Long-Term Outcome of Schizoaffective and Schizophrenic Disorders: a Comparative Study*

II. Causal-Analytical Investigations

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Summary. The influence of symptomatological and non-symptomatological factors on the long-term outcome of schizoaffective and schizophrenic disorders was investigated using the Analysis of Linear Structural Relationships (LISREL). The outcome was assessed employing the GAS, WHO/DAS, PIRS and the Bonn Criteria of Outcome. The analysis produced some interesting results in both groups, separately and in comparison with each other. The most striking difference between the two disorders concerns the finding that only symptomatological parameters directly influence the long-term outcome of schizoaffective disorders – melancholic episodes are correlated with favourable outcome, symptoms typical of schizophrenia with a relatively unfavourable outcome. Both symptomatological parameters (such as schizophrenic first-rank symptoms during course) and non-symptomatological parameters (such as life events or acuteness of onset) have a direct impact on the outcome. It was also found that "simple" depressive symptomatology (the presence of depressive symptoms not fulfilling the criteria of melancholic episodes according to DSM-III-R) has no influence on the long-term outcome of schizophrenia.

Key words: Long-term outcome – Schizophrenia – Schizoaffective disorders – Prediction – LISREL analysis

Introduction

The question as to which factors can influence the long-term outcome of mental disorders is certainly one of the most important questions in clinical psychiatry as well as in research. Several studies on the long-term course of schizophrenia have found factors, such as depressive mood, acuteness of onset, age at onset, sex, premorbid social adjustment and some psychopathological symptoms, assumed to be correlated with a poor or good outcome (Bleuler 1973; Gaebel et al. 1981; Huber et al. 1979; Ciompi and Müller 1976; Möller and von Zerssen 1986). Investigations of factors influencing the long-term outcome of schizoaffective disorders are relatively rare; they usually point out the relevance of symptomatological factors, such as polarity of mood and intensity of schizophrenic symptomatology, for poor or favourable long-term outcome (Angst 1986, 1989; Marneros and Tsuang 1986b; review in Marneros and Tsuang 1986a).

The present part of the Cologne Study (Marneros et al. 1986a, 1988a) deals with the following questions:

1. What is the relevance of non-symptomatological factors for the long-term outcome of schizoaffective and schizophrenic disorders?

2. What is the influence of psychopathological symptoms?

3. Are there any factors similarly influencing the long-term outcome of both schizophrenia and schizoaffective disorders?

Materials and Methods

As we mentioned in part I of the present study (Marneros et al. 1989a) we used the Analysis of Linear Structural Relationships (LISREL analysis; Joereskog and Soerbom 1987) to investigate the influence of various factors on the long-term outcome of schizoaffective and schizophrenic disorders. The other instruments of evaluation and the subjects studied were also described in part I.

Table 1. LISREL model for schizoaffective disorders (constructs and goal variables)

Schizoaffective disorders		
Exogenous independent constructs	Endogenous dependent constructs	Goal variables
Premorbid personality	*Initial episode*	*Residuum*
Obsessoid (typus melancholicus)	Schizophrenic	
Asthenic/low-self-confident	Schizodepressive	*Global Assessment Scale (GAS)*
Sthenic/high-self-confident	Schizomanic	
	Schizomanic-depressive	*Disability Assessment Schedule (DAS)*
Onset condition	Manic	Global evaluation
Life event at onset	Manic-depressive	Self-care
Acuteness of onset		Spare-time activity
Heterosexual stable relationship	*Episode during course*	Slowness
before onset	Schizophrenic	Social withdrawal
	Schizodepressive	
Sex	Schizomanic	*Psychological Impairment Rating*
	Schizomanic-depressive	*Schedule (PIRS)*
Age at onset	Manic	Psychic tempo
	Manic-depressive	Attention withdrawal
Social class		Initiative
Parents' social class	*Melancholic episode*	Communication by facial expression
Social class at onset		Affect display
	Schizophrenia-typical symptoms	Conversation skills
	Delusions (mood-incongruent)	Self-presentation
	Auditory hallucinations	
	(mood-incongruent)	
	First-rank symptoms	
	Incoherence	

As again mentioned in part I, LISREL analysis enables the computation of important aetiological factors as latent hypothetical constructs as well as an assessment of their influence on the outcome of schizophrenia and schizoaffective disorders (Joereskog and Van Thillo 1973).

The basis of the LISREL analysis of parameters relevant for the outcome was formed by the matrices of intercorrelation of 39 variables in the schizophrenia group and of 40 variables in the group of schizoaffective disorders (e.g. various relevant symptoms and combinations of symptoms, various social and demographic variables such as social class, and premorbid interactions). Because of the differences in scale quality of the variables evaluated, polychoric and multiserial coefficients of correlation were applied to compute their intercorrelations. Because the data scales were in part of low quality, mean value distributions and matrices of covariance could not be included in the LISREL analyses, and so restrictions were imposed on the model. Therefore, we initially computed a confirmatory factor analysis for each group of patients separately in order to estimate the latent constructs from the manifested variables. The results of this analysis showed a high degree of discrepancy in both groups of patients between hypothetically estimated constructs and the empirically observed factor structure of the manifested variables. By reducing the initial number of variables and changing the grouping of the manifested clusters of variables, however, it was possible to determine the constructs and to achieve good construct validity of the models for both groups investigated.

LISREL Model for Schizoaffective Disorders

In the model for schizoaffective disorders, five latent constructs could be specified as "exogenous independent constructs" (causal factors independently involved in the model)

and four as "endogenous dependent constructs" (causal factors dependently involved in the model) (see also Table 1).

The "goal variables" of the LISREL analysis were (a) the presence of a psychopathological residuum according to Huber's criteria (Huber et al. 1979; Marneros et al. 1986a), (b) the intensity and form of disability according to the Disability Assessment Schedule (WHO/DAS; Schubart et al. 1986a, b; WHO 1988), (c) the presence of psychological impairment according to the Psychological Impairment Rating Schedule (PIRS; Biehl et al. 1988) and (d) the level of functioning according to the Global Assessment Scale (GAS; Spitzer et al. 1976; Endicott et al. 1976).

Exogenous Independent Variables. Five "exogenous independent variables" could be specified (see Table 1).

The manifest parameters for the latent construct "premorbid personality" are the following personality types: (a) obsessoid (typus melancholicus), (b) sthenic/high-self-confident, (c) asthenic/low-self-confident (for definitions and criteria, see Marneros et al. 1988c). For the latent construct "onset conditions", the following variables were specified: (a) the presence of life events at onset (definitions in Marneros et al. 1988c), (b) acuteness of onset (definitions in Marneros et al. 1988c) and (c) stable heterosexual relationship before onset (definitions in Marneros et al. 1989c).

"Sex" and "age at onset" formed separate constructs. The fifth exogenous latent construct, "social class", was determined by the variables parents' social class (or original social class) and patient's social class at onset. Social class was evaluated according to the criteria of Kleining and Moore (1968) and then transferred to the classification of Hollingshead and Redlich (1958).

Endogenous Dependent Variables. Four endogenous dependent variables were specified (Table 1). The parameters of the

construct "initial episode" were schizophrenic, schizodepressive, schizomanic, manic, manic-depressive and schizomanic-depressive episodes as defined by Marneros et al. (1988a).

The same types of episodes formed the construct "episodes during course". The "melancholic episode" − initially as well as during the course of the illnes − proved to be a separate endogenous construct. The construct "schizophrenia-typical symptoms" was determined by the variables schizophrenic first-rank symptoms, mood-incongruent delusions, mood-incongruent auditory hallucinations and incoherence. In cases with residua the above-mentioned symptoms were involved only if they appeared before the beginning of the residua.

Goal Variables. The goal variables of the LISREL analysis were (a) the development of a residuum according to the definition given in part I of the present study (Marneros et al. 1989a), i.e. the presence of psychopathological residual symptoms according to the criteria of Huber et al. (1979) for at least 3 years before follow-up, and (b) the intensity and form of the residual state evaluated according to GAS, WHO/DAS and PIRS.

Model for Schizophrenia

Exogenous Independent Constructs. In the schizophrenia group five latent constructs were computed in the same way as in the group of schizoaffective disorders (Table 2). While the constructs "sex", "age at onset" and "social class" were determined in the same way as in the schizoaffective group, the other two exogenous constructs were determined in a different way. One, "premorbid interactions", was determined by the globally estimated premorbid social contacts (Marneros et al. 1989c) and by the existence of stable heterosexual relationships before onset. The other, "onset conditions", was specified by the presence of life events at onset and by the acuteness of onset.

Endogenous Dependent Constructs. As Table 1 shows, three endogenous dependent constructs were formed in the schizophrenia group. The first construct, "initial syndrome", was determined by three different types. In type 1, the initial syndrome was dominated by severe hallucinations and/or severe delusions, and/or severe incoherence, and/or bizarre behaviour. In type 2, the initial syndrome was dominated by impairment of attention, reduced social contacts, reduced energy and volition. In type 3, the initial syndrome was dominated either by symptoms other than those mentioned for types 1 and 2, or by symptoms of both groups. A second construct was formed by the combination of symptoms of "simple depression", i.e. depressive symtomatology not fulfilling the criteria of a melancholic episode (Marneros et al. 1988e). The third endogenous construct, "psychopathological symptoms", was determined by four groups of symptoms, namely schizophrenic first-rank symptoms, mood-incongruent delusions, mood-incongruent auditory hallucinations and euphoric symptomatology not fulfilling the criteria of a manic episode (Marneros et al. 1988e).

Goal Variables. The goal variables of the LISREL analysis of schizophrenia were the same as those in the model of schizoaffective disorders.

Results

By specification of the various causal determinants among the various latent construct levels, a satisfactory fit was achieved for both models (Figs. 1, 2); for the schizophrenia model a goodness of fit of $P = 0.36$ ($\chi^2 = 89.92$, $df = 85$), for the schizoaffective disorders, $P = 0.39$ ($\chi^2 = 98.42$, $df = 112$).
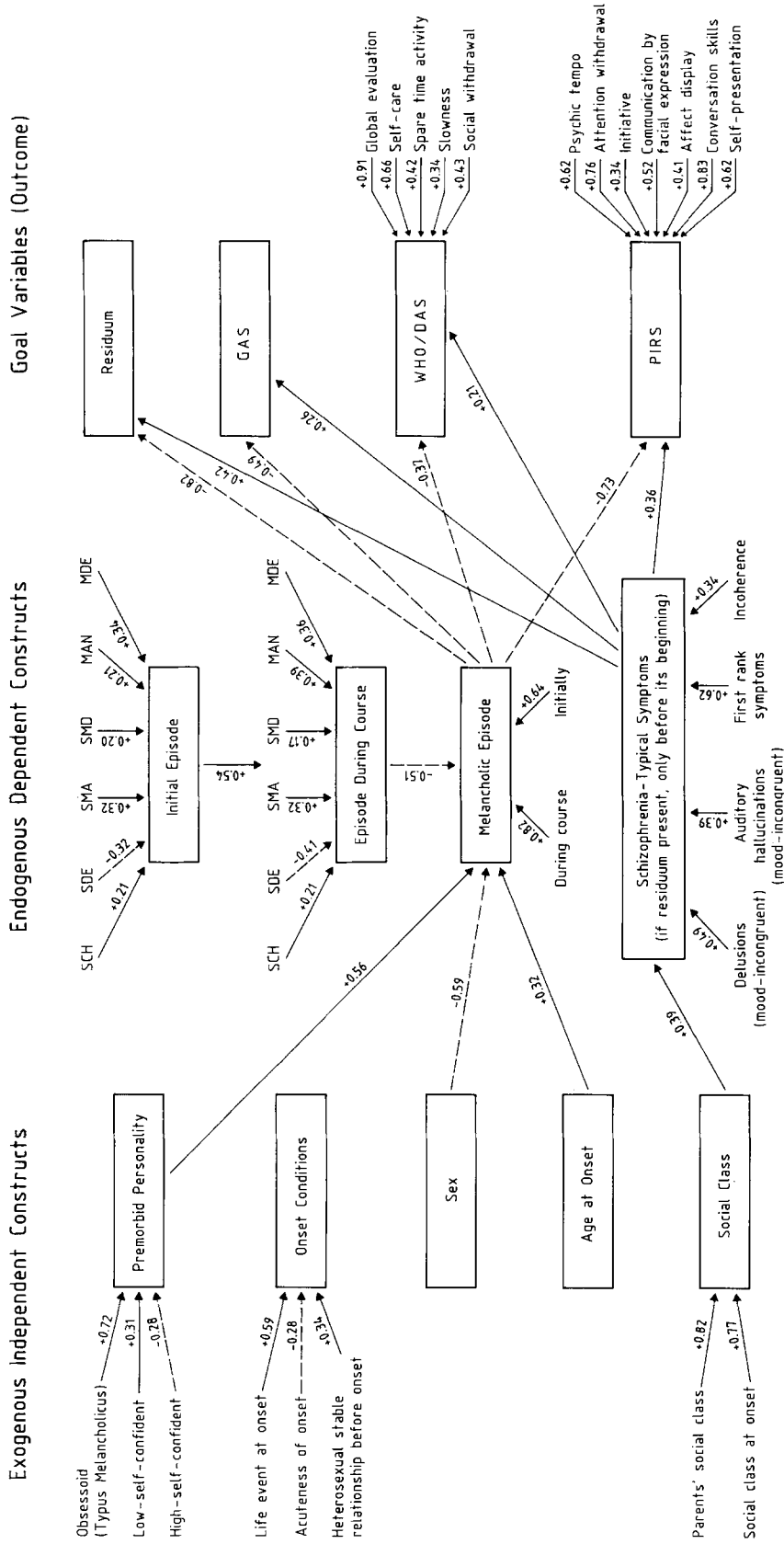
Table 2. LISREL model for schizophrenia (constructs and goal variables)

Schizophrenia

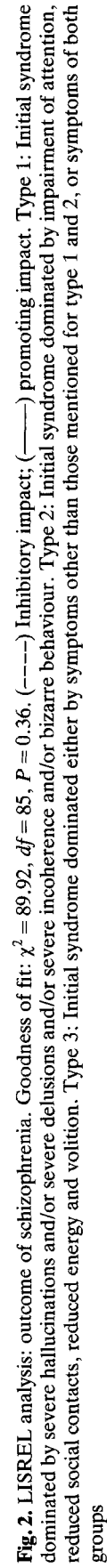| Exogenous independent constructs	Endogenous dependent constructs	Goal variables
Premorbid social interactions	*Initial syndrome*	*Residuum*
Premorbid social contacts	Type 1[a]	
Stable heterosexual relationship	Type 2[b]	*Global Assessment Scale (GAS)*
before onset	Type 3[c]	
		Disability Assessment Schedule (DAS)
Onset conditions	*"Simple" depression*	Global evaluation
Life events at onset		Self-care
Acuteness of onset	*Psychopathological symptoms*	Spare-time activity
	Euphoria	Slowness
Sex	Auditory hallucinations	Social withdrawal
	(mood-incongruent)	
Age at onset	First-rank symptoms	*Psychological Impairment Rating*
	Incoherence	*Schedule (PIRS)*
Social class		Psychic tempo
Parents' social class		Attention withdrawal
Social class at onset		Initiative
		Communication by facial expression
		Affect display
		Conversation skills
		Self-presentation

[a] Dominated by severe hallucinations and/or severe delusions and/or severe incoherence and/or bizarre behaviour
[b] Dominated by impairment of attention, reduced social contacts, reduced energy and volition
[c] Dominated by other symptoms than mentioned for type 1 and 2, or by symptoms of both groups

Exogenous Independent Constructs   Endogenous Dependent Constructs   Goal Variables (Outcome)

Obsessoid
(Typus Melancholicus) — +0.72
Low-self-confident — +0.31
High-self-confident — -0.28
→ Premorbid Personality

Life event at onset — +0.59
Acuteness of onset — -0.28
Heterosexual stable
relationship before onset — +0.34
→ Onset Conditions

Sex

Age at Onset

Parents' social class — +0.82
Social class at onset — +0.77
→ Social Class

SCH +0.21 SDE -0.32 SMA +0.32 SMD +0.20 MAN +0.21 MDE +0.34
→ Initial Episode

SCH +0.21 SDE -0.41 SMA +0.32 SMD +0.17 MAN +0.39 MDE +0.36
→ Episode During Course

+0.54
-0.51

Melancholic Episode
Initially +0.64
During course +0.82

+0.56
-0.59
+0.32

Schizophrenia-Typical Symptoms
(if residuum present, only before its beginning)
Delusions (mood-incongruent) +0.47
Auditory hallucinations (mood-incongruent) +0.39
First rank symptoms +0.67
Incoherence +0.34
+0.38

Residuum
-0.82
+0.42

GAS
+0.42
-0.49
+0.26

WHO/DAS
-0.31
+0.21
Global evaluation +0.91
Self-care +0.66
Spare time activity +0.42
Slowness +0.34
Social withdrawal +0.43

PIRS
-0.73
+0.36
Psychic tempo +0.62
Attention withdrawal +0.76
Initiative +0.34
Communication by facial expression +0.52
Affect display +0.41
Conversation skills +0.83
Self-presentation +0.62

Fig. 1. LISREL analysis: outcome of schizoaffective disorders. (– – –) Inhibitory impact; (———) promoting impact; goodness of fit: $\chi^2 = 98.42$, $df = 112$, $P = 0.39$. *SCH*, Schizophrenic episode; *SDE*, schizodepressive episode; *SMA*, schizomanic episode; *SMD*, schizomanic-depressive episode; *MAN*, manic episode; *MDE*, manic-depressive episode

Fig. 2. LISREL analysis: outcome of schizophrenia. Goodness of fit: $\chi^2 = 89.92$, $df = 85$, $P = 0.36$. (———) Inhibitory impact; (———) promoting impact. Type 1: Initial syndrome dominated by severe hallucinations and/or severe delusions and/or severe incoherence and/or bizarre behaviour. Type 2: Initial syndrome dominated by impairment of attention, reduced social contacts, reduced energy and volition. Type 3: Initial syndrome dominated either by symptoms other than those mentioned for type 1 and 2, or symptoms of both groups

Schizoaffective Disorders

Figure 1 shows the causal relationships between the various latent constructs for the group of schizoaffective disorders. The figure shows clearly that the exogenous independent constructs do not have any direct causal influence on the goal variables, i.e. on the development of a residuum, its intensity and its form.

The central point of this LISREL model is the endogenous dependent construct "melancholic episode" (initially as well as during the course of the illness). The manifestation of a pure melancholic episode has a negative, i.e. an inhibitory, influence on the development of a residuum ($P = -0.82$), as well as on the intensity and form of disability, psychological impairment and disturbances of level of functioning ($P = -0.73$ to -0.37).

As Fig. 1 shows, the endogenous dependent construct "melancholic episode" is mainly determined by the exogenous constructs "premorbid personality" ($P = +0.72$), "sex" ($P = -0.59$) and, less strongly, "age at onset" ($P = +0.32$). The exogenous construct "premorbid personality" is mainly determined by the manifest variable obsessoid personality (typus melancholicus). Thus obsessoid personality, sex and age at onset have only an indirect influence on the development, intensity and form of residuum via the endogenous construct "melancholic episode". This means that patients with personality features of typus melancholicus, female patients or patients with a higher age at onset will have a favourable prognosis if, during the course of the illness or initially, pure melancholic episodes are manifested.

Life events at onset, stable heterosexual relationships before onset and acuteness of onset show no determining influence on the goal variables: they do not influence the outcome fo schizoaffective disorders.

Symptoms typical of schizophrenia (mood-incongruent delusions, mood-incongruent auditory hallucinations, schizophrenic first-rank symptoms and incoherence) have a positive, i.e. a *promoting,* influence (exerted mainly by the schizophrenic first-rank symptoms) on the development of a residuum ($P = +0.42$), as well as on the intensity and form of disability, psychological deficits and disturbances of the level of functioning ($P = +0.36$ to $+0.21$). The symptoms typical of schizophrenia in the group of schizoaffective disorders are again influenced by the patient's original social class (parents' class) and social class at onset in that the lower the class at both times, the greater is the probability of symptoms typical of schizophrenia manifesting. Therefore, original social class and social class at onset have only an indirect,

unfavourable influence on outcome, via the manifestation of symptoms typical of schizophrenia.

Schizophrenia

Examination of the causal dependence among the various constructs using the LISREL model shows totally different pictures for schizophrenia and schizoaffective disorders. In schizophrenia the exogenous independent constructs, principally the construct "onset conditions" (life events at onset and acuteness of onset), have a direct influence on the development of residua as well as on their intensity and form the presence of life events at onset and, albeit less influential, acute onset of the initial symptomatology have an *inhibitory* effect on the development of residua ($P = -0.82$) and also on the intensity and form of disability, psychological impairments and disturbances of level of functioning ($P = -0.71$ to -0.53).

The exogenous constructs "sex" and "age" at onset" have no influence on manifestation or intensity and form of the residuum.

The endogenous dependent construct "simple depression" (depressive symptomatology not fulfilling the criteria of a melancholic episode) has no influence on the outcome of schizophrenia, in contrast to the influence of melancholic episodes on the outcome of schizoaffective disorders.

Manifestation of schizophrenia-typical symptoms (in cases where a residuum developed these symptoms were involved only if present before the beginning of a residuum) had a *promoting* effect on the development of a residuum ($P = +0.68$) and also determined the intensity and form of disability, psychological impairment and disturbances of level of functioning ($P = +0.62$ to $+0.43$); this was especially true for schizophrenic first-rank symptoms and incoherence of thought. The endogenous construct "initial syndrome", which is determined mainly by severe hallucinations and/or severe delusions, and/or severe incoherence, and/or bizarre behaviour, also had a *promoting* effect on the development of a residuum, its intensity and its form. The exogenous construct "premorbid social interactions" had an *inhibitory* influence on the development of a residuum, but only indirectly: the presence of stable heterosexual relationships and good premorbid social contacts has an inhibitory effect on the manifestation of symptoms typical of schizophrenia (as defined in this model) and also on the influence of schizophrenic initial symptoms.

Another exogenous construct with an indirect influence on the outcome, but this time a *promoting* one, is "social class", in that the lower the social class of the patient's parents and of the patient at onset,

the greater is the possibility of the manifestation of symptoms typical of schizophrenia and severe schizophrenic initial symptoms, which promotes the development of a residuum and its intensity as well as influencing its form (disability, psychological impairment and disturbances of level of functioning).

Conclusions and Discussion

The LISREL analysis of the outcome of schizophrenic and schizoaffective disorders produced interesting findings for both disorders, separately as well as in comparison with each other. The most striking difference between the two groups is that non-symptomatological factors (e.g. premorbid personality, life event at onset, acuteness of onset, social class, sex and age at onset) have no direct impact on the outcome of schizoaffective disorders. Thus, only symptomatological factors influence the outcome of schizoaffective disorders. In contrast, both groups of factors, non-symptomatological (e.g. life event at onset, acuteness of onset) and symptomatological (like schizophrenic first-rank symptoms), influence the outcome of schizophrenia.

The most important prognostic factor in the group of schizoaffective disorders proved to be the manifestation of pure melancholic episodes, whether occurring at the beginning or during the course of the illness. In this respect the LISREL analysis confirmed earlier findings of our team (Marneros et al. 1986b, 1988e). Schizoaffective patients with melancholic episodes during their course have a much more favourable prognosis, mainly in that they develop a residuum less frequently than other schizoaffective patients. But even in the patients with a residuum the intensity and nature of disability, psychological impairment and disturbances of level of functioning are relatively mild if melancholic episodes have been present at some time during the course of the illness.

The non-symptomatological factors "premorbid personality", "sex" and "age at onset" have only an indirect influence on the outcome of schizoaffective disorders, especially through their impact on the manifestation of melancholic episodes. This means that the obsessoid type of personality (typus melancholicus) will be more likely to have a favourable outcome if melancholic episodes appear during the course of the illness. The influence of gender is similar: females with schizoaffective disorders are more likely to have a favourable outcome if melancholic episodes occur during the course of their illness. The indirect influence of age at onset on the outcome of schizoaffective disorders is weaker than the influence of obsessoid personality or female sex, but older pa-

tients are also more likely to enjoy a favourable outcome if they have melancholic episodes during the course of their illness.

Symptoms typical of schizophrenia such as first-rank symptoms can have an unfavourable influence on the outcome of schizoaffective disorders; nevertheless, their promoting influence on the development of a residuum is weaker than the inhibiting influence of melancholic episodes.

Non-symptomatological factors again only indirectly promote an unfavourable outcome of schizoaffective disorders. This is especially true for two of these factors, namely low original social class (social class of the parents) and low social class at the beginning of the illness. (Social class was estimated according to the criteria of Kleining and Moore (1968) and then transferred to the classification of Hollingshead and Redlich (1958).) Social class has an impact on the outcome of the schizoaffective disorders via manifestation of symptoms typical of schizophrenia: the lower the original class and the class at onset, the stronger is the correlation to schizophrenia-typical symptoms, which promote the development of a residuum.

It is interesting that "simple depression" − the presence of depressive symptoms not fulfilling the criteria of a melancholic episode (Marneros et al. 1988a, e) − has no influence on the outcome of schizophrenia. Thus depressive symptomatology in general has no influence on the outcome of schizophrenia, in contrast to the findings of other investigators (Huber et al. 1979; Kay et al. 1987; McGlashan 1986). According to our investigations, only the specific melancholic constellation of symptoms actually has the repeatedly reported favourable influence on the outcome of psychoses (Marneros et al. 1986b, 1988e).

It can be assumed that the importance of depression for the outcome of psychosis concluded by former investigators is strongly correlated to their broad definition of schizophrenia, causing heterogeneity of the sample (Harding and Strauss 1984). A considerable number of broadly defined "schizophrenias" were simply schizoaffective disorders (Gross et al. 1986, McCabe et al. 1972).

The LISREL analysis shows that the presence of life events at onset has a favourable influence on the outcome of schizophrenia, in agreement with the results of other authors (Kay et al. 1987).

In partial agreement with earlier investigations we found using the LISREL analysis that symptoms typical of schizophrenia, like first-rank symptoms or incoherence of thought, promote the development of a residuum and influence its intensity (Silverstein and Harrow 1981). A premorbid tendency to social isola-

tion, the absence of a stable heterosexual relationship before onset, absence of life events before onset, insidious onset and belonging to a lower social class (original class or class at onset) all have an *indirect* promoting influence on the development and intensity of a residuum. In addition, the absence of precipitating factors and of insidious onset has a *direct* influence on the development of residual symptomatology and on the intensity of the disability. However, sex and age at first manifestation have no influence, direct or indirect, on outcome parameters investigated in this study by LISREL analysis. This is in agreement with the findings of some authors (e.g. Loyd et al. 1985) but not with those of others (e.g. Huber et al. 1979; Seeman 1986). Nevertheless, schizophrenic males suffer more severe social consequences, for example downward occupational drift, than females, as we have shown elsewhere (Marneros et al. 1989b).

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