

Community-Based Psychosocial Rehabilitation and Prospective Change in Functional, Clinical, and Subjective Experience Variables in Schizophrenia

by John S. Brekke and Jeffrey D. Long

Abstract

In a previous study, we found that the intensity, specificity, and longitudinality of community-based psychosocial rehabilitation services were related to superior functional outcomes for individuals diagnosed with schizophrenia. The purpose of this study was to assess the degree to which the intensity and longitudinality of services were related to improvements in subjective experience and clinical outcomes, and to examine the relationships among prospective changes in functional, clinical, and subjective experience variables. One hundred seventy-two individuals diagnosed with a schizophrenia spectrum disorder were followed for 36 months in three distinct models of community-based care. Functional, clinical, and subjective experience outcome data were gathered every 6 months over a 3-year period. Data were analyzed using hierarchical linear modeling (HLM) and P-technique factor analysis. The results indicated that (1) greater service intensity and the longitudinality of services were associated with improvement in client self-esteem; (2) there was evidence for three distinct factors of prospective rehabilitative change that corresponded to the conceptual domains of clinical, functional, and subjective experience outcomes; and (3) there was no differential program impact on symptom levels or the intrapsychic deficits. In addition, the three-factor model of outcome consisting of functional change, clinical change, and subjective experience change was similar to Strauss and Carpenter's "open-linked" system of outcome in schizophrenia. The implications of these findings for research and practice in the area of community-based rehabilitation for individuals with schizophrenia are discussed.

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Over the last 20 years there have been numerous studies on functional outcomes from community-based programs for persons with severe and persistent mental illness (see Test 1984, 1992; Hargreaves and Shumway 1989; Olfson 1990; Solomon 1992; Bond et al. 1995; Scott and Dixon 1995; Penn and Mueser 1996; and Mueser et al. 1998 for reviews). These studies have quite consistently found that a variety of psychosocial interventions can reduce hospitalization rates and increase housing stability; in some cases symptomatology and aspects of psychosocial functioning in work, social, or independent living domains have been improved. However, there have been recent calls for more empirical attention to be paid to humanitarian and subjective experience outcomes such as self-esteem and satisfaction with life (Strauss and Estroff 1989; Group for the Advancement of Psychiatry 1992; Rosenblatt and Attkisson 1993; Carling 1995; Scott and Dixon 1995). The notion is that there has been great emphasis placed on increasing the functional outcomes from psychosocial interventions, with some attention paid to client satisfaction with services, but there has been almost no consideration of whether the subjective experience of clients is improved by intensive psychosocial rehabilitation or whether changes in functional status and subjective experience are related. As a result, we do not know to what degree effective rehabilitation models are increasing clients' self-esteem and life satisfaction or whether the functional change in clinical and psychosocial variables that has been the main focus of these interventions is associated with changes in the subjective experience of clients.

In a previous prospective study, we provided one of the first tests of the impact of service characteristics on

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functional outcomes in community-based care for individuals with schizophrenia (Brekke et al. 1997). In that study we found that the intensity, longitudinality, and specificity of psychosocial rehabilitation services were associated with greater functional improvement in social, work, hospitalization, or independent living outcomes over a 3-year period. Specifically, more intense services (i.e., more treatment hours per week) were associated with higher levels or rates of improvement, or both, on all indices of clinical and psychosocial functioning. The specificity results suggested that services needed to be targeted to specific areas of functioning in order for improvement to occur. The effect of longitudinality (i.e., the notion that the treatment effect is contingent on remaining in treatment) was related to the outcome domain examined, with the termination of services having the greatest impact on vocational functioning and hospitalization rates.

The purpose of the study presented here was (1) to assess the degree to which the intensity and longitudinality of these same services was related to improvements in subjective experience and clinical outcomes; and (2) to examine the relationships among prospective changes in functional, clinical, and subjective experience variables during 3 years of community-based treatment.

In this study we addressed three issues. First, it is commonly assumed in rehabilitation practice that as a result of effective rehabilitation, clients will experience enhanced self-esteem and satisfaction with life (e.g., Turner and TenHoor 1978; Stroul 1989; Carling 1995). While there has been very little research concerning the impact of psychosocial rehabilitation on subjective experience variables, in a controlled design Stein and Test (1980) found that assertive community treatment was associated with higher levels of self-esteem and satisfaction with life than usual care in the community. Mueser et al. (1997) found that obtaining employment in a vocational rehabilitation program was related to short-term improvements in self-esteem. Based on this literature, we hypothesized that intensive rehabilitative services (which had also been associated with improved functional outcomes) would result in greater levels of self-esteem and satisfaction with life than less intensive services. Considering our previous finding that the impact of longitudinality was contingent on the outcome domain examined, we had no hypothesis in this study concerning the longitudinality of services, but our analyses examined the impact of longitudinality on subjective experience.

Our second study question addressed clinical outcomes. Previous literature on the effects of community-based rehabilitation on symptomatic outcomes has found that some community-based models, such as assertive community treatment, have superior symptomatic out-

comes compared to usual care conditions in the community (Test 1984; Scott and Dixon 1995; Mueser et al. 1998). However, these effects are not consistent with up to 50 percent of community studies showing no differential treatment effect. In this study we hypothesized that more intensive psychosocial rehabilitation would result in equal or greater improvement in general symptom levels when compared to less intensive intervention. There was no specific hypothesis concerning longitudinality.

Another important clinical domain in schizophrenia is the intrapsychic deficits. These deficits represent one dimension of the deficit syndrome in schizophrenia (Heinrichs et al. 1984). Specifically, they encompass the loss of motivation, purpose, and pleasure that have been hypothesized to underlie the functional decrements often characteristic of schizophrenia in general (Heinrichs et al. 1984). Because these intrapsychic deficits have been found to be related to a variety of potentially important rehabilitative outcomes for individuals with schizophrenia (such as social competence, symptoms, work, and independent living; Mueser et al. 1990; Brekke et al. 1993), we wanted to explore whether they could be altered during treatment. While there has been no study concerning the impact of intensive rehabilitation on the intrapsychic deficits in schizophrenia, we addressed the question of whether greater intensity and longitudinality of services would reduce the level of these deficits.

Third, the notion that effective rehabilitation will result in changes in subjective experience is based partially on the assumption that improved functional status will be related to increases in life satisfaction and self-esteem. One cross-sectional study found a modest relationship between higher levels of social and vocational functioning and better self-esteem and satisfaction with life (Brekke et al. 1993), while one other study using a smaller sample did not (Arns and Linney 1995). Some studies have also found that subjective experience variables were more strongly related to clinical variables such as symptomatology and medication status than to functional variables such as independent living or work functioning (Thompson 1988; Warner et al. 1989; Brekke et al. 1993; Mueser et al. 1997). However, we are not aware of any studies that have examined the relationships among prospective changes in these variables. Therefore, in addition to testing the impact of the intensity and longitudinality of rehabilitative services on clinical and subjective experience outcomes, we also explored the relationships among prospective change in clinical, functional, and subjective experience outcome domains during 3 years of community-based intervention.

Method

Design. This study used a quasi-experimental follow-along design of subjects admitted to three community-based programs in urban Los Angeles, California (Brekke et al. 1997). The three programs are described in detail below. Briefly, two of the programs are psychosocial rehabilitation programs that target substantial change in certain functional domains. The third is a case management program connected with residential board and care homes that has no substantial rehabilitative focus. The sample consisted of consecutive admissions to the two rehabilitation programs, as well as case management patients selected from board and care homes that had reputations for providing high-quality care according to county department of mental health criteria. Nearly all of the subjects had received treatment in the publicly funded mental health system and were receiving public assistance.

There were four study admission criteria: (1) having a diagnosis of schizophrenia or schizoaffective disorder; (2) residing in Los Angeles for at least 3 months; (3) being between 18 and 60 years of age; and (4) not having a diagnosis of mental retardation or organic brain syndrome, or a primary diagnosis of substance dependence. Measures of psychosocial functioning and subjective experience were administered in face-to-face interviews at baseline and every 6 months over a 3-year period. Diagnoses were established in a two-step process. Initially, a diagnostic screening for schizophrenia (using chart and interview data) was done by an admitting clinician at the program sites. Subsequently, all subjects who passed the first screen were diagnosed in a face-to-face interview by a licensed doctorate-level research clinician trained in the use of the Schedule for Affective Disorders and Schizophrenia (SADS; Endicott and Spitzer 1978). Structured interview data and clinical records were used in determining the SADS diagnosis.

There was a 6-month replacement period, such that any subject who dropped out of the study during his or her initial 6 months was replaced in the sample by the next available subject at that site. The replaced subjects were excluded from analyses presented in this study. There was an 18-month recruitment period to obtain the study sample. Subjects were followed in the study protocol for 3 years whether or not they exited treatment.

Measures. All the data were gathered in the context of a face-to-face semistructured interview administered by trained research interviewers. While the interviewers could not be kept blind to the programs the subjects were participating in, they were successfully kept blind to the comparative purposes and hypotheses of the study.

Functional measures. There were two functional outcome measures used in this study, the Role

Functioning Scale (RFS; McPheeters 1984; Goodman et al. 1993) and the Strauss and Carpenter Outcome Scale (SCOS; Strauss and Carpenter 1972). The SCOS has been widely used in schizophrenia research, and the RFS was selected as a scale of choice for this population by Green and Gracely (1987). Both scales use single items with multiple descriptive anchors to assess a functional domain. These scales each assess outcome in four distinct domains. The four outcome variables were the hospitalization and work items from the SCOS and the independent living and social functioning items from the RFS.

The scale ratings were derived from a face-to-face interview instrument, the Community Adjustment Form (Test et al. 1991). The ratings were derived according to procedures outlined in Brekke (1992). Interrater reliability using the intraclass correlation coefficient (ICC) was established during intensive rater training and during booster rating assessments throughout the study period. The ICC on the four outcome items ranged from 0.75 to 0.98, with an average of 0.89.

Clinical measures. The measure of symptomatology was the overall score from the 22-item version of the Brief Psychiatric Rating Scale (BPRS; Overall and Gorham 1962; Lukoff et al. 1986). The ICC on the items ranged from 0.74 to 0.98 (mean = 0.92). The intrapsychic deficits measure was the intrapsychic foundations subscale of the Quality of Life Scale (Heinrichs et al. 1984). The ICC on the items ranged from 0.85 to 0.97 (mean = 0.91).

Subjective experience measures. Self-esteem was measured using the Index of Self-Esteem (ISE; Hudson 1982). The ISE is a 25-item self-report measure that taps the subjective evaluation of self. Cronbach's alpha in this study was 0.87. Satisfaction with life was measured with the Satisfaction With Life Scale (SWL; Stein and Test 1980). The SWL is a 21-item self-report measure that targets subjective satisfaction with one's living situation, work, social contacts, and psychological state. The alpha in this study was 0.89.

Several measures were also used to assess the equivalence of the three groups at baseline (see table 1). The current psychometric performance of these measures is detailed in Brekke et al. (1993). In brief, they showed high levels of interrater reliability, interitem reliability, or both.

The Treatment Programs. There were three programs in this study: Portals, the Community Living Program (CLP), and case management (CM). They were selected because of the degree to which they varied on certain service delivery characteristics. This section briefly describes the programs and compares their relevant service characteristics.

Portals provides a psychosocial rehabilitation clubhouse. It targets rehabilitative change in social, voca-

Table 1. Comparison of the three program samples at baseline**A. Client characteristics**

| Characteristic | Portals (n = 70) | CLP (n = 34) | CM (n = 68) | Test statistics |
|------------------|---------------------|-----------------|----------------|-----------------------------|
| Gender | | | | |
| Male | 50 | 26 | 51 | $\chi^2 = 0.38, df = 2$ |
| Female | 20 | 8 | 17 | |
| Diagnosis | | | | |
| Schizophrenia | 42 | 22 | 46 | $\chi^2 = 0.83, df = 2$ |
| Schizoaffective | 28 | 12 | 22 | |
| Ethnicity | | | | |
| Caucasian | 33 | 9 | 45 | $\chi^2 = 21, df = 6^*$ |
| African-American | 18 | 19 | 13 | |
| Latino | 14 | 5 | 8 | |
| Other | 5 | 1 | 2 | |
| Age, mean (SD) | 31.5 (7.5) | 35.5 (8.8) | 33.9 (5.7) | $F = 4.1, df = 2, 169^{**}$ |

B. Psychosocial variables

| Variable | Portals, mean (SD) | CLP, mean (SD) | CM, mean (SD) | F |
|--------------------------------------|-----------------------|-------------------|------------------|------|
| Total RFS ¹ score | 11.1 (3.0) | 12.5 (3.9) | 12.1 (3.3) | 2.7 |
| Prognosis ² | 27.9 (4.4) | 28.6 (4.6) | 27.1 (4.8) | 1.4 |
| BPRS ³ | 43.2 (13.9) | 41.9 (11.6) | 45.4 (13.7) | 0.9 |
| Brief Symptom Inventory ⁴ | 65.7 (39) | 59.4 (36.5) | 62.4 (43.7) | 0.3 |
| Intrapsychic deficits ⁵ | 9.6 (4.0) | 10.2 (3.5) | 8.6 (4.6) | 1.9 |
| Substance use ⁶ | 0.88 (1.2) | 1.3 (1.3) | 1.4 (1.8) | 2.2 |
| Satisfaction with life ⁷ | 40.1 (13.5) | 37.3 (15.4) | 40.1 (14.3) | 0.64 |
| Self-esteem ⁸ | 83.1 (13.7) | 83.9 (17.6) | 87.8 (18.7) | 1.5 |

Note.—CLP = community living program; CM = case management; SD = standard deviation.

¹ Role Functioning Scale (Goodman et al. 1993)

² Strauss & Carpenter Prognostic Scale (Strauss & Carpenter 1974)

³ Brief Psychiatric Rating Scale (Overall & Gorham 1962)

⁴ Brief Symptom Inventory (Derogatis and Melisaratos 1983)

⁵ Quality of Life Scale (Heinrichs et al. 1984)

⁶ Community Adjustment Form (Test et al. 1991)

⁷ Satisfaction With Life Scale (Stein & Test 1980)

⁸ Index of Self-Esteem (Hudson 1982)

* $p < 0.01$; ** $p < 0.05$

tional, and independent living functioning. It has service continua in social, vocational, and independent living areas. Portals provides on-site psychiatric monitoring of medication, and crisis management to prevent hospitalization. Services can be ongoing in each of the service continua, although clients can terminate services at any time.

CLP is located in an apartment complex. Clients are admitted in cohorts of 8–10 for 3 months of intensive independent living training and group socialization. Ongoing supportive and rehabilitative services are available after the initial 3-month training, but clients can exit

services at any time after the initial 3 months of training. CLP is not designed to provide vocational services, but crisis contacts are provided to prevent hospitalization.

The CM program is run by the county department of mental health. It is connected with residential board and care homes. As part of CM, the county provides fiscal incentives to the board and care homes for taking seriously disabled clients. The clients are required to be seen by their case manager once every 3 months and cannot be dropped from the caseload. The primary goals are to keep clients in the community and to provide them with opti-

mal levels of care and maintenance. While the program has no specific rehabilitative focus, there is an intention to enrich the milieu for clients in the residential facilities.

Program fidelity. Program implementation and program fidelity data from this project have been presented in Brekke et al. (1997) and Brekke and Test (1992). These data confirmed the prediction that Portals and CLP were far more intense programs than CM in terms of the hours of staff-client contact, even though the CM clients were being seen as often as required by the county. Additional data on the intensity, specificity, and character of treatment over time as well as numerous milieu characteristics suggested that Portals and CLP were delivering their services according to model specifications and that the differences between them and with another community-based model were in the predicted directions (Brekke and Test 1992). Concerning longitudinality, it should be noted that while services can be ongoing in all three programs, terminating services is seen as an acceptable outcome for both CLP and Portals; however, other than specifying a 3-month training period for CLP, there is no specification as to how long a client should remain in either program. For Portals and CLP, the measure of longitudinality was based on when subjects exited the treatment programs, with no determination as to whether the end of services was planned or unplanned. Concerning client outcomes, Brekke et al. (1997) found that the programs were showing change in the domains of client functioning that they were designed to impact.

Analyses. The first two study questions concerned the impact of intensity and longitudinality on prospective subjective experience and clinical outcomes. To address these questions, growth curve methodology and HLM were used. Recent advances in longitudinal research suggest that modeling should begin on the individual subject level. This allows for the assessment of both intra-individual and interindividual differences in change (Rogosa et al. 1982; Rogosa and Willett 1985; Willett 1988). The recommended approach is to model individual change across time and then examine the effects of covariates (e.g., gender, program type) to see if there are systematic differences in rate (i.e., slope), type of change (e.g., linear, quadratic, cubic), or both. This 2-fold aim can be accomplished using growth curves and HLM (Bryk and Raudenbush 1987, 1992).

HLM involves modeling at two levels. At level 1, a least-squares regression equation is fitted to each individual's data across all time points (this equation is the growth curve). Each individual's scores on the criterion are regressed on time or a transformation of time. At level 2, the level 1 parameter estimates of the linear slope, the quadratic slope, and so on are treated as criterion scores,

and each is regressed on the covariate (in this study, program type). Final estimates of the growth curve parameters for each individual are derived via Empirical Bayes estimation (Strenio et al. 1983; Bryk and Raudenbush 1992).

In this study, there was interest in only one covariate, program type. A central question was whether this covariate was responsible for systematic differences in growth curve rate (i.e., the magnitude of the slopes) or differences in type (i.e., whether the curve was linear or quadratic, or a combination of the two). Linear and quadratic curves were chosen for several reasons. First, these two types of curves are the ones most commonly fit in psychological research (Cliff 1987). Second, we wanted to be as descriptive as possible by including straight-line (linear) change and also nonlinear (quadratic) change for each individual. Third, it was also assumed that linear and quadratic curves (or a combination of the two) would be interpretable in the context of client change. That is, a linear trend indicates that an individual's scores continually go up (or down) as a function of time. A quadratic trend indicates an individual's scores go up, then down (a negative curve), or down, then up (a positive curve) as a function of time.

The linear and quadratic growth curves at level 1 were regressed on orthogonal polynomial transformations of time (Kirk 1995, p. 191). This was to ensure that the level 1 "predictors" (i.e., time and time squared) were not correlated. The orthogonal polynomials were also centered at the first time point, so that the intercept reflected predicted status at time 1. After level 2 equations were computed, tests of significance for slope rate, type of curve, and program type were evaluated for each of the dependent variables related to the study questions. All analyses were carried out with the HLM/2L software (Bryk et al. 1994).

The third study question concerned the relationships among the changes in functional, clinical, and subjective experience variables. To examine the relationships among these variables, a type of longitudinal factor analysis known as P-technique factor analysis was used (Cattell 1952, 1978; Gorsuch 1983; Loehlin 1992). P-technique factor analysis differs from traditional nonlongitudinal factor analysis in a number of ways. Traditional factor analysis is based on correlations computed between pairs of variables measured on different subjects. In traditional factor analysis, the rows of the raw data matrix represent subjects, and the columns represent variables. The goal of traditional factor analysis is usually to identify interindividual constructs that underlie the variables. P-technique factor analysis is based on correlations computed between pairs of variables measured on repeated occasions. In the P-technique factor analysis, the rows of the raw data

matrix represent repeated occasions, and the columns represent variables. The goal of the P-technique is to identify how variables change together over time (Loehlin 1992). A high correlation between two variables means that they covary over time. Therefore, the factors produced in the P-technique indicate clusters of variables that covary over time.

In this analysis, correlations between the functional, clinical, and subjective experience variables measured on repeated occasions were computed for each of the 172 subjects. Each subject had seven measurements over time (baseline through 36 months) on eight variables (hospitalization, work, independent living, social functioning, BPRS scores, intrapsychic deficits, satisfaction with life, and self-esteem). Therefore, an 8-by-8 correlation matrix representing the relationship between the variables across occasions was computed for each subject. To analyze group effects, a single aggregated 8-by-8 correlation matrix was computed by using the unweighted mean of the 172 individual correlation matrices (see Gorsuch 1983; McDonald 1984). This mean correlation matrix was used for the P-technique factor analysis. Since data summary was the primary concern here, the method of extraction used was principal components. We predicted a three-factor solution in which the variables within the three categories (clinical, functional, and subjective experience) would covary over time. We also predicted that variables in different categories would covary to a lesser extent. The intercluster covariation across time was modeled by using oblique rotation.

Results

Sample. The sample consisted of 172 individuals diagnosed with schizophrenia or schizoaffective disorder. The characteristics of the sample are presented in table 1.

Equivalence of the Groups at Baseline. Since this was a quasi-experimental comparative outcome design, assessing the equivalence of the groups at baseline on demographic and functional variables was essential. Table 1 presents baseline data on 12 important variables.

The power (beta) to detect differences in table 1 is > 0.8 for effects beginning in the small range and extending through large effects. In general, the groups were equivalent at baseline on the variables examined. The significant differences indicated that the Portals group was somewhat younger than CLP, and a higher proportion of African-Americans were admitted to CLP.

Attrition. Two kinds of attrition were examined: study and treatment attrition. Study attrition concerned subjects who dropped out of the study. At 12 and 18 months, 88

percent of the sample was retained. This dropped to 83 percent at 24 months, 80 percent at 30 months, and 72 percent at 36 months. There were no statistically significant differences in study attrition rates across the programs. We also compared study completers at 36 months ($n = 123$) to study dropouts ($n = 49$) on gender, race, prognosis, age, length of illness, baseline symptoms, baseline role functioning, baseline substance use, and baseline self-esteem and satisfaction with life. None of the differences was statistically significant.

Treatment attrition concerned the subjects who exited Portals or CLP but who remained in the study protocol. We did not assess whether these were planned or unplanned treatment exits. The exit rate at Portals was 19 percent at 6 months, 45 percent at 12 months, 76 percent at 18 months, 81 percent at 24 months, 90 percent at 30 months, and 91 percent at 36 months. At CLP, the exit rate was 21 percent at 6 months, 56 percent at 12 months, 65 percent at 18 months, 71 percent at 24 months, 74 percent at 30 months, and 79 percent at 36 months. There were no statistically significant differences in exit rates between the two programs. Given this treatment attrition, we examined the relationships between months in treatment and a variety of client variables, including those in table 1. These analyses indicated that being older and having poorer work functioning at baseline were associated with spending more months in treatment.

Medication Use. We gathered self-report data on the number of days on prescribed antipsychotic medication during each interview period. Approximately 8 percent of the sample were not taking any antipsychotic medication throughout one or more of the seven 180-day study periods. On average, 88 percent of the sample that was on medication took it consistently throughout each of the seven interview periods (this represents approximately 82% of the entire sample). Among the subjects who took antipsychotic medication, the average number of days on medication for each of the 180-day periods was 170 days (range in means = 165–175 days). These rates of medication use are similar to those reported for another comparable sample in the community (Owen et al. 1996). There were no statistically significant differences across the programs on days medicated.

Study Questions. The first two study questions were addressed using HLM. In each case we tested the intercept (initial status), linear, and quadratic coefficients for statistical significance and for group differences in change curves. When testing the service intensity hypotheses, we report findings from HLM analyses (1) using the whole sample (whether subjects dropped out of treatment or not) and (2) using only those subjects who were in treatment at

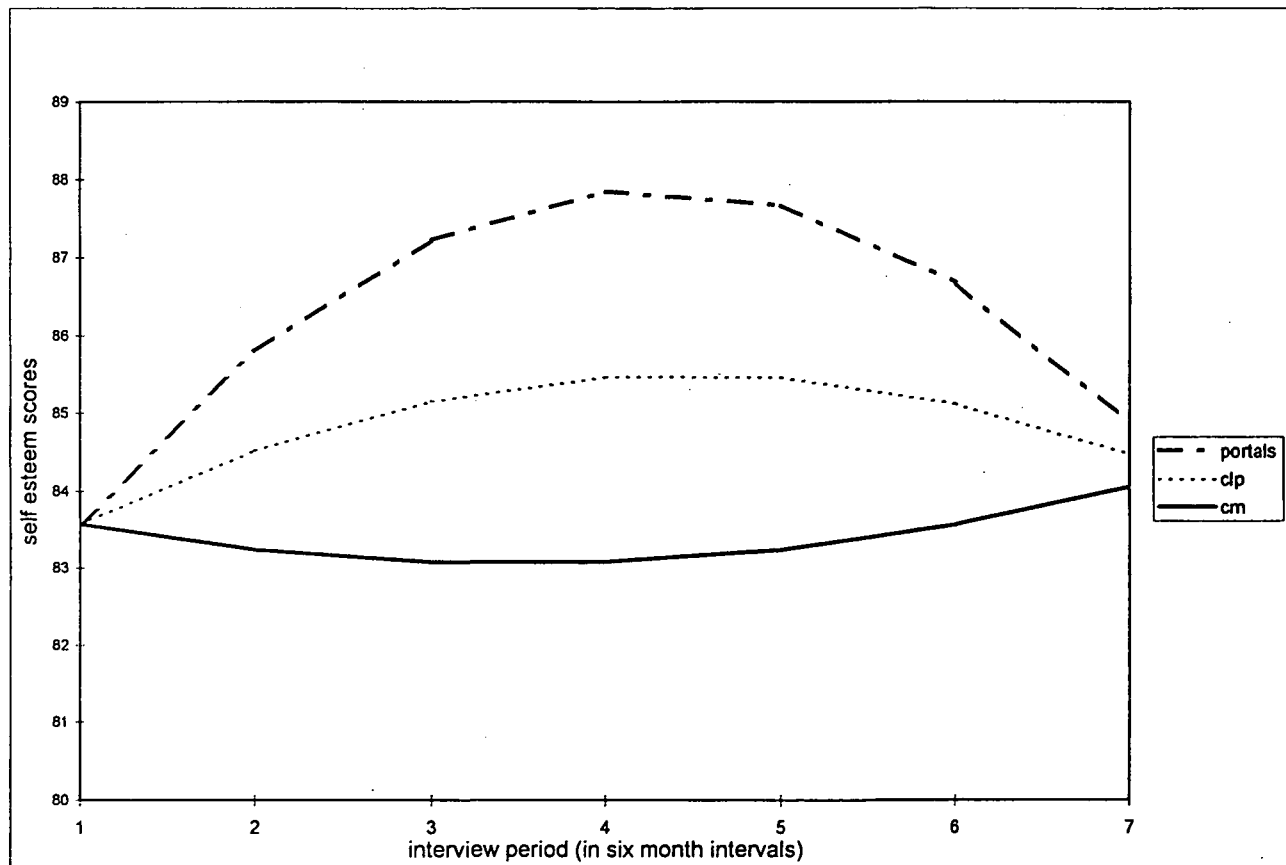
each time point. This second analysis allowed us to assess the impact of treatment attrition on the change curves. Concerning longitudinality, in a previous study using the functional outcome variables, we found that the longitudinality hypothesis was supported when the effects for the in-treatment sample were stronger than for the whole sample (Brekke et al. 1997). Additionally, when a treatment effect was evident, we then compared the in-treatment and out-of-treatment outcome curves for the two high-intensity programs. Based on the longitudinality hypothesis, we would expect the in-treatment curves to show positive linear or negative quadratic (up then down) change, or both, while the out-of-treatment times would show the reverse pattern. When directional hypotheses were tested in these analyses, 1-tailed tests of statistical significance were reported.

Subjective experience indicators. Concerning the first study question, we hypothesized that intensive rehabilitative services that had been associated with improved functional outcomes would result in greater levels of self-esteem and satisfaction with life than less intensive ser-

vices. Concerning self-esteem, findings using the whole sample indicated that there was no group by intercept (initial status) interaction, suggesting that the groups were equivalent at baseline. The linear coefficient was positive, but it was not statistically significant, nor was there a group by linear slope interaction. The quadratic slope was negative ($t = -3.4, p < 0.0001$), and there was a significant group by quadratic slope interaction ($t = 2.8, p < 0.003$) (figure 1). The quadratic coefficients were -0.46 for Portals, -0.27 for CLP, and -0.08 for CM. This suggests that the more intense programs showed greater improvement on self-esteem than the less intense program. Specifically, while there was almost no change in the scores for the CM condition, the scores for Portals and CLP improved for 2 years, and then declined.

The findings on self-esteem using only those subjects that remained in treatment at each time point were very similar to the findings for the entire sample, but they were attenuated. Specifically, there was no group by intercept interaction, and the linear slope and group by linear slope interaction were not significant. There was a significant

Figure 1. Predicted self-esteem score as a function of interview period and program



Note.—CLP = community living program; CM = case management.

quadratic coefficient ($t = -1.97, p < 0.025$), and the group by slope interaction was significant at $p < 0.07$ ($t = 1.5$).

Concerning the longitudinality of services, the statistically significant effect for self-esteem when using the whole sample attenuated to a statistical trend when using the in-treatment sample. This suggests that the significant effect for the whole sample was not entirely predicated on remaining in treatment. However, to more directly test the longitudinality notion, we used HLM to analyze separately the in-treatment and out-of-treatment times for the subjects in the two high-intensity programs. For the in-treatment times, the linear slope was positive (0.47), but it was not statistically significant; the negative quadratic slope (-0.59) was significant ($t = -2.7, p < 0.01$). For the out-of-treatment times, none of the coefficients was significant, but they were in the opposite direction of the in-treatment findings. These findings suggest that the significant improvement in self-esteem that occurred while the sample was engaged in treatment diminished and even reversed when the subjects exited treatment.

Turning to satisfaction with life, findings using the entire sample showed no intercept by group interaction, indicating that the groups were equivalent at baseline. However, while the linear slope was positive (0.34) and the quadratic was negative (-0.08), none of the linear, quadratic, or slope by group interactions was statistically significant. It should be noted that the variance components for both the linear and quadratic slopes were statistically significant, which suggests that the parameter estimates were robust. These findings indicate that there was no significant change in life satisfaction for the entire sample and that there was no differential change based on treatment model. The same was true for the analyses using those subjects who were in treatment at each point in time.

Clinical indicators. Turning to the second study question, we hypothesized that more intensive psychosocial rehabilitation would result in equal or greater improvement in the symptom levels when compared to less intensive intervention. There was no specific hypothesis with regard to the intrapsychic deficits.

Concerning symptoms, there was no significant group by intercept interaction, suggesting that the three groups were equally symptomatic at the baseline assessment. Using the entire sample, none of the linear, quadratic, or group by slope interactions was statistically significant. The linear slope was significant at $p < 0.10$ ($t = 1.7$), which suggests that there was an overall trend for symptoms to increase over the study period for all three groups. The findings using only the in-treatment subjects were very similar to those using the entire sample, except that there was no trend for the overall linear slope. These findings indicate that while there was a statistically nonsignificant increase in overall symptom levels over the 3-year

study period, there was no differential change based on treatment model.

Turning to the intrapsychic deficits, none of the linear, quadratic, or group by slope interactions was statistically significant. There were also no trends in the data. This suggests that there was no significant change in the intrapsychic deficits over time, nor any differential change based on treatment model.

Before turning to the third study question on the relationships between change in subjective experience, functional indicators, and clinical indicators, an important issue must be addressed. The null findings with regard to group change or differential program change over time in life satisfaction, symptoms, or intrapsychic deficits does not mean that there was no individual change occurring in these indicators over time. For example, the individual linear coefficients for satisfaction with life ranged from -5.4 to 4.8 ; for symptoms they ranged from -8.5 to 6.6 , and for intrapsychic deficits they ranged from -1.9 to 2.2 . In each of these domains there were almost an equal number of subjects who had positive and negative change coefficients. Therefore, even though the group change curves were not statistically significant in some domains, there was considerable individual change in these indicators over time. The third study question specifically addressed the covariation in these individual change trajectories over time.

The relationships between change in subjective experience, functional indicators, and clinical indicators. The third study question was addressed by using P-technique factor analysis to examine the relationship among changes in functional, clinical, and subjective experience variables. The primary goal was to identify the number of factors from the mean correlation matrix. In P-technique factor analysis, factors indicate clusters of variables that covary over time. As noted above, it was expected that there would be three factors indicating that the variables within the three categories (clinical, functional, and subjective experience) covaried to the greatest extent over time. It was also expected that variables between clusters would covary to a lesser extent.

The mean correlation matrix for the functional, clinical, and subjective experience variables across time is presented in table 2. Based on statistical and theoretical considerations, both two- and three-factor solutions were performed:

The two-factor solution. The scree plot and eigenvalues of the mean correlation matrix suggested a two-factor solution. The first two eigenvalues accounted for 41.5 percent of the variance. The factor structure matrix for the two-factor solution appears in table 3. Table 3 shows that the functional variables (hospitalization, social functioning, work, and independent living) have the highest loadings on the first factor, and the clinical (BPRS and intrapsychic deficit scores) and subjective experience

Table 2. Correlations among clinical, functional, and subjective outcome variables across time

| | HOSP | WRK | IND | SOC | BPRS | DEF | SWL | ISE |
|------|--------|--------|--------|--------|--------|-------|-------|-------|
| HOSP | 1.000 | | | | | | | |
| WRK | 0.174 | 1.000 | | | | | | |
| IND | 0.563 | 0.144 | 1.000 | | | | | |
| SOC | 0.190 | 0.050 | 0.164 | 1.000 | | | | |
| BPRS | -0.138 | -0.041 | -0.061 | -0.026 | 1.000 | | | |
| DEF | 0.179 | 0.142 | 0.132 | 0.119 | -0.305 | 1.000 | | |
| SWL | 0.105 | 0.054 | 0.078 | 0.039 | -0.058 | 0.154 | 1.000 | |
| ISE | 0.077 | 0.128 | -0.013 | 0.078 | -0.160 | 0.228 | 0.165 | 1.000 |

Note.—BPRS = Brief Psychiatric Rating Scale (symptoms); DEF = intrapsychic deficits; HOSP = hospitalization; IND = independent living; ISE = Index of Self-Esteem; SOC = social functioning; SWL = satisfaction with life; WRK = work functioning.

Table 3. The factor structure matrix for the two-factor oblique solution¹

| Outcome variables | Factor 1 | Factor 2 |
|-------------------|--------------|---------------|
| HOSP | 0.845 | -0.203 |
| WORK | 0.324 | -0.286 |
| IND | 0.839 | -0.060 |
| SOC | 0.420 | -0.143 |
| BPRS | -0.136 | 0.609 |
| DEF | 0.280 | -0.712 |
| SWL | 0.146 | -0.438 |
| ISE | 0.042 | -0.666 |

Note.—BPRS = Brief Psychiatric Rating Scale (symptoms); DEF = intrapsychic deficits; HOSP = hospitalization; IND = independent living; ISE = Index of Self-Esteem; SOC = social functioning; SWL = satisfaction with life; WRK = work functioning.

¹ The highest absolute value loading for each variable is in boldface.

variables (self-esteem and satisfaction with life) have the highest loadings on the second factor. BPRS is the only variable that loads positively on factor 2, indicating its negative correlation with all the other variables. The correlation between the factors was -0.251.

The two-factor solution indicates that there were two clusters of variables that covaried over time: (1) the functional variables, and (2) the clinical and subjective experience variables. A possible exception was the work variable, which tended to covary with both clusters but more so with the functional variables. Finally, the modest correlation between the factors indicated that the intercluster variables covaried to a small extent.

The three-factor solution. Though the scree plot and eigenvalues suggested a two-factor solution, extracting a third factor was desirable from a theoretical standpoint. Extraction of additional factors can clarify results from solutions with fewer factors (see Cattell 1952; Comrey 1978; Wood et al. 1996). Specifically, we wanted to inspect the three-factor solution to see if the clinical variables formed a distinct factor from the subjective experience and functional variables as predicted. The third eigenvalue was slightly under unity (0.98), and the first three eigenvalues accounted for 53.8 percent of the total variance. The factor

structure matrix is presented in table 4. The structure matrix shows separate factors for the functional (factor 1), clinical (factor 2) and subjective experience variables (factor 3), with one caveat: The work variable loads on the functional factor but has a higher loading on the subjective experience factor. This means that work covaries with both the functional and subjective experience variables. The third factor is still arguably a "subjective experience" factor because the subjective experience variables have the highest loadings on the factor and are less factorially complex than the work variable.

The factor correlation matrix for the three-factor solution showed that the functional cluster (factor 1) and subjective experience cluster (factor 3) have the highest absolute value correlation (0.1951), followed by the clinical (factor 2) and subjective experience cluster (1-0.1651) and the functional and clinical clusters (1-0.0871).

In summary, the three-factor solution indicated that (1) the functional variables covaried together over time, the clinical variables covaried together over time, and the subjective experience variables covaried together over time; and (2) while there were very modest correlations among the three clusters of variables, the functional and subjective clusters covaried the most.

Table 4. The factor structure matrix for the three-factor oblique solution¹

| Outcome variables | Factor 1 | Factor 2 | Factor 3 |
|-------------------|--------------|---------------|--------------|
| HOSP | 0.842 | -0.167 | 0.154 |
| WORK | 0.327 | 0.002 | 0.507 |
| IND | 0.849 | -0.042 | 0.063 |
| SOC | 0.416 | -0.075 | 0.159 |
| BPRS | -0.078 | 0.847 | 0.019 |
| DEF | 0.220 | -0.709 | 0.340 |
| SWL | 0.115 | -0.048 | 0.705 |
| ISE | -0.014 | -0.403 | 0.648 |

Note.—BPRS = Brief Psychiatric Rating Scale (symptoms); DEF = intrapsychic deficits; HOSP = hospitalization; IND = independent living; ISE = Index of Self-Esteem; SOC = social functioning; SWL = satisfaction with life; WRK = work functioning.

¹ The highest absolute value loading for each variable is in boldface.

Discussion

There were several important findings from this study. First, the hypothesis that intensive services would show higher rates of improvement on subjective experience measures when compared to less intensive services was supported with regard to client self-esteem. This addresses a significant gap in the literature on community-based psychosocial rehabilitation. It suggests that intensive services that are associated with increases in the functional outcomes of clients can also be related to improvements in one aspect of subjective experience, self-esteem. Concerning the longitudinality of services, it appears that remaining in treatment was related to maintaining the gains in self-esteem. Self-esteem is a core humanitarian outcome, and these findings suggests that in the push for increased psychosocial functioning, the subjective well-being of the clients was not compromised but actually enhanced. Clearly, subjective experience indicators such as self-esteem need to be included in any comprehensive assessment of psychosocial rehabilitation service outcomes.

The quadratic shape of the change in self-esteem also requires comment. It should be noted that the negative quadratic slope found for change in self-esteem was also found for nearly all of the functional outcome domains presented in Brekke et al. (1997) using the same sample. As such, the character of change in self-esteem resembled the character of change in the other functional domains. As we have speculated elsewhere, the negative quadratic slope could suggest that the nature of client change in community rehabilitation might be nonlinear, with change beginning in an accelerated fashion and then attenuating over time. This could mean that clinicians should not expect clients to maintain initial gains and that clients might need particular support when they hit a plateau. It is also possible that these quadratic trends are related to reductions in service intensity over time that are characteristic of the two most intensive programs in this study

(see Brekke and Test 1992). Losses in sample size, especially in the analyses using the in-treatment times, could also be related to the quadratic curves. We will address this issue again below. The findings with regard to satisfaction with life will also be addressed below.

The second main finding resulted from our examination of the relationships among prospective change trajectories in the outcome variables. We found evidence for three distinct outcome factors that corresponded to our conceptual domains of clinical, functional, and subjective experience outcomes. There was strong discrimination among the factors, with very modest correlations between them. This shows that the variables within the clusters tended to have the same trajectories and to travel together over time, while the three clusters appeared to travel together to a lesser extent. This is similar to Strauss and Carpenter's "open-linked" system of outcome in schizophrenia (Strauss and Carpenter 1972). In a series of studies on the natural course of the disorder, the four domains of hospitalization, work, social, and symptom outcomes showed strong correlations within each domain over 2-, 5-, and 11-year periods, with more modest correlations across the domains (Strauss and Carpenter 1972, 1974, 1977; Carpenter and Strauss 1991). They concluded that each outcome domain represented a distinct process that was modestly linked to the other domains. They called this an "open-linked system" of outcome. We found a very similar outcome model even though there were three notable methodological differences between our studies: We used a more elaborate set of outcomes, our sample was engaged in community-based treatment, and we used change-oriented longitudinal statistical procedures. The three outcome domains we found were clinical change, functional change, and subjective experience change. Together, they can be considered an open-linked model of outcome in schizophrenia.

This three-factor change model suggests several things. First, outcome from community-based interven-

tion consisted of three separate but linked domains that had distinct change trajectories over time. It is clear from this that multidimensional outcome assessment is essential, and these findings support the recent calls for the use of multidimensional outcome assessments in research on services for this population (Attkisson et al. 1992). Second, these findings suggest that change in one outcome domain is not likely to be strongly associated with change in another. Conversely, one also cannot assume that change deficits in one area will be associated with generalized deficits across other outcome domains. Third, this outcome model argues for an individualized assessment of needs and progress in each functional domain. Finally, the findings also support the potential importance of a targeted intervention strategy for each outcome domain where change is desired (Torrey and Drake 1994; Brekke et al. 1997).

Concerning the relationships among the three change domains, our findings indicate several things. First, change in clinical outcomes was distinct from change in functional outcomes. Therefore, a good or poor clinical picture was not strongly associated with whether change in other functional outcomes occurred. This has implications for psychosocial rehabilitation in terms of assessment and intervention. Second, based on the factor analysis, we found that change in subjective experience was modestly associated with change in both the clinical and functional domains. Specifically, the work item loaded on the functional factor and the subjective experience factor, and the self-esteem item loaded on both the clinical factor and the subjective experience factor. This suggests that change in subjective experience is somewhat linked to change in both functional and clinical outcomes. Therefore, psychosocial rehabilitation programs that focus on both clinical and functional outcomes could have a modest impact on subjective experience. In general, however, these findings call into question the assumption embedded in many psychosocial rehabilitation interventions that functional change will be closely associated with change in humanitarian outcomes such as self-esteem or satisfaction with life.

While a variety of factors could be related to this multidimensional outcome model, in a previous study we found that distinct neuropsychological and psychophysiological variables were related to different functional outcomes in schizophrenia (Brekke et al. 1997). Therefore, it is possible that distinct psychobiological variables or mechanisms might be related to change in different outcome domains and might underlay the factorial outcome model found in this study.

Turning to satisfaction with life, the findings indicated that changes in satisfaction with life were not associated with the intensity of services or with the amount of

functional change occurring in a program. These findings are similar to those reported in Mueser et al. (1997), who found that improvements in vocational functioning were somewhat related to improvements in self-esteem but not to improvements in satisfaction with life. Based on these results, changes in life satisfaction seem to be related to factors other than service intensity or the effectiveness of services in enhancing psychosocial functioning. At this point, we do not know the rehabilitative or nonrehabilitative factors that affect change in life satisfaction for this population, and much more research is needed on this important outcome.

Our third main finding concerned change in clinical outcomes. There was no differential program impact on symptom levels. Given the very high rates of medication compliance in all three groups, it is not surprising that there was no differential program impact on symptoms. There was also no overall or program-specific change in the intrapsychic deficits over time. Combined with our previous findings of statistically and clinically significant functional change over time (Brekke et al. 1997), this suggests that functional change occurred without change in the intrapsychic deficits. These findings could call into question the degree to which these deficits underlie functional disability in schizophrenia. On the other hand, these deficits could be part of an explanation of why some functional gains made during rehabilitation are lost once the intervention ends (Scott and Dixon 1995; Mueser et al. 1998). In other words, functional change can occur while someone is receiving intensive rehabilitative services, but without concurrent change in the underlying intrapsychic deficits, these functional gains will be lost once the support of an intensive intervention is removed. Given our previous findings on longitudinality, which suggest that some functional gains are maintained even after exiting the intervention (Brekke et al. 1997), this dynamic might be more pronounced for some functional variables than others. Clearly, more research is needed in this area.

Concerning the findings from this study, there are several methodological caveats that need to be considered. First, this study did not use random assignment to conditions; therefore, differences in client characteristics across the conditions could confound the interpretation of any differential program effects. In general, however, the groups were equivalent at baseline on numerous variables that have been related to functional outcomes in schizophrenia. Nonetheless, we cannot rule out the possibility that a selection factor affected our findings to some degree. Second, the variation in service implementation in this study occurred at the program level. It should be noted that these findings might not generalize to service implementation effects at the individual client level and that other effects not evident here might become evident

when using the client as the unit of analysis (Brekke et al. 1999). Third, while one of the strengths of this study was that we compared community support programs (CSPs) that varied in their service implementation, the degree to which the findings are generalizable to other CSPs is unknown. Fourth, since we excluded subjects diagnosed with comorbid substance dependence, the generalizability of these findings to a dually diagnosed population needs to be assessed in future studies. Fifth, since there has been very little study of subjective experience in schizophrenia, it is unclear to what degree our findings would generalize to other subjective experience constructs.

Finally, though the HLM results for the intact treatment group were similar to the results for the whole group, there are two issues that need to be mentioned. First, the intact treatment group had a smaller sample size that lowered the power to detect effects. With a greater sample size, we would expect both groups to be nearly equivalent in terms of their curve profiles. Second, the fact that there was more missing data in the intact treatment group (using only those subjects in treatment at each time point) makes the estimation of the group curves more difficult. The change curves are computed on the maximal available data for each subject. Extrapolation is made to missing time points, if there are any. If the "true" trend (i.e., linear or quadratic, or both) is present in the nonmissing data, then the estimate of the group curve is probably good. However, if the true trend is not present in the nonmissing data, then the group estimate could be misleading.

Future research needs to focus on several things. First, we do not fully understand what characteristics of a CSP service milieu affected the self-esteem of clients. Given the importance of the humanitarian outcomes, we need more study on the intervention factors that can positively affect subjective experience for individuals in a range of community-based interventions. Second, we need to test the effect of CSPs on a variety of subjective experience outcomes. For example, we need much more research on the rehabilitative and nonrehabilitative factors that can influence satisfaction with life for this population. Third, the three-factor model of rehabilitative change found in this study also needs to be tested in the context of other prospective outcome studies and when using other outcome measures. Fourth, the relationship between the intrapsychic deficits and rehabilitative change in schizophrenia needs further study. Finally, there was notable variation in the individual change parameters (growth curves). This suggests that there were individual differences in the responsiveness to the rehabilitative interventions. Future research should be targeted toward understanding the individual factors related to this variation in treatment responsiveness, since this is closely related to

improving the effectiveness of our treatment models. For example, while subjective experience was used as an outcome variable in this study, it is also possible that baseline levels of subjective experience could be used as an individual factor to predict variations in the effectiveness of community-based psychosocial rehabilitation.

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