

*Impairments in cognitive functioning, which obstruct psychiatric rehabilitation, are resistant to drugs and conventional psychosocial treatment but can be reduced by specialized training techniques.*

## Assessment and Treatment of Cognitive Impairments

*Dorie Reed, Mary E. Sullivan, David L. Penn,  
Paul Stuve, William D. Spaulding*

The many psychological processes involved with perception, attention, and thinking are collectively termed *cognition*. Cognition includes relatively simple processes such as identification of visual features and selective attention, as well as complex ones such as social perception and problem solving. A continuum from “molecular” cognition (simple, unitary processes) to “molar” cognition (complex processes), describes the exchange of information within a human being at varying levels of organization and complexity. Upward transmission of information, from molecular to more molar processes, typically results in the integration of perceptual or memory elements into increasingly more integrated and holistic constructions of the world. Downward transmission either modulates the activity of the more molecular processes, analogous to adjustments of the gain of an amplifier, or translates complex plans of action into specific motor responses.

Impairments in cognitive processes are considered basic to serious mental disorders such as schizophrenia and have detrimental effects at all levels of individual psychosocial functioning. For example, when patients are actively psychotic with severe disruption of neurophysiological and cognitive processes, they are generally not able to benefit from conventional forms of psychiatric rehabilitation. Cognitive impairments of varying severity often remain in the residual phase of psychotic disorders, despite optimal antipsychotic drug effects (Spohn and Strauss, 1989). Residual cognitive impairments can be significant obstacles to personal functioning and can impede efforts at psychosocial rehabilitation.

Cognitive impairments appear to play a significant role in the functioning and treatment responses of psychiatric patients undergoing rehabilitation. Among chronic, institutionalized schizophrenics, Spaulding, Penn, and Wiler (1990) found relationships among molar and molecular cognitive impairments, social skills, social behavior, and patterns of symptomatology. Changes in molecular cognitive functioning in residual schizophrenic patients have been shown to correspond to changes in their social functioning (Spaulding, in press). Deficits in vigilance and attention have been found to be related to poor responses to skills training (Kraemer, Zinner, and Moller, 1988; Bowen, 1988). The often-reported failure of schizophrenics to generalize social skills training to naturalistic settings may be due to the failure of skills trainers to address patients' cognitive impairments in their training procedures (Lieberman, Nuechterlein, and Wallace, 1982).

One strategy for addressing cognitive impairments is to make skills training and other conventional rehabilitation modalities as sensitive as possible to the cognitive impairments of patients. This strategy has been successfully pursued in the development of techniques for social skills training by the Clinical Research Center for Schizophrenia and Psychiatric Rehabilitation at the University of California, Los Angeles (UCLA). Lieberman, Nuechterlein, and Wallace's (1982) recommendations for amplifying the effects and durability of social skills training include the following: (1) Keep the training setting uncluttered and devoid of distracting stimuli. (2) Post graphic charts for clear and simple visual cuing of cognitive strategies. (3) Use mild censure for inappropriate responses as well as praise for appropriate responses. (4) Conduct task analysis and break down tasks into simple steps. (5) Decrease novelty by means of many repetitions before moving to new material or scenes.

The main advantage of this strategy is that it makes use of existent skills-training technology to compensate for patients' cognitive impairments. In addition, it is possible that skills training at the molar level improves cognitive functioning at the molecular level, especially if the training is intensive and long term. Its applicability is limited, however, because of the heterogeneity of patients' deficits. Even the most experienced and highly trained therapist cannot be expected to assess and compensate for every patient's unique constellation of cognitive deficits in the course of training sessions.

In this chapter, we present an alternative rehabilitation strategy, namely, techniques for assessing and directly remediating cognitive impairments in psychiatric rehabilitation. We then describe cognitive remediation techniques aimed at molecular-to-molar levels of cognitive functioning.

## **Vigilance and Continuous Performance**

Vigilance is the ability to maintain readiness to respond to an expected signal over an extended period of time. Continuous performance is the

result of vigilance, with emphasis on the response. Continuous performance tasks can be extremely simple, as in pushing a button in response to a signal tone. However, vigilance and continuous performance also underlie such complex activities as participation in skills training and social conversation. Even simple tasks of vigilance and continuous performance are disrupted in the acute phase of psychotic illnesses, with impairments persisting in the residual phase on tasks with complex signal characteristics or performance demands (Neuchterlein and Dawson, 1984; Neuchterlein, 1990).

In our study, commercially available packages of computerized tasks for exercising these skills, resembling very simple video games, were employed as a means of improving the continuous performance of fifteen chronic, institutionalized psychiatric patients. Subjects were selected on the basis of deficient performance on one or more tasks in a set of ten tasks, on which normal adults and even many psychiatric patients can perform perfectly. Each subject showed a unique pattern of deficits across the tasks that was not attributable to diagnostic differences. The subjects then practiced a subset of the tasks in thirty-minute sessions, two to three days per week, for eight weeks.

All but one of the subjects showed improvement on at least one of the ten tasks, but most showed improvement on less than one-half of the tasks that they practiced. The patterns of change were as unique as the patterns of initial impairment. There was no evidence of generalization from improvement on the vigilance tasks to improvement in an occupational therapy workshop program, in ambient social functioning, or in independent evaluations of cognitive functioning. While chronic psychiatric patients can change their levels of vigilance and continuous performance, the small amount of change and lack of generalization point to the need to include extrinsic rewards and transitional opportunities to plan and motivate the generalization of improvements to real-life situations.

A similar study recently completed by Dorie Reed more directly addressed motivational factors. The subjects were four chronic, institutionalized schizophrenic subjects who had previously been classified in a rigorous drug trial protocol as "minimal drug responders." The subjects practiced a variety of visual scanning and memory tasks, less intrinsically interesting than video games, in fifteen- to twenty-minute lessons, four times per week, for eighteen weeks. Continuous on-task behavior was reinforced with food at ten-minute intervals. All four of the subjects showed gradual improvement in continuous task performance. There was no evidence of generalization of this improvement to a concomitant skills-training group. Accuracy on the visual scanning and memory tasks was highly variable both between and within subjects and did not change over the course of the training. However, two of the subjects showed significant improvement in independently assessed cognitive functioning after the training period.

In a more naturalistic study of chronic institutionalized subjects who participated in a continuous performance task in which they sorted and collated in a sheltered workshop, informally delivered behavior therapy improved sustained performance in seven of nine patients (Spaulding, Storms, Goodrich, and Sullivan, 1986). However, no generalization or overall clinical improvement was associated with the improved vigilance.

Taken together, these three studies suggest that improvement on continuous performance tasks has at least two components. One component involves changes in molecular vigilance processes, and the other involves motivational factors. This analysis, in combination with the fact of heterogeneity of impairments within the domain of continuous performance, suggests that considerable individual assessment and treatment tailoring are necessary for significant treatment impact. Also, in view of the lack of spontaneous generalization, improvements in vigilance and continuous performance may be expected to have minimal impact on daily living skills unless cognitive remediation is aggressively integrated into a comprehensive rehabilitation program.

It is notable, however, that the subjects in these studies were selected for having gross impairments. Even within the population of chronic, institutionalized patients, they fall around the ninetieth percentile of severity of continuous performance impairment. Patients with less severe deficits may respond quite differently, if they need treatment in this domain at all. In any case, inasmuch as vigilance and continuous performance are key prerequisites to participation in skills training and related modalities, improvement in this domain may make rehabilitation accessible to some patients who would otherwise have a very poor prognosis, even if spontaneous generalization is very limited.

## **Distractibility**

Distractibility is an impairment in the molecular range of cognition characterized by disruption of ongoing cognitive activity by irrelevant stimuli. Often it is difficult to distinguish between distractibility and vigilance impairments, as distraction directly disrupts vigilance; however, simple vigilance impairments can occur in the absence of distracting stimuli. The distinction is clearest when ongoing activity is disrupted by specifiable stimuli despite the patient's efforts to prevent it.

Distractibility, according to Pogue-Geile and Oltmanns (1980), is primarily associated with schizophrenia. In all people, distractibility is closely associated with psychophysiological arousal, and so it can also be observed in patients with anxiety and affective disorders and even among acutely agitated normal adults. For this reason, distractibility may sometimes be treated with relaxation training and related psychophysiological stress management techniques, with or without interventions aimed directly at cogni-

tion. Schizophrenic patients often have distractibility problems in the absence of extreme arousal, however.

The following case study illustrates the use of cognitive behavior therapy for reducing the impairments associated with distractibility:

The patient was a twenty-three-year-old outpatient whose eight years of paranoid schizophrenic symptoms had been controlled sufficiently for him to attend courses at a university. However, his academic efforts were impaired by distractibility associated with short-term memory problems and ideas of reference, that is, feeling that classmates were talking about and laughing at him.

An exercise was designed to improve his ability to efficiently apprehend the content of spoken information. Over the course of four therapy sessions, the therapist read aloud two to three sentence blocks from a newspaper article and asked the patient to describe in his own words the basic idea of the sentences. At the end of the article the patient was asked to summarize its theme. A tape of other readings, with pauses for summarization, was made so that he could practice this exercise at home. After one month, he reported an improved ability to follow lectures and reading assignments.

To address the social components of his distractibility, the patient practiced a social apperception task, first described by Spaulding, Storms, Goodrich, and Sullivan (1986), involving repetitive generation of different story responses to thematic apperception test (TAT) cards. He found this to be a stimulating task. After a number of sessions, the therapist underscored the parallel between perceiving a particular TAT card in different ways and perceptions of actual social situations. For example, the patient was asked to generate as many different perceptions and interpretations as possible of a situation that he had automatically associated with ridicule, such as hearing other students whispering in class. The plausibility of each of the different interpretations was then discussed, with an emphasis on assessing the likelihood that particular interpretations were correct. He was then given homework assignments to practice this exercise whenever he thought that people were talking about him. This task was also practiced *in vivo* by going to the Student Union with the therapist and discussing alternative interpretations whenever he thought others were watching or talking about him. At the end of six months, he reported feeling less distracted by paranoid thoughts in class and in other social situations. This remediation augmented the improvements that he had already made in his classroom cognitive functioning, and it also made him more amenable to pursuing social-behavioral interventions. The improvement in his classroom functioning was corroborated by his semester grades, which consolidated his motivation in therapy.

## Orientation and Self-Monitoring

Disorientation is a well-known symptom of severe, acute psychiatric disorders, which almost always abates after the acute phase. Occasionally, however, disorientation persists into the residual phase, such as in patients who are poor drug responders, whose clinical presentation is diagnostically anomalous, and/or who have neurological complications. In such cases, chronic disorientation leads to a breakdown in integration of several molecular cognitive functions, including vigilance, selective attention, short-term memory, and executive functions that plan and control simple social behaviors. This breakdown usually precludes meaningful participation in rehabilitation.

It is sometimes useful to identify the cognitive function of self-monitoring as a preliminary treatment target for these patients. Self-monitoring requires the molar integration of a few simple molecular cognitive functions, enough to allow patients to maintain themselves in a minimally meaningful personal and social context. This integration can be accomplished by focusing on the establishment of a short-term memory capacity sufficient for the patients to cue themselves to check their immediate orientation, compare it to a memory of a simple plan for daily activity, and reorient themselves accordingly.

An example of a treatment program for disorientation comes from the Lincoln Regional Center, where a forty-six-year-old woman with a rapid cycling bipolar disorder, agitation, and pressured and rambling speech was in a behavior modification program that engaged her in basic orientation conversations several times a day. She was asked such questions as What is your name? What did you eat for breakfast? and What is your schedule today? and was reinforced with ward privileges and praise for correct and coherent responses. A time-out from the reinforcement program was successful in reducing her agitation and abusive behavior. Her family was trained to augment the staff's efforts through using similar behavioral contingencies. Within months, her orientation improved to the point where she could resume rehabilitative activities, which her disorientation had precluded for two years.

## Concept Formation and Processing

The formation and use of concepts has long been known to be deficient in various psychiatric populations. Recently, interest has focused on schizophrenia and the frontal lobes of the brain, where most cognitive processes are thought to occur. Weinberger, Berman, and Zec (1986) have gone so far as to hypothesize that schizophrenia represents an organic dementia that permanently disables frontal lobe functioning. This hypothesis is con-

troversial for several reasons. It is difficult to localize conceptual functioning in any one region of the brain. Moreover, conceptual impairments are not unique to schizophrenia, and many schizophrenics do not have conceptual impairments. Finally, studies have demonstrated that the performance of schizophrenics on a conceptual task can be improved by training procedures (Spaulding, Storms, Goodrich, and Sullivan, 1986; Summerfeld and others, 1989; Green, Ganzella, Statz, and Vaclav, 1990; Bellack and others, 1990).

The following case study illustrates direct treatment of a conceptual processing deficit:

The patient was a thirty-eight-year-old man, who suffered an initial psychotic episode during military service. In subsequent inpatient and outpatient care in the Veterans Affairs system, an unequivocal clinical picture of paranoid schizophrenia emerged. At one point, in the midst of a delusional psychotic episode, he killed one person. Declared not guilty by reason of insanity, he was committed to the state hospital.

After several years in the hospital security unit without assaultive behavior, he was transferred to the rehabilitation unit. Although his personal and social functioning was generally good, he had considerable difficulty in most of the rehabilitation modalities. In symptom management group, a modality designed to develop comprehensive understanding of one's psychiatric disorder, its symptoms, and environmental stressors, he was particularly incapacitated. After two years, his insight was limited to knowing his diagnosis. He continued to use concrete, largely persecutory explanations of most everything that happened to him. In social interactions he was typically either openly hostile or ingratiating and obsequious. He had a volatile temper and became agitated with the most minor annoyances and frustrations. As part of his vocational rehabilitation plan, he had enrolled in a hotel management correspondence course but had great difficulty with it. His rehabilitation progress had thus been stalled for at least two years.

Testing revealed that although his molecular cognitive functions were well within normal limits, he had severe impairments on the WCST and the Halstead Categories Test. A comprehensive plan for addressing concept formation and manipulation and other aspects of conceptual processing was designed and implemented. This program included the social apperception exercises described by Spaulding, Storms, Goodrich, and Sullivan (1986) and a number of exercises borrowed from special education technology that address categorization, sequencing, and other conceptual skills. A set of concrete criteria for progress in the symptom management group was developed, and achievement of these criteria was linked to ward privileges in a contingency management program.

Treatment continued over a three-year period, concomitant with

the rest of his rehabilitation regimen. Testing was repeated at six-month intervals. Within a year, his performance on the WCST was within normal limits. During the second year, the symptom management therapist began to report an accelerating rate of improvement in that group. In the course of a drug titration to a lower dose, he began to experience some prodromal psychotic symptoms, and he quickly and appropriately renegotiated his neuroleptic regimen with his psychiatrist. This behavior was seen as a striking change, as he had previously been quite secretive about his symptoms.

After two and one-half years of cognitive training, his Halstead Categories score fell within normal limits. The special education teacher reported accelerating improvement on the conceptual exercises and renewed vigor in the correspondence course. By the third year after concept training had begun, the patient had graduated from the symptom management group and had obtained his diploma in hotel management. He began a very stressful process of petitioning for release from the hospital, and he handled it well. To date, his discharge plan is well articulated, and he can reasonably expect release within one to two years.

### **Attributional Processes**

Attributions are beliefs about one's self, others, and the causes of events. The formulation and use of beliefs involve integration of perceptual, attentional, conceptual, memory, and executive processes, and so attributional processing lies in the molar range of cognition.

Attributional problems in severely disordered psychiatric patients fall into three categories: symptom-linked, affect-linked, and achievement-linked. Symptom-linked attributions are associated with psychiatric symptoms, especially delusions. These symptoms sometimes respond to drug interventions, but generally they are the most drug-refractory of the positive symptoms of schizophrenia. Affect-linked attributions are beliefs that are closely linked to affective states, such as the cluster of beliefs that constitutes the cognitive component of self-esteem. Affect-linked attributions are the primary treatment targets of cognitive behavior therapy for depression. Achievement-linked attributions are beliefs about the value of independence, autonomy, personal and social success, and, in the context of rehabilitation, the value of personal effort and investment in making a better life. The complaint that a patient "is unmotivated for treatment" frequently reflects an achievement-linked attributional problem.

Techniques developed by Beck (1976) for treating affect-linked attribution problems are well known and are discussed in the next chapter. It should be noted, however, that research in this area has focused on relatively high-functioning patients, and that little is known about the potential



usefulness of these techniques in the more severely dysfunctional patients who most often need psychiatric rehabilitation. A notable exception is the work of Perris (this volume). It is clear that patients' levels of self-esteem (and, presumably, other aspects of their affective status) benefit indirectly from success in rehabilitation. More direct treatment for patients whose self-esteem and related beliefs compromise the effectiveness of rehabilitation interventions may be helpful.

The value of direct treatment of delusional beliefs has been reported in well-replicated, controlled, within-subject case studies, in which contingencies of reinforcement and instruction of rational speech were the interventions used (Liberman, Teigen, Patterson, and Baker, 1973; Wong, Massel, Mosk, and Liberman, 1986). Development of the social skill of keeping one's bizarre beliefs to oneself may be another treatment strategy.

Beliefs about the origins of symptoms and other aspects of one's psychiatric disorder represent another kind of symptom-linked attribution, and these may be usefully addressed in rehabilitation. A patient who believes, for example, that auditory hallucinations are simply the voice of the devil may be less able to manage them or use them as prodromal danger signs than is a patient who believes that they are symptoms of a drug-responsive neurophysiological condition. Successful psychoeducational approaches to changing such beliefs have been reported by Johnson, Ross, and Mastria (1977) and Spaulding, Storms, Goodrich, and Sullivan (1986), but a comprehensive, systematic method of intervention has not been developed. Skills-training modules in symptom management and medication management developed by the UCLA Clinical Research Center for Schizophrenia and Psychiatric Rehabilitation are designed to develop relevant skills, but no research has been done on their effects on symptom-linked attributions. This is a potentially valuable but largely unexplored area in psychiatric rehabilitation.

As with affect and self-esteem, the traditional rehabilitation approach to promoting motivational and related achievement-linked attributions has focused on providing success experiences. Contingency management provides a motivational prosthesis but does not necessarily produce self-sustaining motivation. As the following case study illustrates, direct induction of achievement-linked attributions can facilitate the effects of both rehabilitation and contingency management:

The patient was a twenty-nine-year-old institutionalized man with severe obsessive-compulsive disorder of late adolescent onset. His IQ appeared to be in the normal range. He was transferred to a long-term rehabilitation unit without much expectation of improvement. Despite repeated hospitalizations, his functioning had deteriorated since onset. Normal social behavior had become totally eclipsed by compulsive rituals. At one point compulsions had prevented food intake to the point that he began to show signs of malnutrition and had to be tube-fed. Drug trials of

imipramine, amitriptyline, and fluoxetine were ineffective, and clomipramine produced a barely discernible decrease in the intensity of his compulsive rituals. A behavioral response prevention program only produced a behavior that could not be prevented, compulsive expectation.

After a year on a restrictive contingency management program that reinforced minimal personal functioning with social contact and ward privileges, the patient managed to earn privileges one or two days per week. When he lost his privileges, he became dejected or aggressive, often requiring restraint. He blamed the staff for victimizing him. Eventually, it became apparent that he was able to comply with his program just enough to attend salient events, such as ward social events and, especially, University of Nebraska football games. Biweekly cognitive therapy sessions began to focus on how it was that he was able to accomplish the bare minimum for privileges. At one point, when shown a graph of his day-to-day performance with salient events marked in, the patient was visibly taken aback. He had not believed that his behavior was under any kind of control, much less the control of events that he valued. He interpreted the graph as a demonstration of his progress, and he even asked to show it to his parents.

Over a number of months his rate of earning privileges gradually increased, which was repeatedly interpreted for him as evidence of increasing control over his behavior. His blaming of staff and his aggression stopped completely. His predominant mood changed from agitation or dejection to sanguinity, even in the face of frustration. He began to show interest in learning self-regulation techniques such as self-talk and relaxation. He began to speculate about what life might be like after discharge from the hospital. The most restrictive parts of his contingency program were discontinued with no increase in compulsive rituals and a continued increase in his ability to attend scheduled activities and classes.

To date, he is fully engaged in a standard skills-training regimen. He has set a discharge date for himself and participates in the planning process. He still engages in a remarkable amount of compulsive ritual, but does so mostly in private, and it does not interfere with his daily schedule.

## **Social Cognition and Role Performance**

At the most molar end of the cognitive range are processes that mediate complex social functioning. This mediation involves integration of many molecular processes of perception, attention, concept formation and manipulation, and response planning and execution. Brenner, Hodel, Kube, and Roder (1987) have developed a group format skills-training modality designed to strengthen many of the molecular components and to facilitate

their integration. It is designed to precede conventional social skills training. The modality consists of a number of specific exercises, many of them similar to exercises described in this chapter. The exercises are interwoven with structured group activities to promote their integration into the molar fabric of social cognition. The modality is currently in widespread use in Europe, where early empirical studies have indicated that it facilitates progress in social skills training.

Social role performance is the sustained, integrated use of a set of cognitive and interpersonal skills made meaningful by a social context. The importance of an ability to perform social roles spurred the development of social skills training (Lieberman, King, DeRisi, and McCann, 1975; Hogarty, Goldberg, Schooler, and Ulrich, 1974). The integration of skills into a social role requires a molar cognitive representation of the role. Psychiatric rehabilitation usually focuses on development of the specific skills and of the molecular cognitive processes that support the skills. However, more recent techniques of social skills training have emphasized the involvement of the patient in setting long-term and overall rehabilitation goals that are consonant with desired and adaptive social roles (Lieberman, DeRisi, and Mueser, 1989). By connecting the arduous and stepwise training of discrete social skills to desired social roles such as "worker," "family member," and "friend," rehabilitation practitioners can enhance patients' motivation and commitment to the skills training program.

## Conclusion

Direct treatment of impairments in cognitive functioning can be a useful and sometimes crucial component of comprehensive psychiatric rehabilitation. Effective use of cognitive techniques requires extensive use of specialized assessment methods, including laboratory procedures, because patients have individually unique constellations of cognitive impairments, many of which can be identified only with specialized assessments. Also, *repeated* assessment is necessary to verify the effectiveness of specific interventions.

The case studies described in this chapter illustrate the potential efficacy of utilizing individualized cognitive interventions in conjunction with psychopharmacology, skills training, behavior modification programs, family therapy, and other forms of treatment involved in comprehensive psychiatric rehabilitation. It would be premature to confidently conclude that the improvements in the above case studies are due to the interventions described. Factors such as cumulative medication effects or medication changes, spontaneous remission of symptoms, and even the passage of time may have contributed to patient improvement. Systematic research will eventually provide more information on the relative efficacy of various techniques for various patients, but until then assessment and treatment must proceed through systematic trial and error.

## References

- Beck, A. T. *Cognitive Therapy and the Emotional Disorders*. New York: International Universities Press, 1976.
- Bellack, A., Mueser, K., Morrison, R., Tierny, A., and Podell, K. "Remediation of Cognitive Deficits in Schizophrenia." *American Journal of Psychiatry*, 1990, 147 (12), 1650-1655.
- Bowen, L. "Prediction of Schizophrenic Patients' Response to Skill Training with Laboratory Assessment of Attentional Deficits." Unpublished doctoral dissertation, California School of Professional Psychology, Los Angeles, 1988.
- Brenner, H. D., Hodel, B., Kube, G., and Roder, V. "Kognitive Therapie bei Schizophrenen: Problemanalyse und Empirische Ergebnisse [Cognitive therapy in schizophrenia: Problem-analysis and empirical study]." *Nervenarzt*, 1987, 58, 72-83.
- Green, M., Ganzella, S., Satz, P., Vaclav, J. "Teaching the Wisconsin Card Sort to Schizophrenic Patients." *Archives of General Psychiatry*, 1990, 47, 91-92.
- Hogarty, G. E., Goldberg, S. C., Schooler, N. R., and Ulrich, R. F. "Drug and Sociotherapy in the Aftercare of Schizophrenic Patients. Part 2: Two-Year Relapse Rates." *Archives of General Psychiatry*, 1974, 31, 603-608.
- Johnson, W., Ross, J., and Mastria, M. "Delusional Behavior: An Attributional Analysis of Development and Modification." *Journal of Abnormal Psychology*, 1977, 86, 421-426.
- Kraemer, S., Zinner, H., and Moller, H. "Cognitive Therapy and Social Skills Training in Chronic Schizophrenia Patients: Preliminary Results of Differential Effects." Paper presented at the 3rd World Congress of Behavior Therapy, Edinburgh, August 1988.
- Lieberman, R. P., DeRisi, W. J., and Mueser, R. T. *Social Skills Training for Psychiatric Patients*. Elmsford, N.Y.: Pergamon, 1989.
- Lieberman, R. P., King, L. W., DeRisi, W. J., and McCann, M. J. *Personal Effectiveness*. Champaign, Ill.: Research Press, 1975.
- Lieberman, R. P., Nuechterlein, K. H., and Wallace, C. J. "Social Skills Training and the Nature of Schizophrenia." In J. Curran and P. Monti (eds.), *Social Skills Training: A Practical Handbook for Assessment and Treatment*. New York: Guilford, 1982.
- Lieberman, R. P., Teigen, J., Patterson, R., and Baker, V. "Reducing Delusional Speech in Chronic, Paranoid Schizophrenics." *Journal of Applied Behavior Analysis*, 1973, 4, 273-274.
- Nuechterlein, K. H. "Information-Processing Anomalies in the Early Phase of Schizophrenia and Bipolar Disorders." Paper presented at the 4th Annual Society for Research in Psychopathology Conference, Boulder, Colorado, November 1990.
- Nuechterlein, K. H., and Dawson, M. E. "Information Processing and Attentional Functioning in the Developmental Course of Schizophrenic Disorders." *Schizophrenia Bulletin*, 1984, 10, 160-203.
- Pogue-Geile, M. F., and Oltmanns, T. F. "Sentence Perception and Distractibility in Schizophrenic, Manic, and Depressed Patients." *Journal of Abnormal Psychology*, 1980, 89, 115-124.
- Spaulding, W. "Spontaneous and Induced Cognitive Changes During Rehabilitation of Schizophrenia." In R. Cromwell (ed.), *Schizophrenia: Innovations in Theory and Treatment*. New York: Oxford University Press, in press.
- Spaulding, W., Penn, D., and Weiler, M. "Relationships Between Cognitive and Social Functioning in Chronic Schizophrenia." Paper presented at the 24th Annual American Psychological Association Conference, New York, March 1990.
- Spaulding, W., Storms, L., Goodrich, V., and Sullivan, M. "Applications of Experimental Psychopathology in Psychiatric Rehabilitation." *Schizophrenia Bulletin*, 1986, 12, 560-577.
- Spivak, G., Platt, S., and Shure, M. *The Problem-Solving Approach to Adjustment*. San Francisco: Jossey-Bass, 1976.
- Spohn, H., and Strauss, M. "Relation of Neuroleptic and Anticholinergic Medication to Cognitive Functions in Schizophrenia." *Journal of Abnormal Psychology*, 1989, 98, 367-380.

- Summerfeld, A., Alphs, L., Wagman, A., Funderburk, F., and Strauss, M. "Monetary Reinforcement Reduces Perseverative Errors in Patients with Schizophrenia." Paper presented at the 2nd International Congress on Schizophrenia Research, San Diego, California, April 1989.
- Weinberger, D. R., Berman, K. F., and Zec, R. F. "Physiological Dysfunction of Dorsolateral Prefrontal Cortex in Schizophrenia. Part 1: Regional Cerebral Blood Flow Evidence." *Archives of General Psychiatry*, 1986, 43, 114-124.
- Wong, S. E., Massel, H. K., Mosk, M. D., and Liberman, R. P. "Behavioral Approaches to the Treatment of Schizophrenia." In G. D. Burrows, T. R. Norman, and G. Rubinstein (eds.), *Handbook of Studies of Schizophrenia*. Amsterdam, Holland: Elsevier, 1986.

*DORIE REED, Ph.D., is a clinical psychologist and research associate in the Department of Psychology at the University of Nebraska at Lincoln. She provides cognitive therapy on the extended care rehabilitation unit at the Lincoln Regional Center where the research reported in this chapter was done.*

*MARY E. SULLIVAN, M.S.W., is director of the extended care rehabilitation unit at the Lincoln Regional Center where she also conducts therapy and supervises social work services.*

*DAVID L. PENN is a graduate student in the Department of Psychology at the University of Nebraska at Lincoln.*

*PAUL STUVE, Ph.D., was a graduate student at the Department of Psychology at the University of Nebraska and is now program director at the Rehabilitation Unit of Broughton State Hospital in North Carolina.*

*WILLIAM D. SPAULDING, Ph.D., is associate professor of psychology at the University of Nebraska at Lincoln and chief psychologist at the extended care rehabilitation unit at the Lincoln Regional Center.*