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The prognostic scale by Strauss and Carpenter and its validity

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Abstract The Prognostic Scale by Strauss and Carpenter (1974) is thoroughly analysed and its predictive value is compared with other predictors, such as symptomatology, premorbid adjustment and social disability. A sample of 138 first-hospitalized schizophrenic patients serve as database. The total days of stationary treatment, the number of rehospitalizations, a complex criterion regarding the course of illness and the extent of social impairment were selected as outcome criteria. The period of time allowing for predictions was 36 months after index episode. A factor analysis yields results indicating that the Prognostic Scale can be divided into two subscales, namely the “social functioning in the previous twelve months” and the “extent of handicap by psychiatric symptoms”. With respect to prognostic aspects it is the first subscale which proves to be especially valuable.

Key words Schizophrenia · Follow-up study · Prediction of outcome · Prognostic scales

Introduction

Predicting the course of illness in schizophrenic patients is one of the great efforts within research dedicated to this psychiatric illness. Thus far, diverse variables with good predictive quality have been identified repeatedly in research, such as gender, premorbid functioning, social class, age at onset of illness, expression of symptoms, medication, previous psychiatric illness or life stress (summarized by Möller et al. 1986; Harder et al. 1990a; Carpenter and Strauss 1991). Questionnaires were developed by combining various predictor variables in order to predict the further course of illness more effectively, e.g. the Elgin Prognostic Scale (Wittman 1941), the Phillips Scale (Phillips 1953), the Social Competence Scale (Zigler and

Phillips 1961), the Gittelman-Klein Scale (Gittelman-Klein and Klein 1969) and the Goldstein Premorbid Adjustment Scale (Rodnick and Goldstein 1974). One of the most commonly used questionnaires is the Prognostic Scale by Strauss and Carpenter (1974).

In the research introduced herein the dimensionality of the Prognostic Scale is analysed first. Following this the factor validity of the subscales is examined, then the predictive value of the subscales is compared with other predictors (e.g. positive and negative symptomatology, social disability at initial hospitalization and premorbid adjustment as a youngster). Eventually, results on the stability over time concerning the predictive value of the Prognostic Scale are introduced.

Subjects and methods

Research design and sample

The data were obtained within an extensive prospective 5-year follow-up study (Rey et al. 1994). Detailed interviews, third-party and self-rating information yielded information on premorbid adjustment, symptomatology, social disability, critical life events, treatment and illness coping. Data were assessed at index admission (t_0) and at five follow-ups: 6, 12, 24, 36 and 60 months after index admission (t_6 , t_{12} , t_{24} , t_{36} and t_{60}). Research between May 1987 and November 1989 included 163 first-hospitalized patients diagnosed as suffering from schizophrenia (ICD-9: 295.0–295.9), a paranoid syndrome (ICD-9: 297.0–297.9) or an acute paranoid reaction (ICD-9: 298.3) at index admission (WHO 1977).

These diagnostic categories encompass the wide range of schizophrenic spectrum disorders as patients are also included in the sample whose original diagnosis was a defensive diagnosis or who later became ill. This clearly increases the probability of a representative sample of initially hospitalized schizophrenics (Rey et al. 1994).

The current study was based on data of partial sample of 138 patients diagnosed as ICD diagnoses 295.0–295.9 with the exclusion of ICD 9: 295.7, “schizoaffective disorder”. Table 1 sketches some sociodemographic and diagnostic data of this partial sample.

Thus far, data are available from the first 36 months after index admission. At (t_{36}) 95 patients were still in the cohort. With regard to the variables in Table 1 this sample did not differ statistically from the original sample.

Table 1 Sample review (t_0); $n = 138$

Gender		Age (years)	
Male	80 (58.0) ^a	Youngest	17
Female	58 (42.0)	Oldest	54
		Mean value	28.8
		Standard deviation	8.7
Personal status		ICD-9 diagnosis at index admission	
Single	96 (69.6)	295.0	5 (3.6)
Living with partner	23 (16.7)	295.1	7 (5.1)
Separated/divorced	13 (9.4)	295.2	3 (2.2)
Widowed	2 (1.4)	295.3	106 (76.8)
No comment	4 (2.9)	295.4	4 (2.9)
		295.5	2 (1.4)
		295.6	2 (1.4)
		295.9	9 (6.5)
Schooling		Education	
Special school/no Leaving certificate	12 (8.7)	None	27 (19.6)
Secondary modern school	41 (29.7)	Trained	8 (5.8)
Secondary school	32 (23.2)	Apprenticeship	53 (38.4)
School-leaving examination (qualifying for university)	44 (31.8)	Trade school	6 (4.3)
		Specialist college with university status	3 (2.2)
Other/unknown	9 (6.5)	University	12 (8.7)
		Other/unknown	29 (21.0)

^aNumbers in parentheses show percentage of absolute numbers

Measuring instruments

Predictors included the following variables:

1. The Prognostic Scale (PS) by Strauss and Carpenter (1974), containing 21 items referring to the following variables: level of useful work, social class, social relationships, heterosexual relationships, quality of treatment facilities used, family history of psychiatric hospitalization, earliest age of onset of psychiatric symptoms, action problems (violence and suicidal or homicidal gestures), flat affect, duration of previous hospitalization, length of time since first occurrence of psychotic symptoms, presence of depression, hypomania or mania, presence of precipitating events, reported severity of subjective distress, ability to meet own basic needs and usual fullness of life. The items were judged on a five-step rating scale by the interviewer. In most cases the period of time to be judged referred to the 12 months preceding the interview.
2. Premorbid adjustment was assessed with the German version of the Premorbid Adjustment Scale (PAS) by Cannon-Spoor et al. (1982). Based on factor analysis carried out within the project (Rey et al. 1992), three subscales were developed from the PAS: social (PAS 1), occupational (PAS 2) and sexual premorbid adjustment (PAS 3).
3. Symptomatology at index admission (t_0) was determined using the Present State Examination (PSE; Wing et al. 1974), the Scale for the Assessment of Negative Symptoms (SANS; Andreasen 1982) and the Psychological Impairments Rating Schedule (PIRS; Biehl et al. 1986). A factor analysis of the entire symptomatology suggested a division into five factors (Rey et al. 1994): "flat affect" and "anhedonia" as factors pertinent to negative symptomatology, "general positive symptomatology" (e.g. obtrusive speech and behaviour as rated in the subscale BSO of the PSE) and "delusion and hallucinations" as factors pertinent to positive symptomatology,

as well as one unspecific factor "general neurotic symptomatology".

4. The extent of social disability was assessed by the German version of the WHO Disability Assessment Schedule (DAS-M) (Jung et al. 1989). In the analysis, however, only the global judgment of social disability was included.

The criterion variables were:

1. The total number of days the patient has spent in hospital during the past 36 months since index admission (t_0).
2. The frequency of rehospitalizations since index admission.
3. The course of illness until the present judged on a five-step ordinal scale considering both the number of psychotic episodes experienced up to that point as well as the nature of the remission. These included the following: step 1: a single psychotic episode, complete remission; step 2: a single psychotic episode, several non-psychotic residual symptoms, two or more psychotic episodes, complete remission; step 3: two or more psychotic episodes, several non-psychotic residual symptoms; step 4: one or more psychotic episodes and one or more nonpsychotic episodes, regardless of the type of remission; step 5: continuous psychotic illness, no remission.
4. The extent of social disability assessed by the DAS-M as in the first interview at index admission.

Results

Analysing the Prognostic Scale

Analysis of only the context of the items in the Prognostic Scale by Strauss and Carpenter (1974) identifies it as an

Table 2 Factors in Prognostic Scale

Prognostic Scale item	Factor 1 (social functioning in past year) ^a	Factor 2 (extent of handicap by psychiatric symptoms) ^a
Number of social relations most usual in past year (item 3 a)	0.83	-0.12
Quality of social relations in past year (item 3 b)	0.79	-0.11
Most usual fullness of life in past year (item 17)	0.78	0.26
Heterosexual relations most usual in past year (item 4)	0.59	0.07
Most usual quality of useful work in past year (item 1 b)	0.58	0.37
Quantity of useful work in past year (item 1 a)	0.58	0.44
Longest period severe psychiatric problems ever persisted (item 11 b)	0.13	0.79
Action problems since age 12 (item 8)	0.06	0.73
Longest period of any significant psychiatric symptoms (item 11 c)	0.37	0.67
Length of time since first occurrence of hallucinations or delusions (item 11 a)	0.16	0.60
Earliest age of onset of any psychiatric problems (item 7)	-0.04	0.58
Previous hospitalization (item 10)	-0.02	0.56

^a Numbers show factor loadings

Table 3 Correlations between various predictors

	PS 1 (social functioning) ^a	PS 2 (psychiatric handicap) ^a
Premorbid social adjustment (PAS 1)	0.65***	0.32***
Premorbid occupational adjustment (PAS 2)	0.65***	0.43***
Premorbid sexual adjustment (PAS 3)	0.40***	0.14
Flat affect	0.11	0.11
Anhedonia	0.48***	0.40***
General positive symptomatology	0.06	0.23**
Delusions and hallucinations	-0.07	0.14
General neurotic symptomatology	-0.09	0.13
Social disability (DAS)	0.61***	0.48***

^a Numbers show Spearman rank correlation coefficients
 ** $p < 0.01$
 *** $p < 0.001$

extraordinarily heterogeneous instrument. The analysis of the internal consistency results in the same findings: Cronbach's alpha across all 21 items was 0.76. A factor analysis using the cut-off criterion eigenwert > 1 followed by a varimax rotation extracts seven factors, which are difficult to interpret regarding their context because several dimensions consist of only two items. At 64.2% the explained variance over all seven factors is low. Because in this regard it does not appear sensible to use a total sum score, the assessed PS data was used in a factor analysis, in which – in accordance with the results of the Scree test – the extraction of two factors was mandatory. Then all items loading less than 0.50 were eliminated in order to achieve homogeneous factors. This procedure yielded two factors, each loaded with six items and together explaining a variance of 52%. The value of Cronbach's alpha for the first subscale was 0.79 and for the second 0.76. The results of the factor analysis are summarized in Table 2.

The first subscale (PS 1) can be interpreted as "extent of social functioning within the 12 months before index admission" referred to as "social functioning" hereafter. The second subscale (PS 2) contains items referring to the "extent of handicap by psychiatric symptoms".

For the sake of better comparability with other research findings we declined to create weighted factor scores and continued by calculating with simple sum scores.

Validating the factors of the Prognostic Scale

The correlation between both PS subscales and the remaining predictors were investigated next (factor validity; Table 3). Examination of the subscale PS1 ("social functioning") results in a high correlation with two of the PAS scales, namely PAS 1 ("premorbid social adjustment") and PAS 2 ("premorbid occupational adjustment"), as well as with social disability, as assessed with the DAS-M. Although they are slightly lower, the correlations between PS 1 and both the negative symptomatology factor "anhedonia" as well as the subscale PAS 3 ("premorbid sexual adjustment") are distinct.

On the contrary, there is neither any correlation between PS 1 and the negative symptomatology factor "flat affect"; nor with either of the positive symptomatology factors "general positive symptomatology" and "delusion and hallucinations", nor with the factor "general neurotic symptomatology".

Table 4 Intercorrelations of outcome criteria

^a Number show Spearman rank correlation coefficients
 ** $p < 0.01$
 *** $p < 0.001$

	Social disability ^a	Days spent in hospital ^a	No. of rehospitalizations ^a
Days spent in hospital	0.32**		
No. of rehospitalizations	0.37***	0.46***	
Course of illness	0.58***	0.48***	0.59***

Table 5 Correlations between predictors and outcome criteria (predictive period: 36 months after first hospitalization)

^a Numbers show Spearman rank correlation coefficients
 * $p < 0.05$
 ** $p < 0.01$
 *** $p < 0.001$

Outcome predictors	Days spent in hospital ^a	No. of rehospitalizations ^a	Course of illness ^a	Social disability ^a
PS 1	0.16	-0.08	0.38***	0.48***
PS 2	0.07	-0.09	0.16	0.23*
PAS 1	0.09	0.01	0.25*	0.36***
PAS 2	0.09	0.13	0.33***	0.47***
PAS 3	0.15	0.08	0.29	0.32**
Flat affect	0.15	0.01	0.09	0.22*
Anhedonia	-0.04	0.04	0.07	0.27*
General positive symptomatology	0.04	-0.05	-0.09	-0.12
Delusions and hallucinations	0.03	-0.07	0.06	-0.09
General neurotic symptomatology	-0.05	0.10	0.01	-0.19
Social disability (DAS)	0.09	-0.02	0.00	0.29*

Table 6 Stability of prediction referring to social disability

^a Numbers show Spearman rank correlation coefficients
 * $p < 0.05$
 ** $p < 0.01$
 *** $p < 0.001$

Follow-up predictor	6 months (t ₆) ^a	12 months (t ₁₂) ^a	24 months (t ₂₄) ^a	36 months (t ₃₆) ^a
PS 1	0.54***	0.42***	0.59***	0.48***
PS 2	0.37**	0.14	0.19	0.23*
PAS 1	0.47***	0.37***	0.34**	0.36***
PAS 2	0.41***	0.27*	0.51***	0.47***
PAS 3	0.13	0.12	0.09	0.32**
Flat affect	0.24*	0.28*	0.09	0.22*
Anhedonia	0.34**	0.34**	0.32**	0.27*
General positive symptomatology	0.03	-0.03	-0.18	-0.12
Delusions and hallucinations	0.03	0.02	-0.11	-0.09
General neurotic symptomatology	-0.14	-0.20	-0.16	-0.19
Social disability (DAS)	0.36**	0.44***	0.44***	0.29*

The second PS subscale ("extent of handicap by psychiatric symptoms") shows a substantial correlation with "general positive symptomatology". Moreover, correlations are found to premorbid social and occupational adjustment (PAS 1 and 2), social disability and anhedonia, but these correlations were in all cases lower than with PS 1.

The correlations between both PS subscales and the remaining predictor variables were substantially conclusive, which accounts for the correctness of our factor interpretation.

Correlations between predictors and diverse outcome criteria

In order to determine the magnitude of independence within the chosen outcome criteria, the intercorrelations of all criterion variables were calculated. Table 4 contains the results of that analysis. The intercorrelations were generally at a medium level as the data proves. The highest correlations were found with the criterion "course of

illness up to present", because as a global measure this criterion includes acute episodes and residual symptoms throughout the entire period of time. Use of these diverse criteria, since they do not refer to identical aspects, proves sensible as the obtained intercorrelations show.

Table 5 contains the correlations between the predictor variables and the individual criterion. No significant correlation could be found between the predictor variables and the outcome criteria "total number of days spent in hospital" and "number of rehospitalizations". Seeking to answer the question of whether the combination of diverse predictor variables could lead to an increase in predictive value, a multiple regression with consideration of all predictors was calculated. Unfortunately, for neither of the two criterion variables could the prognosis be improved by this procedure.

With respect to the outcome criterion "course of illness up to present", the subscale PS 1 ("social functioning") assumes the role of the strongest predictor followed by the PAS subscales 2 and 1. The poor explained variance of

just 11% by subscale PS 1 was not improved by consideration of the remaining predictors as shown by the result of a stepwise multiple regression.

The magnitude of social disability was the last outcome criterion to be examined.

Social disability 36 months after hospitalization could be best predicted by the PS subscale 1 and the PAS subscale 2. Premorbid social (PAS 1) and sexual adjustment (PAS 3) come in second and third, respectively. It is noteworthy that the predictor "social disability at first interview", assessed by DAS-M, turned out to be of less importance to the prognosis than PS 1 and PAS 2. The remaining predictors showed only small correlations. Positive symptomatology and general neurotic symptomatology did not correlate with social disability at a distant time. As before, in order to reveal any possible effects of accumulation within the predictors, a multiple regression was calculated here also. However, PS 1 was the only predictor in the regression equation.

Stability of predictive values of subscale 1

Regarding the good prognosis of social disability at a distant time by the subscale PS 1, the question arose as to how stable this effect was throughout time; therefore, correlations between PS 1 and DAS-M t_6 , t_{12} , t_{24} and t_{36} were calculated. As Table 6 shows, the best predictor throughout time was "social functioning" (PS 1).

Discussion

The following conclusions have been reached from these results:

1. The Prognostic Scale by Strauss and Carpenter (1974) is an instrument useful for predicting certain aspects of the course of illness in schizophrenic patients. This result agrees with recent research findings on the predictive value of the PS (Möller et al. 1985; Möller et al. 1986; Harder et al. 1990a).

2. With respect to the assessed data, we can divide the Strauss and Carpenter scale into two subscales: one strongly associated with the level of social functioning in the year prior to the first interview and one related to the extent of psychiatric handicap. In terms of reducing data, the two-factor solution suggested here appears to be useful. In accordance with a multiple dimensional strategy, as demanded by Strauss and Carpenter (1972, 1974, 1977), two different dimensions were considered, namely the social and the psychopathological aspects. It is interesting that the subscale PS 1, which was obtained by factor analysis, agrees well with the level of Functioning Scale (LOFS) formed by Hawk et al. (1975) and which consists of five PS items, namely quantity and quality of social relationships, quantity and quality of productive occupational activity, and time spent in a psychiatric hospital during the interim 2 years. LOFS is primarily used as an outcome variable.

3. Furthermore, our results show that the subscale PS 1 offers above and beyond different points of measurement the best prognosis of social disability, assessed by DAS-M. The lower predictive value of DAS-M itself, as well as of the PAS, is probably to be explained by the nature of the source of information and the interim considered. The PS and PAS data stem from interviews with the patients themselves, whereas the DAS-M is carried out mainly with the person closest to the patient. Moreover, our data emphasize the greater prognostic importance of the extent of social disability within the 12 months prior to the first interview as compared with the period of only 4 weeks before. On the other hand, going back further than 12 months (to juvenile years) does not improve the predictive power as the result of the PAS proves. This may be explained by the effects of recall. The PAS focusses on events that occurred long ago and memory of which is far less precise than of a recent period of 12 months, which is relevant to the PS. When examining an interim of 4 weeks, as the DAS-M does, the assumption arises that the realized social disability could have been determined already by prodromi existing then.

4. Prediction of more symptomatology-related variables, such as rehospitalization and total number of days spent in hospital, is not possible using our predictors. Most likely, the course of illness is predictable, i.e. by PS 1 and not by PS 2. This can be explained by the fact that the nature of remission is accounted for by this criterion. In the event of remaining residuals, i.e. strong negative symptomatology, connection to the impairment of social functioning is evident. Obviously, it is hardly possible to predict productive episodes which in most cases end in rehospitalization and, moreover, to determine the total time spent in hospital. In our opinion, the small predictive power of subscale PS 2 can be seen in the same context, because the subscale pertains largely to positive symptoms. Further research involving diverse outcome criteria (e.g. number of relapses, acute exacerbations, extent of negative symptomatology) can surely aid in answering the questions which have arisen.

5. Finally, it is impressive that the subscale PS 1 introduced herein is capable of making respectable predictions concerning the further course of illness of first-hospitalized schizophrenic patients. The wording of the items alone makes it clear that the PS originally was not intended for first-episode patients, but chronic patients. The realization of appropriate research on validity with first-hospitalized patients has been demanded by Harder et al. (1990a), among others, whose own study demonstrated the usefulness of the Prognostic Scale in predicting outcome of first-hospitalized schizophrenic patients. These findings have been supported by the data presented herein.

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