSTMENT**

**The child's own experience of misery**

- Doesn't like the school work
- Doesn't like school generally
- Anxiety/stress in schoolwork
- Anxiety/stress outside schoolwork
- Psychosomatic reactions
- Feelings of unhappiness at home
- Other personality problems

**The child's experience of negative evaluations**

- Low self-esteem
- Feelings of low peer status
- Feelings of being negatively viewed by teachers
- Feelings of being negatively viewed by the parents
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1. The classroom
2. The school yard
3. The dining hall
4. The way to and from school
5. The home

The school system in Sweden offers all children the same general school environment. In the community where the present study was carried out there are no private schools; all children attend the same
school system. On one hand, this circumstance allows the study of individual development under what might be called 'standardized' environmental conditions at a very general level. On the other hand, it also implies that the effect on maladjustment of school characteristics of the kind studied by, for instance, Rutter (1979) and reported in his "15.000 hours" cannot be studied since the differences are small between the schools studied in the present project (Nygren, 1969).

The empirical part of this longitudinal project takes its start at the age of ten for a representative sample of Swedish boys and girls. It is natural then that the main part of the data during childhood and early adolescence have been collected at school. During that period of life, the school, and school related activities, also are important and in many cases predominant aspects of the individual's environment.

The fact that data for relevant behaviors, experiences, and social relations have been collected at school does not mean that they refer only to the school environment. Data also cover important aspects of behaviors and social relations outside the school system such as relations to parents and other adults, alcohol and drug abuse, criminal behavior, and norms and norm conflicts.

The environment influences individual behavior at different levels of generality, from the macrolevel characterized by cultural norms, rules, habits etc that are common to most members of the society and rather stable across situations and permanent in time, to the microlevel characterized by single stimuli and events, that are bound to specific temporary situations (see, e.g., Magnusson, Dunér, & Zetterblom, 1975). In the present project, behavior has not been studied with reference to specific types of situations with a few exceptions. Thus, the environmental factors which will be systematically related to individual maladjustment are at a higher level of generality and cover more permanent and broader aspects, such as the socioeconomic standard of the family, parents' education, 'family climate', separation between parents, frequent changes of place to live, etc.
A tentative taxonomy of maladjustment

Maladjustment is not an unambiguous concept with a clearly defined content and distinct boundaries to other kinds of individual functioning. It is multidimensional and its boundaries are to some extent arbitrarily defined. Therefore we have to specify in each case which kinds of individual characteristics that we include when operationalizing the concept in empirical research.

One of the main aims of the present longitudinal project was from the beginning the systematic study of the environmental and person factors that contribute to the development of maladjustment. This aim has been a steering factor in the planning and carrying through of the project, among other things in the choice of person and environmental factors to be covered by data. At each stage of individual development those factors which have been judged to cover main aspects of adjustment and those which may be of particular importance for further adjustment have been studied as far as resources and practical opportunities have permitted.

The aspects of maladjustment that we can study in the present project are then determined by the types of data that have been collected at different age stages, with their potentialities and limitations. Thus we do not investigate maladjustment in an absolute sense; important aspects that may follow from some other definitions of maladjustment may be uncovered by our approach. We need a taxonomy which enables us to provide a bird's eye view of maladjustment, and to find central indicators.

The aspects of maladjustment that we have chosen to elucidate are presented in Table 2. The taxonomy applies to the period from middle childhood to early adolescence. As follows from the comments made above, this taxonomy is to some extent arbitrary; specific variables could have been included, etc. The taxonomy has been made up for the specific purpose of this project; to study individual development of maladjustment. We believe that it meets the necessary requirement for such a study. However, it should be observed that it has not been made up to be used
### Table 2. Outline of a taxonomy of maladjustment.

<table>
<thead>
<tr>
<th>EXTRINSIC MALADJUSTMENT</th>
</tr>
</thead>
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<tr>
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</tr>
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</tr>
</tbody>
</table>
for other purposes, for example, for psychiatric classification and diagnosis. It should be observed that we have focused on covering major single aspects or symptoms of maladjustment as a basis for the construction of syndromes.

In Table 2 a major distinction is made between extrinsic and intrinsic maladjustment. Extrinsic maladjustment means a disagreement between the child's behavior and the demands that define his role in the system. Intrinsic maladjustment means disagreement between the child's needs, motives, and evaluation on the one hand, and on the other the rewards he gains as experienced by himself (Magnusson, Dunér, & Zetterblom, 1975). This distinction agrees rather well with the one made by Rutter between conduct problems and personality problems - a distinction which is well documented (see above).

The distinction made between conduct problems and other kinds of extrinsic maladjustment is with regard to whether the formal or informal set of rules in society are broken or not. This distinction is very basic in most situations both inside and outside school, and is therefore natural to make. The various kinds of conduct problems that are listed have emerged from our review of the literature, and from a common sense analysis. Both underachievement (see, for instance, Svensson, 1971) and poor social relations (see, for instance, Roff et al., 1971) are important aspects of maladjustment. The distinction between mobbing and rejection is central, and perhaps rejection should also be subdivided into passive and active rejection with passive rejection meaning that a child is not liked by anyone, but not disliked, and active rejection meaning that a child is disliked by his peers (cf. Broman, 1974; Jennings, 1950). However, for the sake of simplicity we do not pursue this distinction, and, besides, passive rejection cannot unequivocally be categorized as extrinsic maladjustment.

To obtain a meaningful classification of intrinsic maladjustment is very difficult (see Lorr et al., 1963, for a discussion of the problems of psychiatric classification). Several ways of arriving at a classification are possible but none appears quite satisfactory to us. We make
a basic distinction between the child's experience of misery in different situations, and the child's negative evaluation of himself, and his beliefs of others' negative evaluation of him. From a situational point of view we try to distinguish between what happens within and outside of the classroom and inside or outside school. With regard to personality problems, our review of the literature suggests that anxiety and psychosomatic reactions are commonly identified problems (see above) and are thus included. Since we do not intend to make a psychiatric classification, all other personality problems of an intrinsic maladjustment type are lumped together in one category. Besides, in our opinion a finer distinction within this area has not sufficient empirical support.

With regard to a child's experience of negative evaluations, a basic distinction is between his own negative self-evaluation, and his belief that others hold a negative evaluation of him. Especially important persons are here his peers, his teachers, and his parents. The importance of this set of cognitive pictures with regard to maladjustment is obvious (see, for instance, Diggy, 1966; Hall & Lindzey, 1957; Rogers, 1965). The child's evaluation can of course refer to specific aspects of himself, and a global evaluation is rather crude (see, for instance, Magnusson, 1964). However, it is sufficient for our purposes.

The actual problems involved in finding good indicators for our constructs will not be treated in this report. Such problems are very close to the data, and will be discussed in later reports when the data from each point in time are analyzed. Certain methodological problems, with regard to the construction of indicators, will be treated in the following section.
METHODOLOGICAL CONSIDERATIONS

The construction of indicators of maladjustment

It is our belief that indicators having a direct relation to relevant behavior are preferable to elaborated indices for a number of reasons. For instance, complicated, relative measures have been shown to introduce complications when studying change (see the discussion in a later section). The descriptive focus of the project also gives additional importance to having indicators with an immediate psychological interpretation.

Easy psychological interpretability of indicators also has implications for the choice of scale values or cut off points. Rather than just trying to get fixed percentages of the distribution for a variable allotted to different categories of the indicator, it must also be the aim in research of this nature that a value on the scale of an indicator, should have a direct psychological interpretability.

In an earlier section of this paper it was argued that the scales to be developed should measure symptoms of maladjustment, and need not be constructed with the additional aim of discriminating between different degrees of good adjustment. Considering the imperfect reliability and validity of available measures, it appears not to be useful to attempt to discriminate between more than a few degrees of severity of symptoms of maladjustment. Such a coarse categorization is also necessary to be able to perform the rather down-to-earth kind of analysis we intend to do (see the next section).

The special problems introduced by errors of measurement are discussed in the concluding section with regard to the study of syndromes of maladjustment. The main practical implication of this discussion with regard to the construction of indicators is to avoid, if possible, to rely on a single scale or variable to measure a construct. To use several sources of information to measure a construct also increases the possibility of an acceptable situational coverage.
The detection of syndromes of maladjustment

As was discussed in the second section of this paper, one of our central interests is the grouping of persons into different syndromes of maladjustment rather than merely the grouping of variables.

There exists a multitude of methods for the detection of syndromes ranging from rather robust forms of cluster analysis (see, for instance, Bijnen, 1973) to the analysis of latent structures (see, for instance, Lazarsfeld, 1968). In some situations, such methods will be used by us, but we would normally prefer a methodology which allows us to stay closer to the data than we are able to in latent structure analysis. Ideally, we would like to study the maladjustment pattern in all indicators for all individuals. If we are willing to reduce the number of indicators to, say 8 - 10, each taking a maximum of two or three values, there are methods available to structure and analyze such data. Furthermore, in these methods few assumptions are made – they are robust.

The data to be analyzed is of a k-dimensional categorical type and can be represented by the data matrix in Table 3.

Table 3. Data matrix for k-dimensional categorical data.

<table>
<thead>
<tr>
<th>Person nr</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>...</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$X_{11}$</td>
<td>$X_{12}$</td>
<td>$X_{13}$</td>
<td>...</td>
<td>$X_{1k}$</td>
</tr>
<tr>
<td>2</td>
<td>$X_{21}$</td>
<td>$X_{22}$</td>
<td>$X_{23}$</td>
<td>...</td>
<td>$X_{2k}$</td>
</tr>
<tr>
<td>3</td>
<td>$X_{31}$</td>
<td>$X_{32}$</td>
<td>$X_{33}$</td>
<td>...</td>
<td>$X_{3k}$</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>n</td>
<td>$X_{n1}$</td>
<td>$X_{n2}$</td>
<td>$X_{n3}$</td>
<td>...</td>
<td>$X_{nk}$</td>
</tr>
</tbody>
</table>
Let us denote the number of possible values or categories for variable \( i \) with the letter combination \( C_i \). The number of possible profiles or combinations of values in the \( k \) variables are \( C_1 \cdot C_2 \cdot C_3 \cdots \cdot C_k \), and it is easily seen that already for a moderate number of variables, each taking on a few different values, the number of possible combinations is very large. For instance, ten variables each taking on three values gives 59,049 different combinations. To be able to stay close to data, and manage to overview and structure data, the number of indicators, and the number of values these take on, must be limited.

Krauth & Lienert (1973) have developed a method for analyzing \( k \)-dimensional categorial data in order to detect syndromes ('Konfigurationsfrequenzanalyze' or 'KFA'). Their method consists in essence of a systematic analysis of response patterns using \( \chi^2 \)-based statistics. The observed frequencies of all possible response patterns are compared to the expected frequencies, under the null hypothesis of independence between the \( k \) variables. A significant excess frequency of an observed pattern indicates a 'Konfigurationstype', and a significantly lower frequency of an observed pattern than expected indicates a 'Konfigurationsantitype'. The method has been developed to incorporate hierarchical analysis and the study of pattern change.

In our opinion, Kraut & Lienert's method is very useful in many situations. However, certain problems arise when using it in the present context - one problem being the very small expected frequencies for many patterns which may invalidate the significance testing procedures. There are, however, ways of getting around this problem such as devising other tests of significance (cf. Krauth & Lienert, 1982) and as grouping variables before testing.

Another way of analyzing \( k \)-dimensional categorial data is using log-linear models (see, for instance, Bishop, Fienberg, & Holland, 1975). There it is assumed that the probability of an occurrence in each cell in the \( k \)-dimensional table can be represented as a product of a number of latent parameters which indicate the existing interactions between the \( k \) variables and the single effects. If the logarithms are taken of the cell probabilities,
these then become linear functions of the parameters, which can be interpreted as in an analysis of variance situation. Different models can be tested by assuming different parameters to be zero.

Also in the case of log-linear models problems are introduced by small expected frequencies, and the model is more complicated than 'KFA'. With many variables empty cells will appear which introduce complications. However, log-linear analysis is a powerful tool for testing models, i.e., in our case detected syndromes, and will be used in some situations for confirmatory analysis.

To illustrate the methodology mentioned above the following example is given in Table 4, using data from the present project.

Table 4. An example of 3-dimensional categorial data taken from boys aged 10 in the project.

<table>
<thead>
<tr>
<th>Hyperactivity</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressive</td>
<td>5</td>
<td>33</td>
</tr>
<tr>
<td>Not aggressive</td>
<td>8</td>
<td>49</td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>64</td>
<td>290</td>
</tr>
<tr>
<td>No hyperactivity</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The expected frequency of each cell under the null hypothesis of complete independence of the three variables is given in Table 5.

Table 5. Expected frequencies for the cells in Table 4.

<table>
<thead>
<tr>
<th>Hyperactivity</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressive</td>
<td>2.1</td>
<td>10.2</td>
</tr>
<tr>
<td>Not aggressive</td>
<td>8.3</td>
<td>40.5</td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>14.0</td>
<td>68.7</td>
</tr>
<tr>
<td>No hyperactivity</td>
<td>55.6</td>
<td>272.6</td>
</tr>
</tbody>
</table>
An overall $\chi^2$ for testing independence computed for Table 4 is 79.3 with 4 degrees of freedom ($p < .0001$). In a 'KFA' analysis a $\chi^2$ component is calculated for each cell, and the value is compared to the $\chi^2$ distribution with one degree of freedom. The value of each component is given in Table 6.

Table 6. Values of $\chi^2$ components in a 'KFA' analysis of Table 4.

<table>
<thead>
<tr>
<th></th>
<th>Hyperactivity</th>
<th>No hyperactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggressive</td>
<td>4.0*</td>
<td>51.0***</td>
</tr>
<tr>
<td>Not aggressive</td>
<td>3.4</td>
<td>10.4**</td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>2.6</td>
<td>5.6*</td>
</tr>
<tr>
<td>No hyperactivity</td>
<td>1.3</td>
<td>1.1</td>
</tr>
</tbody>
</table>

* = $p < .05$
** = $p < .01$
*** = $p < .001$

To handle the problem of dependence between the different $\chi^2$-component-tests, Krauth & Lienert suggest that each of the tests are performed with a type I error level that equals the desired level divided by the number of tests. If in our case the desired $\alpha$ is 5%, then each test should be performed on the 5/8% level. We then find that Aggression x Hyperactivity x No timidity constitutes a significant type, and that Aggression x No hyperactivity x No timidity constitutes a significant antitype.

A log-linear approach was also performed on the same data, and the fit of four different such models are given in Table 7. A small $\chi^2$ indicates a good fit.

The first model, denoted (A) (H) (T), implies that there are no interaction effects between the variables and the second model indicates that in addition to the main effects of all three variables, there is an interaction effect between Aggression and Timidity. The third model,
Table 7. The fit of four different log-linear models to the data in Table 4.

<table>
<thead>
<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) (H) (T)</td>
<td>63.7***</td>
<td>4</td>
</tr>
<tr>
<td>(AT) (H)</td>
<td>62.9***</td>
<td>3</td>
</tr>
<tr>
<td>(HT) (A)</td>
<td>62.7***</td>
<td>3</td>
</tr>
<tr>
<td>(AH) (T)</td>
<td>1.4</td>
<td>3</td>
</tr>
</tbody>
</table>

denoted (HT) (A), implies that in addition to the single effects of all three variables there is an interaction effect between Hyperactivity and Timidity. The fourth model, denoted (AH) (T), implies that in addition to the single effects there is an interaction effect between Aggression and Hyperactivity. It is seen from Table 7 that the fit of the three first models is not acceptable, but that the fourth model fits the data well. The interpretation is similar, but not identical to the one reached after the KFA-analysis. From both analyses it is concluded that there is an interaction effect between Aggression and Hyperactivity, but in the KFA the interpretation also calls for an interaction of Aggression x Hyperactivity with Timidity. This variable is a linear effect in the log-linear analysis, which gives a somewhat simpler interpretation.

In our opinion, the KFA has a great heuristic value in being simple to perform and it allows us to stay close to data. However, we believe that in some situations it is advantageous to use both methods.

In situations when many variables must be included in the analysis it may not be meaningful to apply the above kinds of analyses. A robust form of cluster analysis is then an alternative where the similarity between objects is measured with, e.g., the agreement score of McQuitty (see Bijnen, 1973, for a discussion of this).

Additional problems are introduced by the presence of errors of measurement. These are discussed in the last section where a method ("the type-leader method") is suggested for handling such problems.
When grouping individuals using information from many variables, problems almost always arise not only with regard to how many clusters to retain and how to allot objects to different clusters or types. Problems arise also with regard to the psychological interpretation and description of the types that are circumscribed. One method to guide both the grouping of individuals and the structuring of the different maladjustment syndromes of indicators is to use a two step procedure in which the first step is to find syndromes within the main areas. One possible division into areas would be to divide the indicators in two broad groups, namely those measuring extrinsic maladjustment and those measuring intrinsic maladjustment. Then the syndromes within each area are related to syndromes in the other area in a cross-tabulation. The resulting classification of syndromes or patterns of maladjustment would then have the appearance illustrated in Table 8. For illustrative purposes it is assumed that three syndromes are found within each syndrome area.

Table 8. Example of a possible result structure for patterns of maladjustment.

<table>
<thead>
<tr>
<th>Syndrome found with regard to intrinsic maladjustment</th>
<th>Syndrome found with regard to extrinsic maladjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Syndrome 1</td>
</tr>
<tr>
<td>Syndrome 1</td>
<td>( n_{11} )</td>
</tr>
<tr>
<td>Syndrome 2</td>
<td>( n_{21} )</td>
</tr>
<tr>
<td>Syndrome 3</td>
<td>( n_{31} )</td>
</tr>
<tr>
<td>No intrinsic maladjustment</td>
<td>( n_{41} )</td>
</tr>
</tbody>
</table>

In Table 8, for example, \( n_{23} \) means the number of persons exhibiting Syndrome 2 with regard to intrinsic maladjustment and Syndrome 3 with regard to extrinsic maladjustment. In practice, presumably more than three syndromes are necessary within each syndrome area, and with, for instance, five syndromes within each area the number of cells become 36. The results may then be somewhat difficult to overview, but we think it
is nevertheless important to present such results since they are rather close to the actual response patterns. On the basis of results like those in Table 8, a simpler description can then be given.

It may be that it is found that the subdivision of the indicators into the two areas suggested here, oversimplifies and that it is necessary to divide the indicators into more than two areas. This is fully possible, but there are also obvious limitations to the number of cells and/or dimensions that are possible to handle.

A longitudinal approach for studying the development of patterns of maladjustment

Some design problems. The development of psychological characteristics has been studied using both longitudinal and cross-sectional designs, and it has been shown that both designs have their strengths and weaknesses (see, for instance, Baltes, 1968; Janson, 1981b). The strength of a longitudinal design is the possibility of studying individual development, and that cohort effects are separable from age effects. The weakness of a longitudinal design is the difficulties in generalizing from the cohort studied to other cohorts (generations) for some kinds of studies, and that the results from a longitudinal study are not available until several years after the study was initiated. With a cross-sectional design it is possible to initiate and implement a developmental study within a year or even a shorter time. However, a cross-sectional study has severe deficiencies in that individual development can not be studied, and age and cohort effects are confounded.

Since our emphasis is on the development of the complete maladjustment pattern for each individual, we judge it necessary to use a truly longitudinal design in which the maladjustment pattern for each individual is followed over time.
When discussing methodological problems in studying change, the focus in the literature has almost always been variable-centered. The case with a single psychological characteristic as the dependent variable is often treated; this variable assumed to be measured on an ordinal or interval scale (see, for instance, Bergman, 1972b). The problem of age-specific measurements is then almost always troublesome when interpreting the psychological meaning of an observed change (see, further in Harris 1963). For instance, is a decrease of ten points on a test anxiety score for an anxiety test administrated at age 10 and 15, respectively, really a decrease in test anxiety, or does this decrease just reflect an increased level of denial of anxiety with age?

Our main concern is with the development of patterns of maladjustment. To the extent that the patterns can be reduced to a limited number of syndromes or types, this corresponds to a statistical model where the development is studied for a variable scaled using a nominal scale. The conceptual problems in the study of change are not avoided completely in this situation, but they are somewhat different and also somewhat alleviated. They are alleviated in the sense that no assumptions have to be made that measures from different points in time really measure the same construct on the same scale. For each individual the transition can be studied between the syndrome at one point in time according to the classification at that time and the syndrome at another point in time according to the classification at that time. However, with many possible syndromes at each point in time, and somewhat different classifications at different points in time, the description easily becomes very complicated.

One way of studying change in syndromes which avoids the complication mentioned above is to score for change all indicators that are common at two points in time. Krauth & Lienert (1973) has suggested such a procedure where a positive change in an indicator is scored '+' , no change is scored '0', and a negative change is scored '-'. For instance, an indicator taking values from 1 to 20 at each point in time is used for scoring a change variable which is given the value '-' if the difference is
less than minus 1, the value '0' if the difference is \(0 = 1\), and the value
'+' if the difference is larger than 1. For \(t\) indicators there are
\(3^t\) possible change profiles, and such data can be analyzed with KFA
as shown by them. At first glance one is inclined to believe that,
applied in this connection, this method shares many of the problems con­
nected with the univariate study of change for a characteristic mea­
sured on an interval scale; mainly the difficulty of the psychological
interpretation of a change score. However, we believe that this problem
is somewhat alleviated with the KFA-procedure, since only very broad
categories are used as indicators of change.

Another way of analyzing change between two or more points in time
is to view the types at each time as states of being. Assuming the same
possible states at the different points in time it is then possible to
apply a statistical model for the transition between states at different
points in time, e.g., a Markov chain model. In the present context we
believe that such models have limitations; mainly doubtful statistical
assumptions (for instance, in some models an assumption is made of 'no
memory' of the process), and problems in interpreting a state as being
identical between different points in time.

Consider the situation when change in the adjustment pattern between
two points in time is to be studied. If we are unwilling to make the
simplifications and assumptions suggested in the above models, we are
back to the complicated result structure that was mentioned in the nomi­
nal variable case. It can be illustrated by the data matrix in Table 9
below.

In Table 9, for instance, \(n_{21}\) means the number of persons classi­
fied as belonging to Syndrome 2 at time 1 and belonging to Syndrome 1
at time 2. Such a data matrix easily becomes very complicated to over­
view and interpret, but we believe that these problems often can be solved
by a careful description where an initial cross-tabulation like the one
in Table 9 is broken down in successive smaller cross-tabulations con­
taining percentages, for instance, by combining values or by just
Table 9. Data matrix for the results when studying change between two points in time.

<table>
<thead>
<tr>
<th>Syndrome at time 1</th>
<th>Syndrome at time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$n_{11}$</td>
</tr>
<tr>
<td>2</td>
<td>$n_{21}$</td>
</tr>
<tr>
<td>3</td>
<td>$n_{31}$</td>
</tr>
<tr>
<td>,</td>
<td></td>
</tr>
<tr>
<td>,</td>
<td></td>
</tr>
<tr>
<td>J</td>
<td>$n_{j1}$</td>
</tr>
</tbody>
</table>

studying a few values in each table. Great care has also to be taken in order to make the classification at each point in time suitable for a change analysis.

In the next step, change syndromes are constructed after careful inspection of the results, and these are related to the patterns of maladjustment at time 3 etc. Alternatively can the above kind of analysis be performed for each pair of points in time (or just each adjacent pair).

There are various tools available to aid in the above kind of analyses. Krauth & Lienert (1982) indicate a procedure using fourfold table tests in a similar way as in their multi-sample KFA. Log-linear models can also be used. Goldstein (1979) gives an example in which a 2 x 5 cross-classification table is analyzed; the rows being two levels of reading scores at age 16, and the columns being five levels of reading scores at age 11. Looking at Table 9, it can be said that with a log-linear model the different $n_i$s are 'explained' by the linear effects and the interaction effects in the general model. When testing if data fits a certain log-linear model, the effects assumed to be non existant are set to zero. This kind of models
can be generalized to higher order tables (Bock, 1976), but the interpretation of the results from such models is difficult, and it is not easy to judge whether the necessary assumptions are met.

**The importance of having a representative sample.** A troublesome problem in longitudinal studies is the lack of representativeness of the samples in many investigations. The lack of representativeness has two main causes:

(a) A biased group is chosen from the beginning, for instance, the sample is made up of the children in a day care school close to the university.

(b) In the implementation of the longitudinal study, subjects are lost due to biased attrition.

With regard to (a) above, the main point is naturally the degree of representativity of the studied group for the population it is desired to make inferences to. In our view, such problems are ignored to a surprisingly large extent, and the conclusions of many longitudinal studies are severely limited by deficiencies in sampling (Bergman, 1972c; Rutter, 1981; Wall & Williams, 1970).

In the present project the main group under study is defined as all children in the third grade in Örebro in 1965 who received normal schooling.

This definition was applied for practical reasons and it does not correspond perfectly to a definition of the population as all children in the relevant age cohort in Örebro. For instance, 6% of the children in grade 3 received special schooling, mostly due to severe reading difficulties, and they are not included. However, for most purposes the applied definition should be acceptable if it is kept in mind that the negative end of the distribution of some variables may be somewhat curtailed.

Surprisingly good agreement has been found between the Örebro results and results from other Swedish samples, at least with regard to intelligence scores and achievement scores (Bergman, 1973) and with regard to
drop out from the school system after age 16 (Beckne, 1981). For many purposes, it appears reasonable to assume that the Örebro cohort is representative of a Swedish urban population of children of the same generation.

With regard to (b) above, we do not possess complete data for all children. In order to minimize the drop out it may be advisable to use all individuals who have the necessary data for a certain analysis, and who belong to the population. In this way the possible drop out bias (see below) is reduced. This means that different analyses will include somewhat different individuals which introduces complications. However, we estimate that at least 85% of the individuals will be identical between any two analyses. Nevertheless, it is important to investigate the effects on the results of the shifting composition of the groups in different analyses, and this can be done by utilizing the fact that we have at least some information for all individuals in the population.

The reason we put such emphasis on reducing the drop out rate is that the drop out presumably is selective in the sense that maladjusted children are overrepresented amongst children with incomplete data (Cox et al, 1977). Perhaps it will also be possible to introduce in the study a variable of the type 'drop out/not drop out' as an indicator of maladjustment.

In a longitudinal study, some information is almost always at hand also for drop out cases, and this information can be very useful when analyzing the effects of the drop out on the results (Bergman, 1972c; Robins, 1978). This is also the case in our project. As shown by Bergman, it is in some situations even possible to correct for the effect of the drop out on the results.

Complications introduced by errors of measurement

It is well known that errors of measurement complicate the study of change, and often more seriously than within most other fields of study. To illustrate the problem, take the case of a single dependent variable, measured on an interval scale, and studied at two points in time. Let us
make the classical test theoretical assumptions (see, for instance, Magnusson, 1967) in which an observed score is composed of a true part and an error part, and denote the involved variables as follows:

\[ X = X_t + X_e \]  \hspace{1cm} (1)

\[ Y = Y_t + Y_e \]  \hspace{1cm} (2)

where \( X \) is the observed score at time 1
\( X_t \) is the true part of the score at time 1
\( X_e \) is the error part of the score at time 1 and, correspondingly for \( Y, Y_t, \) and \( Y_e \).

The change score \( Y - X \) can then be expressed as

\[ Y - X = (Y_t - X_t) + (Y_e - X_e) \]  \hspace{1cm} (3)

Usually, \( Y_t \) and \( X_t \) are highly correlated, and in the case of no true change identical. It can then be shown that the variance of \( (Y_t - X_t) \) usually is much smaller than the variance of \( Y_t \) or \( X_t \). On the other hand, \( Y_e \) and \( X_e \) are independent of each other and \( (Y_e - X_e) \) has a variance which is the sum of the variance of \( Y_e \) and of \( X_e \). Thus, the error part of the variance is larger in relation to the true part for the change score than for the score of \( Y \) or \( X \), and, correspondingly, the reliability is lower. This is developed more fully in Bergman (1971, 1972b).

The above line of reasoning points to the danger in using change scores for imperfectly measured indicators. In many situations it may then be advisable to use very broad categories for classifying change scores.

When studying patterns of maladjustment, errors of measurement also introduce complicated analytical problems. Intuitively this is realized when it is understood that a response pattern can be viewed as indicating a multiple difference structure.
Consider the situation when we want to find patterns of maladjustment among \( k \) indicators, \( X_1, X_2, \ldots, X_k \), with indicator \( X_i \) taking the values \( C_{i1}, C_{i2}, \ldots, C_{ip} \). Denote the probability of indicator \( X_i \) being misclassified for an individual when it truly is \( C_{ij} \) with \( m_{ij} \), and assume that all classifications are independent of each other. The probability of all \( k \) indicators being correctly classified, here denoted \( m_0 \), is then given by formula (4) below for the response pattern \( X_1 = C_{1j}, X_2 = C_{2j}, \ldots, X_k = C_{kj} \).

\[
m_0 = \prod_{i=1}^{k} (1 - m_{ij})
\]  

(4)

If we assume that all misclassification probabilities are equal, and denote this probability with \( m \), we can simplify (4) to

\[
m_0 = (1 - m)^k
\]  

(5)

In this case, the probability of all \( k \) indicators being correctly classified, except \( g \), denoted \( m_g \), is given by the binominal probability

\[
m_g = \binom{k}{g} (1 - m)^k - g \cdot m^g
\]  

(6)

To exemplify the practical implications of the above formula, the probabilities of no, at most one, at most two, and at most three, misclassifications of an individual's true response pattern are given in Table 10 for the case with ten indicators. Three different cases with different probabilities of misclassification of a single indicator are presented.

Table 10. Probability of different numbers of misclassifications for a profile of 10 indicators. Assumptions as in formulae (5) and (6).

<table>
<thead>
<tr>
<th>Number of misclassifications</th>
<th>Probability of misclassification of a single indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.30</td>
</tr>
<tr>
<td>0</td>
<td>0.03</td>
</tr>
<tr>
<td>Not more than one</td>
<td>0.15</td>
</tr>
<tr>
<td>Not more than two</td>
<td>0.38</td>
</tr>
<tr>
<td>Not more than three</td>
<td>0.65</td>
</tr>
</tbody>
</table>
It is seen from Table 10 that, for instance, the probability of not more than one misclassification is depressingly low, if the reliability is not very high. The following three conclusions can be drawn from this:

1. It is very important to use indicators having a high reliability.
2. As few indicators as possible should be used in the pattern analysis. Sometimes several indicators of the same concept is at hand, and these can then be combined so as to increase the reliability.
3. When classifying persons according to their response pattern, the methods used should be robust with regard to the effects of errors of measurement. We believe this is the case for KFA. Below a method for cluster analysis is suggested in which the problem of misclassification to some extent is taken into account.

Assume that we have access to true values in \( k \) indicators for \( n \) objects, and that indicator \( i \), denoted \( X_i \), as before, takes on \( r_i \) different values. The number of different combinations or possible response patterns denoted \( w \), is then given by formula (7).

\[
w = \prod_{i=1}^{k} r_i
\]  

For instance, \( k = 8 \), and \( r_1 = r_2 = \ldots = r_k = 2 \) gives \( w = 256 \),
\( k = 10 \), and \( r_1 = r_2 = \ldots = r_k = 4 \) gives \( w = 1048576 \), and
\( k = 20 \), and \( r_1 = r_2 = \ldots = r_k = 3 \) gives \( w \approx 3.5 \cdot 10^9 \).

Normally, if \( n \) is not small compared to \( w \) and if types exist, we should expect to find that certain patterns occur in several persons, and that other patterns do not occur at all. What happens to the result structure if there is a probability larger than zero that each indicator is misclassified? For the sake of concreteness, let us assume that we have 10 indicators \( (k = 10) \), and that the probability of misclassification for each single indicator is 0.10. Let us also assume that the assumptions made in Table 10 holds and that misclassification probabilities are identical for all persons. The probability of no misclassification for a given person is then 0.35, i.e., if, say, 20 persons...
have a certain true response pattern, we should expect on the average
0.35 \times 20 = 7 \text{ of them to show such an observed response pattern after}
errors of measurement have been introduced. It is intuitively realized
that misclassifications of the type we discuss here will normally not
lead to new types but rather to a scatter of the observed response pat-
terns.

The implication of the above line of reasoning is that errors of
measurement may well lead to important types being underrepresented in
the observed response patterns. It seems reasonable to assume that types
frequently observed should be more frequent if no errors of measurement
were present. When clustering objects it then appears natural to find
the frequent response patterns or types, and then add to each type the
objects that are similar to that type. (It should be noted that by a
'type' we here simply mean a response pattern that often occurs regard­
less of whether it occurs more frequently than expected from the marginal
frequencies. Of course, 'konfigurationstypen' as previously defined may
be of special psychological significance, but this is not reflected in
the analysis, and is left to the stage when the results of the analysis
are to be interpreted.) As a measure of similarity, for instance, the
agreement score of McQuitty (1954) could be used. We call this method
the 'type leader method'.

The suggested procedure will in many cases produce similar results
to ordinary cluster analysis, but there are also important differences:

(1) If no initial types are found, the type leader method will not be
applicable. This will usually be the case when the number of pos­sible response patterns is large (see Formula (7)) compared to the
sample size. However, in our study of maladjustment we will make
every effort to keep down the number of variables or indicators,
and the sample sizes are over 400 for both boys and girls.

(2) The measures of similarity we use are in relation to the specified
types, and are not computed for every pair of objects.
(3) A maximum degree of disagreement to a type which is tolerable must be specified, and this will in practice often lead to quite a few objects being left unclassified. These can either be cluster analyzed separately in a conventional cluster analysis or classified by visual inspection. Perhaps a certain residue of unclassified objects should be allowed rather than forcing such objects into a classification that does not fit. Considering the state of knowledge in this field of psychology, deficiencies in concepts and indicators and so on, this may lead to a truer presentation of the facts.

We are interested in studying syndrome or type change. Consider the situation when change between two points in time is studied. In addition to the problems of finding syndromes in the presence of errors of measurement, which were discussed above, another problem appears. Let us assume that the probability of syndrome misclassification at each point in time is 0.20. Under assumptions of independence etc, this means that as many as 36% of the persons will not be represented in the cross-tabulation with their true syndrome at occasion 1 x true syndrome at occasion 2. Again, the conclusion is that the classification at each point in time must be very reliable; the most important determinant of this being very reliable single indicators.
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