At Issue: The Future of Cognitive Rehabilitation of Schizophrenia

by Steven M. Silverstein and Sandra M. Wilkniss

Abstract

Cognitive rehabilitation is becoming an increasingly popular intervention in treatment programs for people with schizophrenia. Despite this increased acceptance, however, the evidence base on its effectiveness is not impressive. Moreover, given the evidence of cognitive recovery in treated patients who do not receive cognitive rehabilitation—from newer medications and from other evidence-based psychosocial interventions—it is not clear whether cognitive rehabilitation is worth its expense in time and resources. We believe that the slow progress in the field of cognitive rehabilitation of schizophrenia is related to failure to address several critical issues: (1) the importance of manipulating stimulus and context structure in rehabilitative interventions; (2) the need to base a cognitive rehabilitation of schizophrenia on cognitive neuroscience as opposed to neuropsychology; (3) the importance of systematically addressing motivation, self-esteem, and affective factors when designing cognition-enhancing interventions; (4) the need to move beyond one-size-fits-all interventions and develop individualized treatments; and (5) the need to address abnormalities in the experience of the self when designing interventions to optimize cognitive and behavioral performance. Suggestions for addressing these issues are discussed.

Keywords: Schizophrenia, cognitive rehabilitation, cognition, treatment.


Over the past 10 years, there has been an increased recognition of the importance of cognitive impairments in schizophrenia (Sharma and Antonova 2003). Cognitive deficits have been proposed to be manifestations of core illness mechanisms (Cohen and Servan-Schreiber 1992; Phillips and Silverstein 2003), vulnerability indicators for the development of the illness (Nuechterlein et al. 1994), and strong predictors of treatment response and level of functioning (Green 1996). In response to the increased focus on cognitive deficits in schizophrenia, researchers and clinicians have developed efforts to systematically reduce these cognitive impairments. Psychological treatments designed to improve cognition have been generally termed cognitive rehabilitation. The field of cognitive rehabilitation of schizophrenia now includes individualized (Sohlberg et al. 2000; Lopez-Luengo and Vasquez 2003) and group (Brenner et al. 1994; Spaulding et al. 1999) treatments, as well as computerized (Burda et al. 1994; Bell et al. 2001) and noncomputerized (van der Gaag 1992; Kurtz et al. 2001) methods.

There have now been enough published reports of cognitive rehabilitation that reviews of the field have begun to appear. The few published reviews range from quite positive (e.g., Kurtz et al. 2001a), to somewhat positive (Twamley et al. 2003), to negative (e.g., Pilling et al. 2002). In many cases, however, these reviews have not addressed critical issues facing the field. Therefore, the main goal of this article is to address the following issues: (1) the question of whether cognitive recovery is possible in schizophrenia, and if so, the necessity of cognitive rehabilitation given the cognitive recovery effects from other interventions; (2) the importance of manipulating stimulus and context structure in rehabilitative interventions; (3) the need to ground cognitive rehabilitation...
efforts for schizophrenia firmly within cognitive neuroscience as opposed to neuropsychology; (4) the importance of systematically addressing motivation, self-esteem, and affective factors when designing cognition-enhancing interventions; (5) the need to develop individualized treatments; and (6) the need to address abnormalities in the experience of the self. Following a brief discussion of the definition of cognitive rehabilitation, each issue will be considered separately. Each section will necessarily be selective, as a comprehensive discussion of any of these issues could easily fill a separate review.

What Is Cognitive Rehabilitation?

As Twamley et al. (2003) and Silverstein (2000) have pointed out, cognitive rehabilitation for people with schizophrenia is a heterogeneous category. For the purposes of this review, we are focusing on rehabilitation methods that aim to improve or restore (Twamley et al. 2003) cognitive functioning by targeting specific cognitive processes (e.g., attention, memory, problem-solving skills). These include any technique that directly focuses on improving cognitive functioning, whether through computerized tasks, tasks using other equipment for presenting stimuli, paper-and-pencil tasks, motivational enhancement, or group exercise. They exclude compensatory and environmental adaptation strategies, which may lead to improved functioning but are not intended to improve functioning outside of the environmental contexts that are changed. Cognitive-behavioral therapies and other forms of milieu, group, and individual therapy are also excluded. Nevertheless, it is recognized that these treatments may affect cognition and that research is necessary to determine whether cognitive rehabilitation produces effects that are greater than, or that add to, those of these other psychological treatments.

Is Cognitive Recovery Possible in Schizophrenia?

An assumption underlying all cognitive rehabilitation efforts is that cognition can be improved in people with schizophrenia. This assumption is in direct contrast to older beliefs that schizophrenia is a disorder involving cognitive deterioration. It has also been established in well-designed studies that, at least outside of a rehabilitation context, many cognitive deficits in schizophrenia are stable over time (Spaulding et al. 1994; Addington and Addington 1998, 2002). In this section, we briefly review evidence that cognitive recovery is possible. Such evidence provides the context from within which studies of cognitive rehabilitation must demonstrate independent/additive or interactive effects, if cognitive rehabilitation is to be seen as worth the expense in time and resources.

Medication Effects. Early comprehensive reviews of the effects of second generation antipsychotic medications on cognition (e.g., Meltzer and McGurk 1999) demonstrated positive outcomes in a number of domains. However, there were also negative findings in close to 40 percent of the studies reviewed. A more recent review (Harvey and Keefe 2001) found effect sizes (Cohen’s $d$, weighted based on $n$'s over 20 studies) ranging from 0.13 for immediate memory to 0.42 in verbal fluency. While compelling, data showing the positive effects of any of the newer medications must be viewed cautiously because of design flaws in many of the studies (e.g., low doses of new drugs being compared with higher than normal doses of first generation drugs such as haloperidol) and because of the difficulty in identifying true cognition-enhancing effects, rather than recovery of function due to elimination of cognition-interfering side effects (e.g., sedation, akathisia, rigidity) of older drugs (Harvey and Keefe 2001; Carpenter and Gold 2002).

Recent evidence points to the conclusion that newly developed drugs, or older ones being used for the first time for schizophrenia, may enhance cognition more than the earlier second generation antipsychotic medications. For example, moderate to large effect sizes have been reported for the cognition-enhancing properties of drugs such as tandospirone (a 5-HT1A agonist) (Sumiyoshi et al. 2001), mianserin (a 5-HT2A antagonist) (Poyurovsky et al. 2003), quetiapine (Velligan et al. 2003), and CX516 (an ampakine) when added to clozapine (Goff et al. 2001). Again, because of small sample sizes, only tentative conclusions can be drawn about the effects of these medications. However, when results are taken together, a notable trend toward cognitive recovery is evident.

Still, a major problem with cognitive studies of medication is that improvements in adaptive functioning (maybe a true sign of cognitive recovery) have yet to be demonstrated. For example, a recent study documenting the cognition-enhancing effects of quetiapine (and reporting large effect sizes) did not find any significant effects on adaptive functioning, even after 6 months of treatment (Velligan et al. 2003). Bellack et al. (2004) found that neither clozapine nor risperidone improved social role functioning or social cognition in patients whose symptoms were improved by these medications. To date there is little convincing evidence that adaptive functioning improvements follow medication-related improvements on cognitive tests or that they occur at all in the absence of psychosocial rehabilitation (e.g., Mojtabai et al. 1998; Wahlbeck et al. 1999; Keefe et al. 2003).
Effects of Structured Psychosocial Treatment. In contrast to the large number of studies examining the cognition-enhancing effects of medication or cognitive rehabilitation (see below), little attention has been given to the potential for psychosocial treatment to improve cognitive functioning, even though evidence suggests that it occurs. For example, Spaulding et al. (1999b) conducted a 5-year controlled study comparing Brenner et al.’s (1994) integrated psychological therapy (IPT) with supportive therapy, both conducted within the context of an intensive behavioral rehabilitation program. In this study, the IPT group demonstrated significantly more cognitive improvement on only 2 of 13 variables. Of interest, within-group paired t tests indicated that the control group improved significantly on 4 of the 13 tests, while the IPT group improved on 6 of 13 tests. One conclusion that can be drawn from these data is that the structured milieu program had greater effects on cognition than did IPT, which had a small additive effect on only two cognitive measures. Further support for this conclusion comes from an earlier study of milieu effects on cognition done by the Spaulding group (Spaulding 1993), prior to the implementation of the behavioral milieu. At that time, with less structure in the program environment, no significant cognitive changes were observed in patients over time.

Further evidence for the cognition-enhancing effects of a structured ward milieu comes from a seminal 6-year study by Paul and Lentz (1977) that established the superior effectiveness of an intensive inpatient, social learning–based behavioral rehabilitation program over therapeutic community and long-term psychiatric treatment-as-usual milieus. In addition to demonstrating significantly higher discharge rates and lower medication use in the social learning program group, they demonstrated, on a combined index of adaptive, social, cognitive, and instrumental functioning, a greater than 1200 percent increase for the social learning group, compared with entry-level scores, and a 10-fold increase over the gains demonstrated on the therapeutic community unit (Glynn and Mueser 1986). It is interesting to note that the gains from the latter program, while overshadowed by those of the social learning unit, were nevertheless comparable with those from some cognitive rehabilitation studies (and greater than some as well). The treatment-as-usual program was associated with little or no functional improvement.

Similar positive effects on cognition from participating in structured psychiatric rehabilitation programs in the absence of specific cognitive rehabilitation efforts have also been reported in the outpatient literature. For example, Fiszdon et al. (2003) examined verbal memory skills at 3-month intervals for 1 year among schizophrenia patients participating in a structured day treatment program after hospital discharge. For male patients, there was consistent improvement from discharge to 1-year postdischarge, with a near-linear trend over the course of the year. For female patients, this improvement was not observed. However, they were basically “recovered” at baseline, where female patients’ performance was approximately 70 percent better than that of male patients, and female patients’ performance remained higher at all time points, even with the consistent improvement among males.

Environmental Effects. Large improvements in cognitive functioning have also been found among stable outpatients as a function of residential setting. Seidman et al. (2003) studied 91 persons with serious and persistent mental illness who were moved from homeless shelters and then randomly assigned to either group homes or independent apartments. Neuropsychological functioning improved across the entire sample. Of interest, executive functioning, as measured by the Wisconsin Card Sorting Test (WCST), decreased significantly among people moved into independent apartments and increased, although not significantly, among people assigned to group homes. Seidman et al. (2003) interpreted these results as indicating that the structure and stability of permanent housing improves cognitive functioning in general among seriously mentally ill people and that executive functioning is affected by the amount of structure in the environment, such that living alone can actually worsen it. These results extend earlier findings that living in an impoverished environment (e.g., prison) is associated with deterioration in basic cognitive functions (Silverman et al. 1966). The implications of such studies are that cognitive ability is affected by many factors, including environmental and treatment setting factors that are typically ignored, not accounted for in interpretations of other study data, or at least not fully made use of, in the cognitive treatment of schizophrenia.

Taken together, the results of the studies reviewed in this section indicate that there can be considerable improvement in cognitive functioning without specific cognitive rehabilitation interventions. This has been found among both outpatients and inpatients and both psychiatrically stable patients and stabilizing patients. One lesson here is that psychiatric rehabilitation techniques with demonstrated effectiveness should be more widely used, as these can improve basic living skills as well as cognitive functioning (Spaulding et al. 1999b). An added caveat is that cognitive rehabilitation, when used, should be part of an intensive, structured, and comprehensive rehabilitation program. Isolated efforts outside of an intensive behavioral rehabilitation context are likely to produce minimal effects at best, as has been previously demon-
Effects of Cognitive Rehabilitation. The evidence presented above suggests that cognitive functioning can be improved in schizophrenia. But does cognitive rehabilitation significantly add to the effects of medications, structured psychosocial programming, or healthy environments in terms of improving cognitive abilities in schizophrenia patients?

Pilling et al. (2002), in a meta-analysis of studies of cognitive rehabilitation of schizophrenia, found no positive effects. While this review did not include all available studies, more inclusive reviews have come to similar conclusions. Suslow et al.'s (2001) meta-analysis \((n = 9\) studies) concluded that only two of nine investigations showed clear positive results, and both of these had small effect sizes \((d's)\). Suslow et al.'s review also found that there was no improvement on 19 of 35 outcome variables and improvement for both (rehabilitation and control) groups on 6 of 35 variables. Of importance, they found that improvement associated with cognitive rehabilitation was demonstrated on measures with low processing loads and simple structure (e.g., nondegraded continuous performance test, simple reaction time, Trail Making Test). There was typically no gain on more demanding measures (e.g., degraded-stimulus continuous performance test).

A more positive review was published by Kurtz et al. (2001a). That review found a mean \(d\) of 0.96 for studies of training in the WCST. This is a very specific training protocol, however, and essentially represents training on a specific test or problem-solving strategy. It is far from demonstrating the more general effects on cognition, let alone real-world behavior, which are the goals of most forms of cognitive rehabilitation. Moreover, to date, analogues studies of training on specific tests such as the WCST have demonstrated either no generalizability (Bellack et al. 1996) or generalizability to only similar tests (e.g., Halstead Category Test) (Bellack et al. 2001). Kurtz et al. (2001a) also reviewed effects of cognitive treatment on attention and found more mixed results, with some negative findings and no large positive effect sizes.

The most comprehensive review of the cognitive rehabilitation literature in schizophrenia is that of Twamley et al. (2003). They reviewed 17 randomized controlled trials and concluded that the overall effect is significant, within the small-to-moderate range. This review was noteworthy for its methodological critiques of the evidence base and noted a number of pitfalls that limit the confidence that can be invested in prior studies. These included small sample sizes, no control for multiple statistical comparisons (including in the most well-designed studies, where improvement was noted on only 20% to 25% of measures, uncontrolled for joint alpha level), lack of measurement of real-world functioning in the studies, and lack of evidence of cost-effectiveness.

In contrast to most studies of cognitive rehabilitation of schizophrenia, a recent study by Bell et al. (2003) found a large effect size associated with cognitive rehabilitation. A problem with the Bell et al. (2003) study, however, was that the large effect size was reported for one measure only (digits backward), and effect sizes for other cognitive measures were not reported. Moreover, all of the patients in that study were outpatients who were high functioning and motivated enough to attend a vocational rehabilitation program, and so the generalizability of those results to more impaired patients (who typically benefit less from cognitive training [Michel et al. 1998]) is unknown. Despite these cautions, the Bell et al. study demonstrates that significant cognitive improvement can occur in schizophrenia, beyond the cognitive effects of taking medication and attending a structured treatment (vocational) program. Finding methods to make such effects the rule rather than the exception is a major challenge facing the field. In the following sections, we review conceptual and methodological issues that we believe must be addressed for such progress to occur.

Finally, the durability of gains from cognitive rehabilitation has not been convincingly demonstrated. It has also rarely been investigated. In a recent 6-month follow-up study of this issue, Wykes et al. (2003) found loss of gains on the WCST and Tower of Hanoi, and no differences between the control and rehabilitation groups for cognitive flexibility and planning composite scores. While positive effects were found for digit span and memory, this represented a minority of the measures used. Bell et al. (2003), in the study noted above that observed large effect sizes for working memory improvement, found that the effect at 6 months posttreatment represented a small effect size \((0.3)\) relative to pretreatment performance, among less severely impaired patients. For more severely impaired patients, the posttreatment followup effect reflected a moderate effect size \((0.5)\). Because the Bell et al. (2003) and Wykes et al. (2003) studies are the only controlled studies that have looked at durability of treatment, more research is clearly needed here. As no treatment for schizophrenia has been demonstrated to work once withdrawn (including medication), however, it is important to recognize that the ultimate effects of cognitive rehabilitation should not be judged by what happens when the treatment is no longer offered. On the other hand, it remains to be seen whether declining contact intervention, or "booster sessions," as have been found...
effective in other forms of skills training, can maintain the gains made in the full treatment, or whether some type of continued full intervention is necessary to maintain gains.

Importance of Stimulus and Context Structure in Cognition-Enhancing Interventions

Far more attention has been paid to designing cognitive exercises to improve specific cognitive functions than to the overall learning environment within which cognitive and/or behavior change takes place. Both laboratory and real-world treatment data exist, however, that suggest that stimulus presentation and environmental structure/design have a large impact on cognitive functioning. For example, schizophrenia patients’ impairments in perceptual organization (Silverstein et al. 1996a, 1998a; Silverstein 2000) can be eliminated by structuring the presentation of stimuli to facilitate consistent stimulus-response mapping and the use of top-down strategies during task performance (Silverstein et al. 1996a, Study 2). A more recent study (Silverstein et al., in press) compared the effects of performing a task with trials presented in increasing order of difficulty to the effects of performing a task with trials presented in a random order. Among nonpatients, when the random order was experienced first, the subsequent re-taking of the test in sequential order led to significant improvements in performance. Among the schizophrenia group, however, this ability to benefit from the sequential order was not observed. When the sequential order was presented first, however, schizophrenia patients performed like controls in both conditions. This highlights the importance of beginning tasks with obvious task structure for patients and the potentially disruptive effects of not doing so (i.e., for patients only, benefit from later structure seemed to be prevented because of initial lack of structure). Evidence for the importance of structure can be found from areas of cognition other than visual and auditory perceptual organization. For example, Cromwell (1975) described a study in which the reaction time crossover effect in schizophrenia was eliminated by training patients in high-level task-relevant skills (e.g., time estimation) to facilitate adaptive top-down input. There is also evidence that the abstract thinking abilities of schizophrenic patients can improve with task structuring. Blaufarb (1962) presented chronic schizophrenia patients and nonpatient controls with either single proverbs or sets of three proverbs in which all three had the same meaning (e.g., “strike while the iron is hot,” “grab with a quick hand the fruit that passes,” and “hoist your sail when the wind is fair”) (Chapman and Chapman 1973). Patients performed worse than controls on the test of the single proverbs but scored similarly to controls on the test of the sets of proverbs. This result was later replicated by Hamlin et al. (1965), who found that both “open-ward schizophrenics” (but not “closed-ward schizophrenics”) and patients in remission performed significantly better with the sets of proverbs compared with single presentations. The fact that a significant amount of performance variance in these studies was explained by the manner of stimulus presentation indicates that performance is negatively affected by context processing deficits, as has been hypothesized (Cohen and Servan-Schreiber 1992; Phillips and Silverstein 2003). The data also suggest, however, that performance can be optimized by systematically strengthening contextual input in order to maximize the likelihood of patients’ recruiting task-relevant cognitive operations. An ultimate goal of any such treatment would be to train patients to, on their own, strengthen their processing of contextual cues during task performance.

A study of abstract reasoning in schizophrenia (Nahor and Vannicelli 1976) found that schizophrenia patients demonstrated abnormal performance on the Gorham Proverbs Test when the instructional set required more personal involvement in the generation of the responses but demonstrated more normal performance when the instructions required less personal involvement. This is further evidence that task conditions can significantly affect cognitive task performance in schizophrenia and that these conditions extend beyond task structure into task-related affective factors (to be considered more fully in a later section). These data also suggest that it would be useful to provide training in affect-monitoring strategies as part of cognitive rehabilitation for schizophrenia.

The improvements in functions such as perceptual organization, reaction time, and abstract thinking, which occur with task structuring, parallel the reductions in behavioral disorganization that occur as the result of environmental structuring. Perhaps the strongest environmental modification, in terms of the provision of structure, that has been studied is the social learning program developed by Paul and Lentz (Paul and Lentz 1977; Menditto et al. 1996) (mentioned in the previous section because of its cognition-enhancing effects). This program also led to a 60 percent decrease in bizarre/disorganized behavior. It is important to note that these effects were interpreted as restorative changes and not compensatory or environmental changes only, because of the high rate of maintenance of the behavior changes even after hospital discharge.

The evidence reviewed above suggests that multiple forms of disorganization (e.g., in perception, language, behavior) improve via the use of stimulus and task structure. This could be expected given evidence that (1) normal organization of perceptual, memory, language, and motor activity has been linked to the operation of a com-
mon binding mechanism involving contextual coordi-
nation (Glezer 1985; Chechile et al. 1996; Phillips and
Singer 1997; Stoet and Hommel 1999; Jarrold et al.
2000); and (2) multiple forms of disorganization in schiz-
ophrenia, including perceptual, linguistic, motor, and
behavioral, have been found to be significantly correlated
and have been theoretically linked to a dysfunction of this
hypothesized algorithm and its neural basis in NMDA
receptor functioning (Silverstein et al. 1998a, 2000;
Silverstein 2000; Phillips and Silverstein 2003; Silverstein
and Phillips 2003; see also Carr and Wale 1986 and
Bressler 2003 for similar views). This implies that a
greater focus on using task and environmental manipu-
lations to increase structure, decrease disorganization, and
optimize performance is necessary in future treatment.
Teaching patients to structure their perceptions of
task/environmental demands and to monitor affect during
performance may also be an important goal.

Need To Base Cognitive Rehabilitation
of Schizophrenia on Cognitive
Neuroscience as Opposed to
Neuropsychology

Strauss and Summerfelt (1994) and Keefe (1995) pointed
out the shortcomings of the neuropsychological approach
for increasing our understanding of schizophrenia. A
major issue is that neuropsychology, which developed by
studying patients with well-defined brain lesions, makes
inferences about the links between these known lesions
and changes in behavior. In this paradigm, such inferences
are valid. Schizophrenia, however, is likely to result from
multiple disease processes affecting multiple brain
regions and their ability to interact and is likely to be neu-
rodevelopmental in origin. This makes it invalid and mis-
leading to assume localized brain pathology from
observed behavior because test scores are not likely to be
reliable indicators of brain pathology.

Another problem with grounding cognitive rehabilita-
tion of schizophrenia within clinical neuropsychology is
that test scores from patients typically cannot differentiate
a specific cognitive deficit from other factors that could
cause poor performance (e.g., poor motivation, sedation,
akathisia). While profile analysis of multiple scores can be
useful in this regard, it still does not ensure that single
processes can be isolated from among other influences on
test performance on any single test and it is still vulnera-
table to psychometric artifacts involving differences in re-
liability and difficulty between the tests. Moreover, this
approach is rarely used in assessment or retraining. In the
past few years, greater attention has been paid to this
problem. For example, evidence has accumulated that
poor WCST performance in schizophrenia may reflect a
generalized intellectual deficit (Dieci et al. 1997; Laws
1999). Recent work also indicates that impaired theory of
mind ability in schizophrenia might be secondary to other
cognitive deficits (Brüne 2003) and that up to two-thirds
of the variance in memory deficits found in schizophrenia
can be explained by the anticholinergic effects of antipsy-
chotic medication (Minzenberg et al. 2004). The obvious
implication of such studies is that, unlike in cases of tra-
matic brain injury, where a deficit can be reasonably
inferred to be the result of focal brain dysfunction, infer-
ences about isolated cognitive, or structural, pathology in
schizophrenia should not be made from test scores alone.
While suggestions have been proposed to remedy this
problem (Knight and Silverstein 2001; MacDonald and
Carter 2002), process-specific assessment strategies have
yet to be incorporated into treatment planning or outcome
evaluations in cognitive rehabilitation for schizophrenia.

The relevance of this problem for treatment is that (1)
using neuropsychological test scores as the basis for
designing a cognitive rehabilitation program for a schizo-
phrenia patient may lead to false assumptions and to the
use of "therapeutic" exercises that are not addressing the
primary contributors to abnormal cognitive functioning
(e.g., poor motivation, other cognitive deficits); and (2)
any improvement demonstrated on such tests after cog-
nitive rehabilitation may be due to multiple factors that fall
outside of the conceptual framework of the treatment (see
section on motivation below).

We have argued elsewhere (Phillips and Silverstein
2003) that basing cognitive psychiatric concepts too
closely on cognitive neuropsychology neglects informa-
tion from psychopharmacology and cognitive neuro-
science. For this reason, and because of the shortcomings
of neuropsychology for understanding schizophrenia
(noted above), we suggest that the field of cognitive reha-
bilitation of schizophrenia would benefit from a reground-
ing in the fields of cognitive psychology and neuro-
science. A number of strong theories of schizophrenia
have now been proposed from within the cognitive neuro-
science perspective (e.g., Gray et al. 1991; Cohen and
Servan-Schreiber 1992; Friston 1998; Braver et al. 1999;
Bressler 2003; Phillips and Silverstein 2003). These
views, however, have had minimal, if any, impact on the
field of cognitive rehabilitation of schizophrenia.

Related to this is the need to move away from focusing
rehabilitation efforts on isolated cognitive processes and
toward efforts to integrate cognitive activity. Several
theories of brain and cognitive functioning view cognition
as involving interactive activity between domains of pro-
cessing (Edelman 1992; Fuster 2002), and top-down
effects on basic aspects of perception and cognition are
well known (e.g., Gilbert et al. 2000; Beck and Palmer

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memory performance in schizophrenia has been improved increasing the affective salience of the task. Working nia? One method that has been successful involves hypothesized cognitive-motivational deficit in schizophrenia. This was supported experimentally by Sonntag et al. (2003), who demonstrated impaired strategic control of the contents of conscious awareness, and by Danion et al. (2001a), who found intact implicit learning but impaired explicit learning in schizophrenia. These data were interpreted as indicating that it is not memory but conscious awareness of cognitive activity (in this case, during encoding and recall) that is abnormal, leading to poor performance. Such conclusions apply even to higher level tasks such as those involving theory of mind. For example, Brüne (2003) reported that schizophrenia patients’ impairments on a theory of mind task were not due to a true failure to infer the mental state of others, as is found in autism. Rather, the problem in schizophrenia appeared to be one of knowing how and when to apply strategic social reasoning. These data are consistent with Spaulding et al.’s (1999a) suggestion that recovery of cognitive function in schizophrenia involves the ability to recruit the cognitive functions necessary for a particular task, as opposed to improvements in specific basic processes. We suggest that it would be worthwhile, therefore, to focus on the development of metacognitive techniques to promote the recruitment of context-appropriate cognitive strategies.

Need To Address Motivation, Self-Esteem, and Affective Factors

Cognitive activity is intimately related to affect and motivation. The adequacy of functions such as attention and memory in any given situation is linked to the person’s affective state and level of motivation for performing the task at hand. This was noted long ago by Kraepelin (1919), who wrote that lack of motivation “is without doubt clearly related to the disorder of attention which we very frequently find conspicuously developed in our patients. It is quite common for them to lose both the inclination and ability on their own initiative to keep their attention fixed for any length of time” (pp. 5–6).

What methods might be useful for overcoming this hypothesized cognitive-motivational deficit in schizophrenia? One method that has been successful involves increasing the affective salience of the task. Working memory performance in schizophrenia has been improved using this method. Park et al. (2000) tested schizophrenia patients using a spatial working memory (SWM) task (spatial delayed response test) that had been used in prior studies to demonstrate a SWM deficit and that purportedly taps dorsolateral prefrontal cortex (DLPFC) functioning. Schizophrenia patients performed better when the targets were pictures of faces compared with when they were black dots. The SWM deficit was also reduced when positive feedback was given during the testing session (Park et al. 2003). Finally, they found that the SWM deficit could be reduced by introducing direct social interaction prior to having the patient complete the task (Park et al. 2003). Of interest, the converse of these findings has also been noted: that cognitive functioning in schizophrenia patients worsens with negative affect (Docherty et al. 1996). All of this suggests that the cognitive abilities of schizophrenia patients vary as a function of the level and type of affective input in the task situation and that it would be worthwhile when designing cognitive treatment to determine the level and type of affective input needed for each patient to perform optimally, in addition to teaching affect regulation strategies to enhance performance.

Other methods to more strongly link affect, motivation, and attention in schizophrenia involve increasing the strength of reinforcers. This can also be viewed as a form of increasing the affective salience of a task. Evidence consistently indicates that using monetary rewards and other powerful secondary reinforcers can improve the performance of schizophrenia patients on cognitive tasks, including those that are linked to DLPFC dysfunction and those that have been considered vulnerability markers of the illness (Rosenbaum et al. 1957; Karras 1962, 1968; Wagner 1968; Meiselman 1973; Summerfelt et al. 1991; Kern et al. 1995; but see also Green et al. 1992 and Hellman et al. 1998 regarding WCST improvements). Reinforcement procedures have also been effective in increasing attentiveness during social interactions (e.g., Wallace and Boone 1984; Massel et al. 1991).

In addition, published reports on attention shaping (Spaulding et al. 1986; Menditto et al. 1991; Silverstein et al. 1998b, 1999; Bellus et al. 1999) have demonstrated dramatic improvements in attention span by consistently pairing primary or secondary reinforcers with the behavioral response of attentive and participatory behavior, even among so-called treatment-refractory state-hospital schizophrenia patients (reviewed in Silverstein 2000; Silverstein et al. 2001). These procedures are also effective with outpatients in community settings (Skinner et al. 2000). Moreover, while more evidence is needed on this issue, preliminary data suggest that the gains are maintained after shaping procedures are withdrawn (Menditto et al. 1991), possibly because of increases in self-efficacy (see below) and greater social reinforcement for the new behaviors.
In addition to external reinforcers, it is possible that duration of attention to a task could be increased by the use of intrinsic reinforcers. One such intrinsic reinforcer is increased self-efficacy. It is known that people with schizophrenia and schizoaffective disorder have lowered self-esteem (McDermott 1995). Many schizophrenia patients who need cognitive rehabilitation have been treatment-refractory and have had multiple hospitalizations; thus, they can be considered to be in a state of "self-efficacy deprivation." Linking behavior change to increased self-efficacy could thus make such an increase a powerful reinforcer. Bandura et al. (1977) suggested that self-efficacy could be enhanced in therapy by providing opportunities for mastery or success and offering incentives for achievement. The attention-shaping approach we have used meets these requirements. In particular, the successive approximation approach inherent to shaping provides opportunities for mastery and success, and the use of differential reinforcement provides incentives for achievements that are likely to be met. Errorless learning approaches (O'Carroll et al. 1999; Kern et al. 2003) also can be viewed as promoting self-efficacy; evidence indicates that this is another effective approach to improving cognitive functioning in schizophrenia. While direct efforts to improve self-efficacy have not yet been attempted in cognitive rehabilitation, they have been reported to mediate gains in medication and symptom management programs in schizophrenia (Shon and Park 2002).

An underappreciated issue is the need for cognitive rehabilitation exercises to be intrinsically reinforcing. Intrinsic reinforcers are especially important for higher functioning patients who do not need extrinsic reinforcement to engage in a task. Medalia and colleagues (Medalia and Revheim 1999; Medalia et al. 2000, 2001, 2002) are the only group to have focused on the importance of using training tasks that include enjoyable features and have reported positive effects using this strategy. Taken together, all of these data suggest that (1) when working with people with schizophrenia, it is critical to enhance motivation, as this is intimately linked to attention, task engagement, and performance; (2) motivation is likely to be enhanced by using powerful reinforcers; and (3) these are likely to include primary and secondary reinforcers as well as intrinsic reinforcers involving both task enjoyment and self-efficacy.

Need To Develop Individualized Interventions

Schizophrenia is a heterogeneous condition in many respects, including cognition. No single deficit has been found to exist in all patients, and patients differ widely in the number, type, and severity levels of their cognitive deficits (Silverstein 2000; Heinrichs 2001). To date, however, little effort has been invested in developing interventions for specific profiles or severity levels of cognitive impairment.

An additional issue is that cognitive impairment in schizophrenia can be a primary illness manifestation or a secondary consequence of having prominent positive symptoms. For example, patients with frequent auditory hallucinations can have difficulty with sustained and selective attention (Cornblatt et al. 1985), but this can result from the distracting effects of the voices and should not be assumed to be a core symptom of their illness (Spaulding et al. 1986). There is currently no standardized form of cognitive rehabilitation that specifically addresses the effects of severe symptoms on cognitive functioning. Rather, when patients like this have been helped it has been through the development of interventions tailored to their cognitive difficulties. For example, Spaulding et al. (1986) and Hatashita-Wong and Silverstein (2003) demonstrated that dichotic listening tasks (typically used to demonstrate selective attention impairments) can be used as a training tool to help patients learn to disattend to irrelevant information, leading to improvements in functioning, including a better ability to ignore highly distracting auditory hallucinations.

In short, both because most existing cognitive rehabilitation interventions have demonstrated, at best, small to moderate effects, and because many patients have difficulties that are not addressed by existing interventions, more work is needed to match interventions to patients' needs. This will require the use of better assessments of cognitive impairments and the conditions under which these impairments occur, and a willingness to choose/develop interventions based on these assessments, as opposed to relying solely on standardized cognitive rehabilitation interventions.

Need To Address Self-Awareness Issues in Cognitive Rehabilitation

The focus of cognitive rehabilitation efforts in schizophrenia is typically the cognitive deficits themselves and not the experience of the person struggling with the deficits. Sass (1992), Sass and Parnas (2003), Minkowski (1927), Blankenburg (1971), Kimura (1992), and other phenomenologically oriented writers, however, view core problems in schizophrenia as including a disturbance in the feeling of being the agent of one's own actions. Statements exemplifying this abnormality include "It is as if I watched from somewhere outside the whole bustle of the world"
and "If I am going to sit down, for example, I have got to think of myself and almost see myself sitting down before I do it. It's the same with other things like washing, eating, and even dressing—things that I have done at one time without even bothering or thinking about at all" (McGhie and Chapman 1961, pp. 107–108). Hemsley (1998) proposed that these types of disturbances in the sense of self are related to impaired cognition. Clearly, patients with this sort of disturbance are not approaching cognitive tasks or life demands with a mindset that is conducive to peak performance. This highlights the issue that performance level is not solely a function of degree of cognitive skill or level of motivation. To date, however, cognitive interventions have not addressed how to help people with these experiences improve their ability to interact adaptively with their environments.

Several researchers have attempted to empirically examine the cognitive mechanisms operative in phenomenological disturbances in schizophrenia. Studies have demonstrated that many patients are impaired in subjectively assessing the correctness of their knowledge and that their behavior is less determined by subjective experience than nonpatients’ behavior (although performance improvement by incentives still occurs) (Danion et al. 2001b). Schizophrenia patients’ impaired episodic memory has been attributed to deficient binding of self-awareness with sensory input during encoding (Danion et al. 1999), and impaired learning has been related to disturbances in conscious awareness of cognitive activity during encoding and recall (Danion et al. 2001a). Frith (1995) suggested that self-awareness during task performance is reduced in schizophrenia.

While the remediation of these problems is not part of the mainstream of cognitive rehabilitation efforts, there are reports that point to possible developments. For example, Schneider et al. (1992) demonstrated successful operant conditioning (via use of monetary feedback) of slow cortical potentials, reflecting the self-regulation of attentional resources and activity in cortical neuronal networks, by 20 training sessions, in schizophrenia. This was later replicated and recommended as a therapeutic technique by Gruzelier (2000). On a purely behavioral level, Perry et al. (2001) found WCST performance could be improved by asking schizophrenia patients to verbalize their sorting strategy during the task. These reports indicate that it is possible to train people with schizophrenia to develop an ability to recruit cognitive and behavioral strategies to improve adaptive functioning, and that biofeedback, and potentially other devices capable of delivering real-time feedback, can be useful complements to the practice-, structure-, and affect/motivation-based procedures described earlier.

Conclusions

The development of cognitive rehabilitation interventions for schizophrenia reflects a growing recognition that cognitive recovery is possible. At the same time, there is little evidence for the effectiveness of existing interventions that goes beyond the demonstration of small effect sizes, let alone for cognitive rehabilitation’s durability or generalizability. We argued that in order for the field to advance, cognitive interventions for schizophrenia must incorporate a number of other features, including (1) a focus on stimulus, task, and environmental structure during training; (2) a theory base in cognitive neuroscience as opposed to neuropsychology, and a focus on strengthening metacognitive skills and integrative cognitive activity, as opposed to focusing only on basic processes; (3) a systematic focus on motivational and affective factors during training; (4) the development of individualized interventions; and (5) a focus on strengthening links between self-awareness and stimulus encoding. It must also be recognized that significant cognitive recovery in schizophrenia can occur through the use of structured interventions, and living and treatment environments in general, and possibly through medication. Therefore, a focus on maximizing cognitive recovery through whatever means (or combination thereof) are possible should replace a focus on single interventions in future research and practice. Paradoxically, in moving ahead in these ways, the future of cognitive rehabilitation of schizophrenia will be making use of insights that date back to Kraepelin but that have yet to be used for systematically promoting cognitive change.

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The Authors

Steven M. Silverstein, Ph.D., is Associate Professor of Psychiatry, and Sandra M. Wilkniss, Ph.D., is Assistant Professor of Psychiatry, Department of Psychiatry, University of Illinois at Chicago, Chicago, IL.