

Patients with severe mental illness can benefit from cognitive remediation training

CRT leads to significant improvement at a Texas hospital

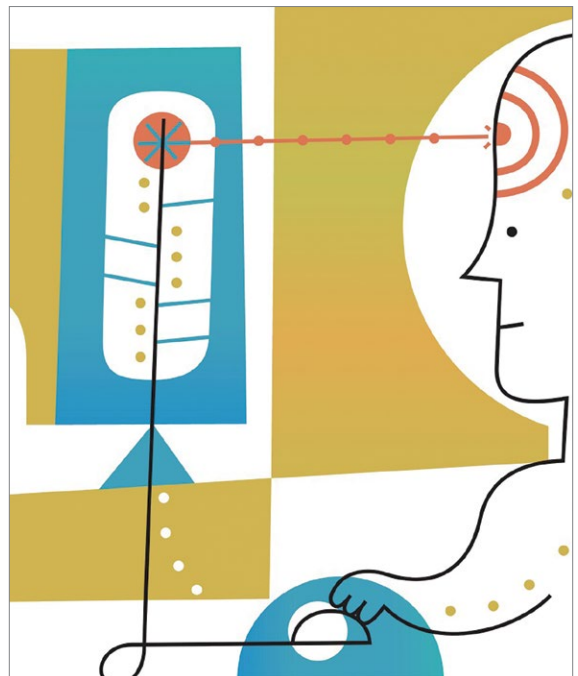
Cognitive impairment seen in severely mentally ill people is well documented, and has been shown to affect as many as 98% of patients with schizophrenia.¹ At this time, there are no FDA-approved medications for treating this cognitive impairment.²

Rusk State Hospital in Rusk, Texas, decided to put greater emphasis on improving cognitive impairment because of an increase in patients with a forensic commitment, either because of (1) not guilty by reason of insanity and (2) restoration of competency to stand trial, which typically require longer lengths of stay. Some of these patients experienced psychotic breaks while earning a college education, and one patient was a member of MENSA (an organization for people with a high IQ) before he became ill. Established programs were not adequate to address cognitive impairment.

How we developed and launched our program

Cognitive remediation is a new focus of psychiatry and is in its infancy; programs include cognitive remediation training (CRT) and cognitive enhancement therapy (CET) (*Box, page 40*³⁻⁹). CRT focuses more on practice and rote learning and CET is more inclusive, including aspects such as social skills training. These terms are interchangeable for programs designed to improve cognition. Because there is no standardized model, programs differ in content, length, use of computers vs manuals, social skills training, mentoring, and other modalities.

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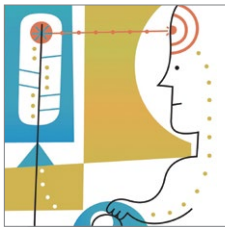
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Disclosures

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Cognitive remediation therapy

Clinical Point

We could not find a program that could be adapted to our setting; therefore we developed our own



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Box

What is cognitive remediation training?

Cognitive remediation training (CRT) for severe mental illness is “a behavior training based intervention that aims to improve cognitive process (attention, memory, executive function, social cognition, or metacognition) with the goal of durability and generalization.”³ CRT produces moderate improvements in cognitive performance; when combined with psychiatric rehabilitation, the intervention also improves functional outcomes, such as work, social skills, and self-care. Fundamental elements of cognitive remediation are the concepts that there is plasticity in the brain and that repetitive practice can lead to sustained cognitive improvement.⁴

In animal studies, learning by categories is more effective than rote learning and has been shown to cause brain waves from different parts of the brain to synchronize and “hum,” according to a 2014 study from the Massachusetts Institute of Technology.⁵ Researchers reported that “functional connectivity between the [prefrontal cortex] and [striatum] increased as animals acquired new categories.” This phenomenon is of particular interest because this network has been implicated in several neurologic and

psychiatric conditions, including autism spectrum disorder and schizophrenia.⁵

Cognitive enhancement therapy (CET) was studied in patients with schizophrenia who were in an outpatient program; the goal was to develop memory skills through (1) enhancing categorizing capacity and (2) encouraging an abstracting attitude, cognitive flexibility, and decision-making.⁶ This program used computer training exercises in attention, memory, and problem-solving along with social cognitive group exercises. At 12 months, CET showed significant improvements in processing speed and neurocognition.

The Neuropsychological Educational Approach to Rehabilitation program was developed in 2008 for psychiatric patients in outpatient programs. It provides computerized cognitive remediation and, in some cases, small-group debriefing sessions.^{7,8} This program targets different skills than our CRT program at Rusk State Hospital; with guidance, each participant was allowed to choose which skill to work on at any given time. Significant improvements have been found in attention processing speed and delayed verbal memory.⁹

We could not find a program that could be adapted to our setting because of lack of funding and insufficient patient access to computers. Therefore, we developed our own program to address cognitive impairment in a population of individuals with severe mental illness in a state hospital setting.¹⁰ Our CRT program was designed for inpatient psychiatric patients, both on civil and forensic commitments.

The program includes >500 exercises and addresses several cognitive domains. Adding a facilitator or teacher in a group setting introduces an additional dimension to learning. Criteria to participate in the program included:

- behavior stable enough to participate
- ability to read and write English
- no traumatic brain injury that caused cognitive impairment
- the patient had to want to participate in the training program.

We tested each participant at the beginning and end of the 12-week training program, which consisted of 2 one-hour classes a week, with a target group size of 6 to 10 participants. As a rating tool, we used the

Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), which has been shown to be an efficient approach to screening for cognitive impairment across several domains.¹¹

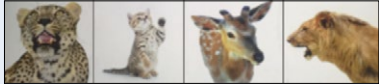
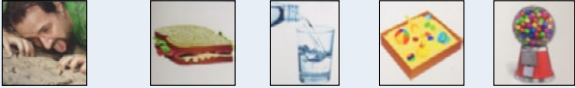

We offered 2 levels of training: basic and advanced. Referral was based on the patient’s level of education and current cognitive function. Materials for the advanced group were at a high school or college level; the basic group used materials that were elementary school or mid-high school in scope. Assignment to the basic or advanced training was based on the recovery team’s or psychologist’s recommendation. The training was ongoing, meaning that a participant could begin at any time and continue until he (she) had completed the 12-week training program.

The weekly sessions in the CRT program were based on 12 categories (*Table*).¹⁰

1. Picture Puzzles: Part 1, Odd Man Out.

Participants receive a series of 4 pictures and are asked to select the 1 that does not share a common link with the other 3 items. Targeted skills include pattern

Cognitive remediation training examples

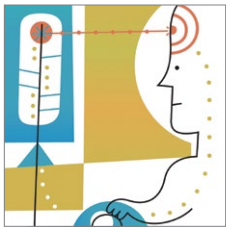
<p>Odd Man Out</p>	 <p>A B C D</p> <p>Answer: C, fawn. The others are all members of the cat family.</p>															
<p>Word Problems</p>	<p>Amy visits 3 stores and has \$30 to spend. At the first store she spends half of her money. She then spends \$5 at store 2 and another \$5 at store 3. How much money does she have left?</p> <p>A \$10 B \$5 C \$15 D \$20</p> <p>Answer: B</p>															
<p>Picture Matching</p>	 <p>A B C D</p> <p>Answer: B</p>															
<p>Verbal Challenge</p>	<p>Word games: Each 6-letter square contains the letters of a word. Both 6-lettered words are objects that are used on paper.</p> <table border="1" data-bbox="908 774 1094 928"> <tr><td>E</td><td>C</td><td></td></tr> <tr><td>L</td><td>P</td><td></td></tr> <tr><td>I</td><td>N</td><td>Y</td></tr> <tr><td></td><td>R</td><td>O</td></tr> <tr><td></td><td>A</td><td>C</td></tr> </table> <p>Answer: pencil, crayon</p>	E	C		L	P		I	N	Y		R	O		A	C
E	C															
L	P															
I	N	Y														
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	A	C														
<p>Mental Arithmetic</p>	<p>Find the combination of coins that equals the designated amount. \$1.65</p> <p>A. 5 pennies 1 nickel 1 dime 2 quarters 2 half dollars B. 0 pennies 4 nickels 0 dimes 4 quarters 1 half dollars C. 0 pennies 2 nickels 1 dime 2 quarters 2 half dollars D. 0 pennies 1 nickel 1 dime 0 quarters 3 half dollars</p> <p>Answers: D</p>															
<p>Visual/spatial</p>	<p>Which is the odd one out?</p>  <p>A B C D</p> <p>Answer: D. The circle does not contain the black dot.</p>															
<p>Speed Training</p>	<p>Complete the following serial subtractions and record your times: Subtract 3 from 20 and continue subtracting 3 until you reach 0 or a negative number. Time _____</p>															
<p>Memory</p>	<p>On the next page, you will see a list of 15 items in a precise order. You will have 10-15 seconds to view the page before closing the book and reproducing the entire list of 15 items in the correct order from memory.</p> <p>A B C 1 2 3 a b c I II III ○ □ △</p>															

Clinical Point

When combined with psychiatric rehabilitation, CRT improves functional outcomes, such as work, social skills, and self-care

recognition, visual learning, reasoning, and creativity (looking for non-obvious answers). This plays a role in global cognition and everyday activities that are sight-related.

2. Word Problems. Participants receive math exercises with significant background information presented as text. Targeted skills include calculation, concentration, and reasoning. This helps with making



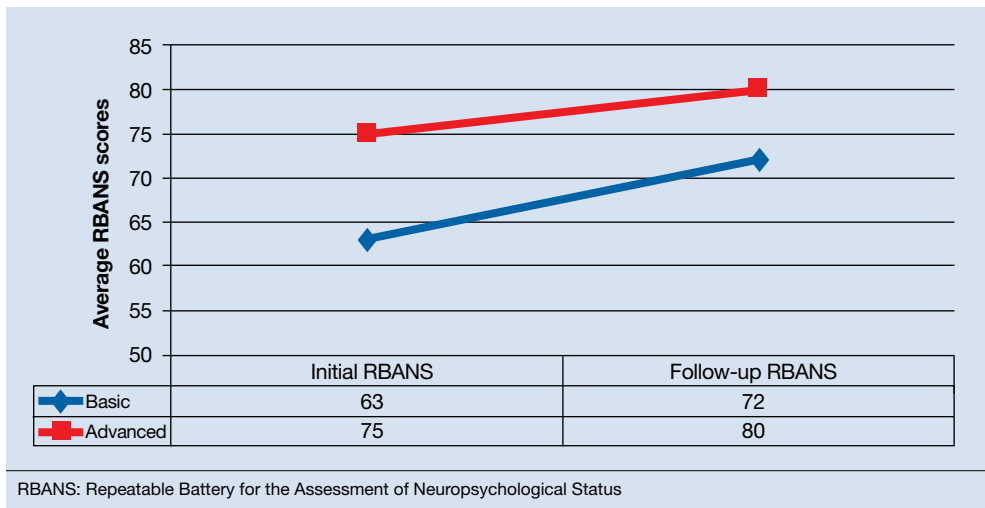
Cognitive remediation therapy

Clinical Point

The training was ongoing; a participant could begin at any time and continue until he had completed the 12-week program

Figure 1

Change in average RBANS score after cognitive remediation therapy



change, figuring out the tip on a bill, balancing a checkbook, and assisting children with homework.

3. Picture Puzzles: Part 2, Matching. Participants view an illustration followed by a series of 4 other pictures, where ≥ 1 of which will have a close relationship to the example. The participant selects the item with the strongest link. Targeted skills include determining patterns, concentration, visual perception, and reasoning.

4. Verbal Challenge. Participants are provided a variety of word-based problems that involve word usage, definitions, games, and puzzles. Targeted skills include vocabulary, reading comprehension, reasoning, concentration, and global cognition.

5. Picture Puzzles: Part 3, Series Completion. Participants receive a sequence of 3 pictures followed by 4 possible solutions. The participant selects the item that completes the series or shares a common bond. Targeted skills include visual perception, picking up on patterns, creativity, reasoning, and concentration.

6. Mental Arithmetic: Part 1, Coin Counting. Participants are presented math problems related to money that can be

solved by simple mental or quick paper calculation. Targeted skills include basic math, speed, concentration, and counting money. This helps with making change and balancing a checkbook.

7. Picture Puzzles: Part 4, Ratio. Participants receive presented analogy questions where the participant has to determine the ratio or proportional relation of the items. Targeted skills include memory, creativity, and decision-making.

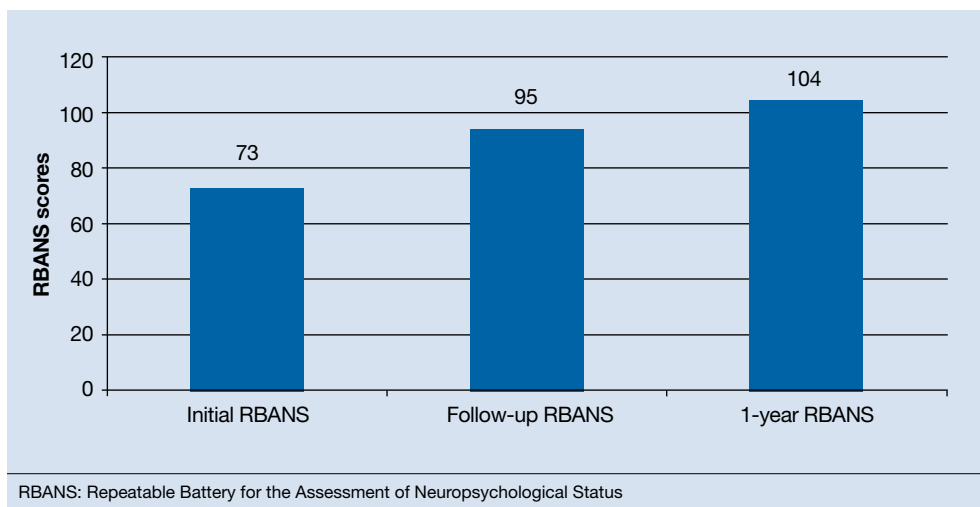
8. Mental Arithmetic: Part 2, Potpourri. Participants receive a hodgepodge of math problems, including number sequences and word problems. Targeted skills include reasoning and computation.

9. Visual/spatial. Participants are presented exercises that require them to think in 3 dimensions and see "hidden" areas behind folds or on the other sides of figures. Targeted skills include spatial perception, reasoning, and decision-making.

10. Reasoning. Participants receive problems that involve taking in information, processing the data, analyzing the options based on previous experiences, and coming up with a decision that is factual and rational. Targeted skills include reasoning and decision-making.

Figure 2

Change in RBANS score in a patient with high pre-morbid functioning



11. Memory Exercise, Listening. Participants are provided a reading selection. After the reading, there is 20-minute waiting period during which the participant is engaged in other exercises before returning to answer questions about the reading. Targeted skills include listening, retention, and memory.

12. Speed Training. Participants receive exercises that provide practice in gathering and processing information and making decisions based on the given information. Targeted skills include decision-making, speed, and concentration.

Preliminary results, optimism about good outcomes

In the past 12 months, 28 participants have completed the CRT program: 11 in the basic training class and 17 in the advanced class. Of those, 7 in the basic program and 11 in the advanced program showed significant improvement as measured by the pre- and post-training RBANS; 64% of the participants improved. The average pre-test score in the basic group was 63 and post-test score was 72 ($t_{10} = 3.148, P < .05$). The average advanced pre-test score in the advanced class was 75 and post-test score was 80 ($t_{16} = 2.476, P < .05$) (Figure 1).

Because this program was developed as a treatment intervention for psychiatric inpa-

tients, not a research study, we did not establish a control group.

In addition to the overall increase in cognitive functioning, individual successes have been noted. One participant who experienced a psychotic break while pursuing a college degree in literature scored 73 on his initial RBANS, indicating moderate impairment. After completing the 12-week program, his RBANS score increased to 95 (Figure 2). One year after completing the CRT program without additional cognitive training, the participant achieved an RBANS score of 104. Since then, the patient has been observed reading the classics in Latin and Greek, as he did before his psychotic break, and has been noted to be making more eye contact and engaging in conversations.

Success also has been noted for participants who did not see an increase in their RBANS scores. One participant historically had shown little interest in any programming or classes, but attended every CRT class, participated, and asked for additional worksheets to take back to the unit. Based on this feedback, each session now includes a worksheet that participants can take back with them.

Further findings of success

Cognitive impairment can be a significant disability in patients with severe mental illness. Longer lengths of stay present an

Clinical Point

Some increase in cognitive functioning was seen with participants who would not or could not complete all 24 classes



Cognitive remediation therapy

Clinical Point

The program engaged patients who previously were uninvolved in activities, and provided a sense of purpose and hope

Related Resources

- O'Reilly K, Donohoe G, O'Sullivan D, et al. Study protocol: a randomised controlled trial of cognitive remediation for a national cohort of forensic mental health patients with schizophrenia or schizoaffective disorder. *BMC Psychiatry*. 2016;16(1):5.
- Amado I. What is cognitive remediation in psychiatric practice and why do we need it? http://www.huffingtonpost.com/isabelle-amado-md-phd/cognitive-remediation_b_3728023.html. Published August 13, 2013.

opportunity to provide a CRT program over 12 weeks. However, some increase in cognitive functioning, as measured by the RBANS, was seen with participants who would not or could not complete all 24 classes. In addition to increased cognitive functioning, clinicians have noted improvements in patients' participation in treatment and self-esteem.

The program engaged patients who previously were uninvolved in activities, and provided a sense of purpose and hope for them. One participant stated that he felt better about himself and had a more optimistic outlook for the future.

This program offers the possibility for participants to clear the mental fog caused by their illness or medication. The exercises stimulate cognitive activity when the goal is not to get the correct answer, but to think about and talk about possible solutions.

CRT, we have found, can greatly increase the quality of life of people with severe mental illness.

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Bottom Line

Cognitive impairment can be significant in people who have a diagnosis of severe mental illness. Cognitive remediation training, which aims to improve cognitive processes, such as attention, memory, executive function, and social cognition, can improve these patients' self-esteem, participation in treatment, and quality of life.