Cognitive Rehabilitation Therapy

The Neuropsychonline Cognitive Rehabilitation Therapy (NCRT) program is the latest edition in the evolution of therapy systems developed by Dr. Odie Bracy and Psychological Software Service dating back to 1981. This cutting edge of technology program was among the first to be developed to run over the internet.

NCRT therapy is designed to focus primarily on one aspect of an individual's rehabilitation treatment, cognitive skills enhancement. The purpose of NCRT is to help an individual acquire the highest level of cognitive functioning and functional independence possible for that individual. This is best accomplished through treatment programs, provided by a competent therapist, who utilizes retraining strategies, teaching the use of compensatory skills (for areas not amenable to retraining), counseling, environmental restructuring, incorporating the services of educational and vocational training facilities and following up on patients as they go into their next placement, be it work, school or just better living at home. In our opinion NCRT is a vital part of the treatment program. Therapy conducted with NCRT centers around the person's thinking, attention, perception, memory, problem solving and

The Neuropsychonline Cognitive Rehabilitation Therapy (NCRT) program is a cognitive skills enhancement system designed for the rehabilitation of those who have experienced cognitive impairment from brain injury, stroke and other neurologically based anomalies as well as those with attention deficit and learning disabilities. NCRT is designed to develop and enhance cognitive functions across the following domains:

- Attention Skills
- Executive Skills
- Memory Skills
- Visuospatial Skills
- Problem Solving Skills
- Communication Skills

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decision making skills. With hard and dedicated work from the patient, significant improvement in cognitive functioning can be achieved that can lead to significant improvement in daily functioning and meaningful participation in daily life activities.

Although NCRT is used in many inpatient hospitals and facilities, it was primarily designed as an outpatient intervention system. Ideally, NCRT should be set up as a combination clinic and homebased, outpatient, computer assisted rehabilitation program. In our outpatient clinic, the patient is seen at our center for 1 one-hour visit each week. During this intensive, interactive session, we evaluate the patient on all therapy exercises prescribed at the last session, troubleshoot cognitive strategies and performance difficulties, re-evaluate our treatment plan and prescribe the therapy exercise assignments for the upcoming week. We discuss compensation skills, strategy development and deployment, and how all of what is learned in therapy can be used in daily life activities. The patient then performs the therapy exercises at home, on their own computer, for at least 1 to 3 one-hour periods every day between the weekly sessions at the center. During the daily work at home the patient's should be incorporating and practicing the compensation skills and strategies discussed during the face-to-face session. The whole program, as we administer it, typically takes the patient about 9 to 12 months to complete.

NCRT consists of six Tracks of exercises designed to improve the user's cognitive skills. The Tracks are:

1. Attention Skills (12 Tasks)

2. Executive Skills (12 Tasks)

3. Memory Skills (12 Tasks)

4. Visuospatial Skills (12 Tasks)

5. Problem Solving Skills (12 Tasks)

6. Communication Skills (12 Tasks)

The Tasks are arranged in an order so that the most basic of cognitive skills are addressed first in therapy. As the user progresses, the Tasks evolve to become more complex and challenging. In addition, each Task contains four levels of difficulty. More Tasks are being added on a regular basis.

Each Task is set up in a game like format. To do therapy the patient simply plays the game and tries to do the very best they can. We have tried to make the Tasks fun to do so that therapy will be a more enjoyable experience. However, even the Tasks that are not so much fun must be completed in order for the patient's skills to develop properly. If a patient already has some skill in a certain area and they get assigned a Task in that area, they should pass through it fairly rapidly and move on to the next level.

NCRT Cognitive Skills Tracks

Track 1 – The Attention Skills

The attention skills of our brain allow us to focus on one part of what is going on around us while at the same time ignoring, to some degree, other things that are going on at the same time. Attention skills are necessary for us to be able to take information from our senses (like seeing and hearing) and transfer it into our brain for use in thinking, learning, problem solving and memory. We must be able to maintain attention long enough to get all the important information from the events upon which we are focusing. Attention span refers to how long we can maintain this focused attention. If a person has a short attention span then they might not be getting all of the important information.

Even though focusing is important, we must, at the same time, be aware of other things going on, so if something more important than what we are focusing on starts to happen we can be aware of it and shift our focus over to the more important event. This is called attention shifting. Another example of attention shifting would be when we are tracking, for example, two things so that we spend a little time with one and then a little time with the other. Sometimes we must divide our attention and have some degree of focus on more than one thing at the same time. This is call divided attention or multiple simultaneous attention.

Sitting and watching for something to occur is referred to as vigilance. This is a process of maintaining our attention over a period of time while we wait for the something to happen. One way of sharpening our attention skills is to set up a vigilance situation and then train a person to respond quickly when the situation occurs. Feedback about whether the response was quick enough helps to train the person to attend better and respond quicker. Responding, by actually doing something like clicking a mouse button is called an initiation response. Sometimes, however, the best response to a situation would be an inhibitory response — which means responding by doing nothing. Impulsive people are poor at doing this. This type of exercise requires the cooperation of attention and executive skills as initiating and inhibiting are executive skills.

Our Track 1, Attention Skills is designed to provide training in all of these areas, one step at a time. In the beginning we work with focusing and initiation responses. We use the reaction time as a measure of these skills. Later in the series of tasks we start introducing situations that require a decision, initiate (make a response) or inhibit (don't make a response), to sharpen the attention skills and train one to process information quickly but also accurately. Even later in the series, we introduce tasks that require attention shifting, divided and multiple simultaneous attention.

Track 2 – The Executive Skills

The executive skills are so named as they oversee and manage the cognitive functions of the brain. They play a major role in information processing, abstract thinking, problem solving, initiation and inhibition. The executive skills organize, sequence, sort, group, relate, differentiate, combine, separate and many other operations with the data and information taken into the brain through the senses. The executive then uses this information to plan, reason, make decisions and initiate/inhibit responses. Cognitive flexibility is a desirable attribute of executive functioning as it leads to better information processing and hypothesis generation. Difficulty with initiation and inhibition is undesirable as it can interfere with responding or cause one to be impulsive and inappropriate in behavior. The executive skills interplay with the attention skills in determining the target of focus and keeping track during attention shifting and divided attention.

Track 3 – The Memory Skills

Memory refers to the ability to store, retain and recall information, events and procedures. Typically memory functioning is defined in terms of the length of time between the exposure and the recall (i.e. long term, short term and immediate memory). A more formal way of saying

the same thing would be to refer to the three categories as remote, recent and working memory. Within these three general time based categories of memory there are further divisions of memory functioning. Visual (or non-verbal) memory refers to the ability to recall what one sees or experiences in terms of shape, size, location, position, color etc.. Verbal memory refers to the ability to recall information that is encoded in words and includes hearing, reading and any other avenue that involves speech and language. Procedural memory refers to the ability to recall how to do something. A person can have a weakness in one or a combination of these areas.

Working memory (or immediate recall) refers to the memory that we use at the very moment we are doing something such as working a math problem, looking up a phone number or just engaging in a conversation. Working memory requires joint effort from attention and executive skills. These three skills together form the constant "thinking" that we do to function from minute to minute. Information used in working memory is not necessarily stored for recall as recent or remote memory. Working memory information can be, mostly, discarded after a person finishes using it. There is a limit to the capacity of working memory. Research has consistently shown that an average person can hold about seven pieces of information in working memory, plus or minus about two pieces. So, the average person could hold about five to nine pieces of information in working memory for use in problem solving, dialing a phone number, working a math problem etc.. When working memory is reduced to a capacity of five or less items and/or when the ability to manipulate the information in working memory is compromised

and/or when the ability to stay on track is impaired, then one would probably experience some difficulty in functioning in more complex and fast moving situations.

It appears that the capacity of working memory can be expanded by practice and by the use of compensation techniques. In addition, work to improve the attention and executive skills can improve the utilization of working memory. Accomplishing this can greatly improve a person's functioning in daily life situations. If problems with more long term memory, such as recent memory (a few minutes to a few hours) and remote memory (longer than a few hours) are due in some part to low capacity working memory or impairment of attention and/or executive skills then practice and the learning of compensation skills can improve those memory functions as well.

Track 4 – The Visuospatial Skills

Visuospatial skills allow us to visually perceive objects and the spatial relationships among objects. These are the skills that enable us to recognize a square, triangle, cube or pyramid. They allow us to retrace our way across the city because we have a visual map in our memory from the last time we made the trip. They allow us to know that the car is closer to us and smaller than the building just behind the car. They enable us to realize that the car we see two blocks away is actually about the same size as the car that is just in front of us, even though it appears to be much smaller. Most of what we analyze visually would take many, many words to describe (remember the adage that a picture is worth a thousand words) yet we do it visually in a fraction of a second. Visuospatial skills include a wide variety of

individual skills that vary from recognizing brightness/darkness, identifying complex intersecting angles and curves to recognizing faces from the shape of eyes, noses, mouths and hair. Impairment of these abilities can have a devastating effect on even simple daily functions that we take for granted. Imagine walking one block away from your home and not being able to find your way back! Fortunately, it appears that whether impairment to visuospatial skills was due to an accident or was present from birth, rehabilitative work in this area can greatly enhance functioning and thereby improve ones ability to function in daily life.

Track 5 – The Problem Solving Skills

Problem solving skills are those skills that allow us to analyze the facts of a situation so that we can use that analysis to come to a conclusion about the situation. The name, itself, is the best description. We are faced with a problem that we must overcome or solve to acheive our goal. The situation can be as simple as deciding what clothes to wear today or as complex as an algebra or calculus math problem. Although problem solving skills well deserve their own category, they require the use of the other cognitive skills, particularly those of attention and executive functioning that are needed to recognize facts, gather them together and organize them.

Two of the main types or methods of problem solving are 1) deductive reasoning and 2) inductive reasoning. With deductive reasoning the conclusion is ensured by the facts. This means that when you have gathered and analyzed the facts of a situation you are certain that the conclusion is the true solution. For example, Jack is spraying Tim with the

water hose, therefore Tim is wet. We deduce Tim is wet because we see Jack spraying him with the hose. However, if we just saw that Tim was wet, we could not, with certainty, deduce that Jack sprayed him with the water hose. Tim might have fallen into the pond.

With inductive reasoning, analysis of the facts can allow one to predict the conclusion or solution with high probability that the conclusion is correct but without a guarantee the conclusion is correct. The facts might support a particular conclusion but they do not ensure it. Suppose we walked up to Tim's house and saw that he was wet and also saw that Jack was holding a water hose. We could analyze the facts and conclude that Jack sprayed Tim with the hose. This is inductive reasoning because with just those facts we could not be certain. Tim could have fallen in the pond while Jack was watering the flowers.

In daily life we probably use a combination of deductive and inductive reasoning to come to conclusions and solve problems. If we learn to gather, organize and analyze facts better we could become better and more accurate problem solvers.

We can gather facts just by observing situations. There may or may not be enough facts to just see or hear to solve the problem. If this is the case we may have to engage in more investigative actions to discover more facts. We may have to ask questions. We may have to try to recreate situations to better see how the facts played out. We may have to think up hypothetical conclusions and test them to see if our "educated guess" is consistent with the facts we have gathered. Trial and error learning might fall into this problem solving strategy.

Organizing information better might enable us to see facts we missed when the information was not so organized. This might involve putting information into groups or in a certain order. We may have to group one way and then regroup it another way to make the facts clear to us. We may have to compare one fact or one group of facts with another to see what is true or what goes together or does not go together. Making a decision that some facts cannot go together helps us to come to good conclusion just a much as determining what does go together. For example, there are four children of different heights and without seeing them I must determine which is shortest and which is tallest. Through my investigation of the facts I find that Jim is taller than Bill, Kathy is shorter than Jane and Bill is taller than Jane. Rather than just trying to answer the question of who is tallest or shortest I can help myself by determining who cannot be tallest or shortest. Since Jim is taller than Bill, Jim cannot be shortest. By using the same line of reasoning Jane cannot be shortest since Kathy is shorter than Jane. And since Bill is taller than Jane he cannot be the shortest. Therefore that only leaves Kathy to be the shortest. Then, since Bill is taller than Jane and and Jim is taller than Bill, Jim has to be the tallest. With one line of reasoning I was ruling out possibilities to come to my conclusion and with the second line of reasoning I was focusing in on possibilities to arrive at my conclusion. This example involved organizing and analyzing the information.

It does appear that learning to gather, organize and analyze facts better helps a person to become a better problem solver.

Track 6 – Communication Skills

Communication skills allow an individual to send and receive information. The sending and receiving can take the forms of gestures, writing, speaking, reading and listening etc.. There are many ways in which development, injury or disease can affect one's communication skills. The communication skills track of the NCRT system will present exercises that focus on some very specific areas of difficulty that we frequently observe with those having cognitive impairment. We will focus primarily on auditory discrimination, verbal comprehension, reading and following instructions.