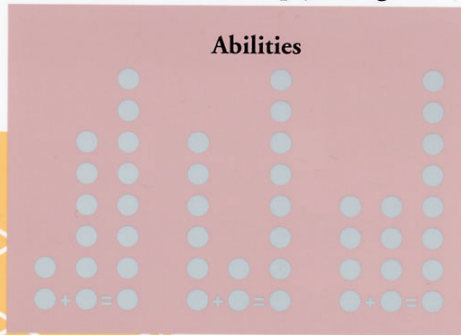


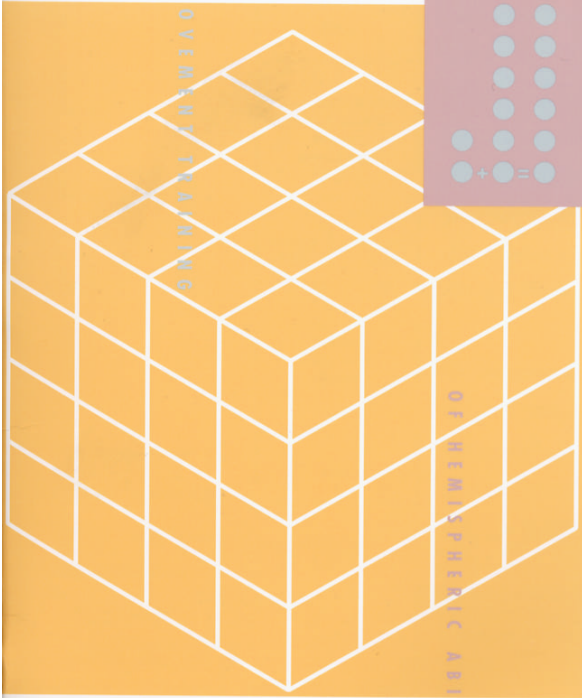
REHABIT

A Structured
Program
for Retraining
Neuropsychological

Abilities



BRAIN IMPROVEMENT TRAINING



OF HEMISPHERIC ABILITIES AND

REITAN EVALUATION



Based on the
Halstead-Reitan
Test Batteries



Ralph M. Reitan, PhD, is the codeveloper of the Halstead-Reitan Neuropsychological Test Batteries, the most widely-used batteries for assessment of brain functions in human beings. Author or coauthor of 215 professional publications and 20 books and manuals,

Dr. Reitan has studied brain-behavior relationships in adults and children for more than 40 years.

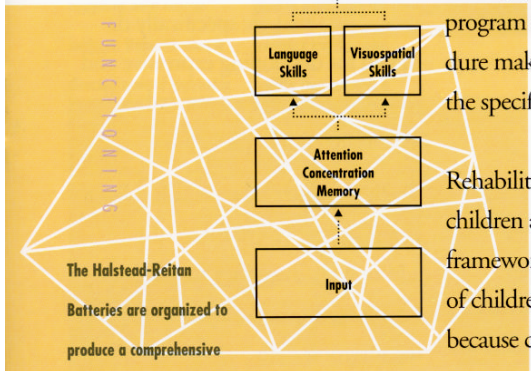
Based on his extensive research and experience with persons who have impaired neuropsychological

functions, Dr. Reitan designed the REHABIT program in 1978. In the ensuing years the program evolved to include over 600 training items, and has been utilized by practitioners in hospitals, schools, and private practices across the United States and Canada. REHABIT has been used to remediate the cognitive deficits of adults and children with a wide range of causative etiologies, including mild to severe traumatic brain injury, encephalitis, and learning disabilities.

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**A Structured
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for Retraining
Neuropsychological
Abilities**

NEUROPSYCHOLOGICAL FUNCTIONING



The Halstead-Reitan Batteries are organized to produce a comprehensive

neuropsychological examination which evaluates sensory input, attention, concentration, and memory abilities, verbal and language skills, visual-spatial and manipulatory functions, and abstraction, reasoning, logical analysis and planning abilities, and motor output. Materials in REHABIT are used to remediate cognitive deficits in these various areas of functioning.

Although many specific procedures for training brain-based abilities of children and adults have been developed over the years, few have been organized around any meaningful conceptualization of human brain-behavior relationships. The Halstead-Reitan Neuropsychological Test Batteries provide a solution to this problem by identifying the individual subject's impaired or deficient neuropsychological functions in the framework of a model of brain-behavior relationships, thereby producing an evaluation on which a remediation program can be developed and prescribed. This procedure makes it possible to tailor the training program to the specific needs of the individual person.

Rehabilitation of neuropsychological impairment in both children and adults is viewed within this same theoretical framework. Differences in neuropsychological evaluation of children and adults must be recognized, primarily because children are in a developmental phase of achiev-



ing brain-related abilities. However, if a child sustains neuropsychological impairment in a particular area, the basic functions of that area tend to be the same as the functions in which an adult may have deficiencies.

Verbal and language functions are customarily related to the integrity of the left cerebral hemisphere, and visual-spatial and manipulatory skills are dependent on the status of the right cerebral hemisphere. The highest level of neuropsychological functioning, which covers the

broad range of abstraction abilities, represents cerebral cortical functioning generally. In terms of their representation in the brain, it can be postulated that abstraction, reasoning, logical analysis, and planning abilities may be more fundamental than the specialized skills.

The REHABIT program does not use a “shotgun” approach to brain retraining; instead, it has specifically been organized to remediate the individual’s neuropsychological deficits, as determined by an evaluation with the Halstead-Reitan Battery.

Recognizing the importance of abstraction abilities and their central role in brain training, five tracks of remediation materials have been established in REHABIT:

The Reitan-Wolfson model of brain-behavior relationships recognizes both receptive (sensory) and expressive (motor) aspects of brain functions.



The integration of these abilities with central processing functions determines the adequacy and efficiency with which the brain receives information and produces responses.

The brain’s ability to register incoming (sensory) information determines the usefulness of the information and the ways in which it can be utilized to produce meaningful responses.



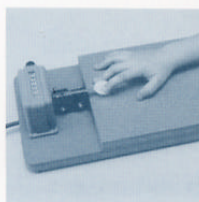
Tasks to improve attention, concentration, and memory pervade all aspects of the REHABIT program.

Track A contains equipment and procedures that are specifically designed for developing expressive and receptive language and verbal skills and related academic abilities.

Track B, which also specializes in language and verbal materials, additionally integrates abstraction, reasoning, logical analysis, and organization skills.

Track C includes various tasks that focus upon reasoning, organization, planning, and abstraction skills, and do not emphasize any particular content.

Track D emphasizes abstraction abilities while focusing on materials that require the subject to use visual-spatial, sequential, and manipulatory skills.



The sensitivity of the Category Test to impaired cerebral functioning gives it a central role in developing a rehabilitation program. Any person with diffuse (generalized) or localized (focal) involvement is likely to demonstrate impairment on this test when compared with control subjects. Rehabilitation is directed toward improving abstraction, reasoning, and logical analysis skills.



The Tactual Performance Test is a measure of complex psychomotor ability that includes a significant problem-solving component. A person who has difficulty on this test may manifest a range of impaired neuropsychological abilities, including poor memory and general inefficiency in everyday performances. Remediation with REHABIT may be directed toward improvement of skills such as attention, concentration, memory, problem-solving, and tactile-form discrimination.

Track E specializes in tasks that require the subject to exercise fundamental aspects of visual-spatial and manipulatory abilities.

Regardless of the content of the training materials being used for the individual subject, every effort is made to emphasize the basic neuropsychological functions of attention, concentration and memory.

The selection of the items included in REHABIT and the integration of the cognitive retraining with neuropsychological theory and assessment contribute to the uniqueness of the REHABIT approach. Although the theoretical background and practical application of REHABIT overlap with many other educational and professional approaches, the REHABIT program differs from other approaches in both content and procedure.

The REHABIT program emphasizes higher-level neuropsychological functions much more than customarily occurs in rehabilitation settings; it has been designed to remediate specific neuropsychological deficits and impairment related to brain damage and dysfunction.



C O G N I T I V E R E T R A I N I N G

Expressive and Receptive Language Skills



Track A of REHABIT consists of training materials which develop cognitive abilities in the area of verbal, language and academic competence. The basic segments of Track A include materials used to:

- Develop preliminary reading skills (learning the alphabet; developing familiarity with consonant and vowel sounds; phonetics; vocabulary building; practice with word beginnings, word endings, and the use of contractions; compound words; synonyms, antonyms, and homonyms; practice in the use of words in sentences; and an introduction to simple reading)
- Develop reading comprehension skills
- Provide training in both printing and cursive writing
- Increase auditory verbal comprehension skills
- Develop competence in following verbal and written instructions
- Introduce numbers, number concepts, counting, addition, subtraction, multiplication, and division

Many children and adults, including persons with subtle dysfunction of the left cerebral hemisphere, have significant difficulty in auditory verbal comprehension. Track A includes materials

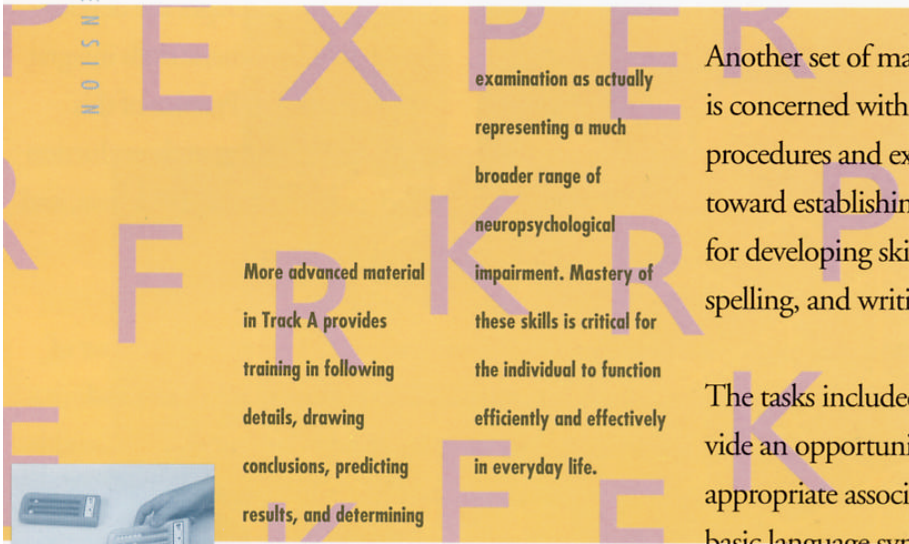


designed to teach the individual to register, process, and appreciate incoming stimuli. These skills are particularly critical for persons identified as having learning disabilities.

The first step in the neuropsychological behavioral cycle is the input of stimuli to the brain. It is then necessary for the brain to register and comprehend the input material before an appropriate response can be generated. Because of this sequential relationship, we have included in REHABIT a substantial number of items dealing specifically with training in the area of auditory verbal comprehension. It is only reasonable to teach the subject to register, process, and appreciate incoming stimuli fully and ad-

equately before requiring comprehension of the material and/or an appropriate response. Impairment of input (receptive) skills often goes unrecognized in the classroom or the home and creates problems that frequently are interpreted as lack of cooperation, impaired motivation, or personality problems.

We recommend that every client who has difficulties with academic subject matter, and who demonstrates evidence of learning disabilities that appear on neuropsychological examination to be brain-related, receive specific training with the auditory verbal comprehension materials in Track A. This material will help increase the individual's capability to register incoming stimuli and appreciate the symbolic significance of auditory verbal communications.



More advanced material in Track A provides training in following details, drawing conclusions, predicting results, and determining cause-and-effect relationships. Difficulties in these areas are often described by the client as "memory problems," but are identified by a comprehensive neuropsychological

examination as actually representing a much broader range of neuropsychological impairment. Mastery of these skills is critical for the individual to function efficiently and effectively in everyday life.

Another set of materials in Track A is concerned with a large number of procedures and exercises aimed toward establishing the foundation for developing skills in reading, spelling, and writing.

The tasks included in Track A provide an opportunity for developing appropriate associations between basic language symbols, words, and pictorial representations as well as contributing to the development of color and number concepts.



The content of Track A relates primarily to left hemisphere functions, but the full requirements of the tasks and the individual's responses require a degree of organization aimed at integrating left hemisphere abilities with brain functions more generally.

UNDERSTANDING SYMBOLS

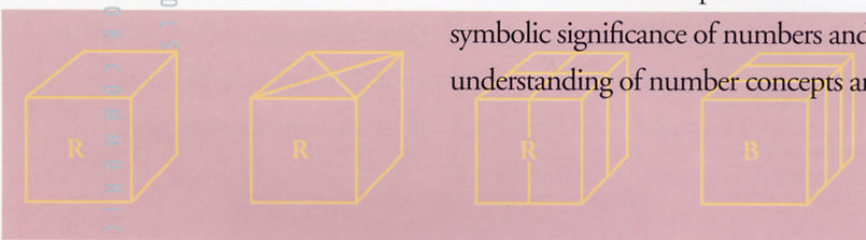
USED FOR COMMUNICATION



There are also items in this section which include books and cassette tapes to assist in developing auditory discrimination, reception, association, and memory. These materials provide exercises in the area of verbal reasoning using comprehension types of questions, inferences regarding what must necessarily have occurred between the beginning and end-point based on information provided, answering who, when, where, what, and why questions, and other exercises to help the subject not only to comprehend verbal material but to develop and use verbalizations to give meaningful explanations.

Track A also includes several training materials to facilitate development of printing and writing skills. Use of plastic cards encourages the development of the kinesthetic skills integral to legible writing. Practice of this kind is very useful as an introduction to independent writing of letters, and eventually, words.

This section of Track A also includes an extensive set of materials for instruction in arithmetic-readiness and provides specific training in addition, subtraction, multiplication, and division. The training in arithmetic-readiness uses a number of procedures for communicating the symbolic significance of numbers and for developing an understanding of number concepts and relationships.



Language and Verbal Skills Combined with Abstraction, Reasoning, and Logical Analysis

Materials included in Track B were carefully selected to emphasize tasks with verbal and language content. The items, which range from very simple to complex tasks, are related to the materials in Track A, but require more general problem-solving, abstraction, reasoning, and memory skills.

The material in Track B contains progressively more difficult verbal material, with the tasks selected according to a theme that requires complex abstraction and reasoning abilities.



In Track B we have emphasized especially the association of pictorial (nonverbal) material with numerical and verbal symbols in order to achieve a degree of integration between these various tracks. Thus, many of the individual items include requirements of a perceptual or performance nature that extend across the entire range of the neuropsychological behavioral model described above.

Training items in Track B were selected to effect an integration of basic neuropsychological functions relating materials in Track A to items in Track C, D, and E.



Besides including elements of numerical or verbal symbols, the tasks in Track B frequently require a degree of logical analysis in addition to spatial and sequential elements.



Sorting,
Classification,
Reasoning,
Logical Analysis,
Planning and
Abstraction

The material in Track C focuses on the development of problem-situations for the client to solve according to an organizing principle. As in the other tracks of REHABIT, items in Track C emphasize close attention, alertness, continuous concentration, and memory. These abilities, which are often



impaired in persons with compromised brain functions and children with learning disabilities, are fundamental to eventual successful use of the higher skills in central processing.

Many investigators of intelligence, including some who related intellectual impairment to cerebral damage, have concluded after years of study that abstraction and reasoning abilities represent the fundamental nature of intelligence.

REHABIT, as a brain retraining program, must deal necessarily with the specialized neuropsychological abilities of the brain. In addition, one of the unique characteristics of REHABIT is the emphasis placed on the integration of these specialized abilities with the general functions of abstraction, reasoning, and logical analysis. Track C therefore represents a central feature of REHABIT, concentrating on basic abilities in abstraction and reasoning while establishing a linkage with verbal and language skills for the left cerebral hemisphere and spatial and manipulatory abilities with the right cerebral hemisphere. The training materials included in Track C were selected to emphasize abstraction and reasoning abilities and place lesser emphasis upon the content of the task.

Because deficits of abstraction, reasoning, concept formation, and analytical abilities are such common features among persons with impaired brain functions, it is often necessary to begin brain retraining using the materials found in Track C. Our experience indicates that training of the general aspects of brain functions is usually a prerequisite to training in the specific skills. It is often stated that individual children have *specific* learning disabilities but, on examination with the Halstead-Reitan Battery, by far the majority of such children have *general*



Many items in Track C are appropriate for individuals who require more advanced training in the use of abstraction, reasoning, and logical analysis. Skills that are targeted include identifying premises and conclusions, distinguishing between relevant and irrelevant information, and

recognizing conclusions that do not follow from the presented evidence. Improvement of these skills encourages behavior which is appropriate and effective in everyday life.



as well as specific deficits. Until the child develops sufficient ability in the area of abstraction and reasoning and has a general ability to understand complex situations, it frequently is of limited value to attempt to accomplish training in the basics of academic skills. The initial step required to develop abilities in this area depends upon careful and accurate observation of recurring similarities and differences in stimulus material.

A number of the items in Track C provide exercises in visual perceptual discrimination and categorization of objects. Using this material, the client is given an opportunity to observe the significance of minor differences in similar spatial configurations and develops an appreciation of the directionality of the figures depicted.

The exercises in Track C range from very simple procedures to tasks that are relatively complex. The basic purpose of the material, however, is to permit development of problem-situations for the subject to solve according to an organizing principle. This material is intended to provide training in memory tasks that are integrated with organizing principles in order to permit deduction to facilitate the memory process.

A considerable number of the tasks in Track C can be used with individuals – children as well as adults – who have been identified as having a learning disability or ADD. In the individual case, any aspect of impaired brain functions may be sufficient to cause limited academic and/or personal competence, but deficits in the area of abstraction and reasoning are often of major importance. These individuals particularly need to learn to understand the general context in which they are trying to master specific skills in order for training to have practical meaning and generalizability to other situations.

**Visual-spatial,
Sequential, and
Manipulatory
Skills Combined
with Abstraction
and Reasoning**



Individual efficiency of performance is strongly dependent upon right cerebral functioning.

The material in Track D



emphasizes abstraction and reasoning abilities in the context of visual-spatial tasks, problems involving sequential elements, and activities requiring problem-solving skills.

Track D includes items which provide a wide range of exercises dealing with the receptive and expressive aspects of spatial relationships. The material requires perception of the stimulus, a degree of central processing, and a response. Attainment of these skills fosters the development of abilities fundamental to appropriate goal-directed behavior.

Track D emphasizes the importance of right hemisphere functions in the development of abilities important in the practical aspects of everyday living. These functions center particularly around visual-spatial, tactile-spatial, and sequential tasks. While the specialized functions of the left cerebral hemisphere facilitate and abet communicational skills, the functions of the right cerebral hemisphere permit the individual to function efficiently in space and time.

The emphasis in Track D is on the visual-spatial skills in a context of abstraction, reasoning, and logical analysis. Nearly every item in Track D permits development of skills in naming, counting, sorting and grouping, and reproduction after an interval, to stress the integration of memory and visual-spatial organization principles.

A final aspect of Track D emphasizes visual-spatial input (or receptive functions) in specific detail. Every item in Track D requires perception of the stimulus material, a degree of central processing, and expression of a response.



However, since so many training items emphasize the response aspect (in terms of drawing, manipulating objects, forming and completing designs with objects, etc.), we deliberately

included several tasks that depend mainly upon visual form perception. This type of training is particularly important for some children in order for them to develop the basic skills necessary for the visual form discrimination requirements (differential recognition of letters) in reading.



**Expressive
and Receptive
Performance
Skills**



Track E contains materials that were selected to provide basic experience in the fundamentals of spatial relationships. The items include training in learning to draw various shapes, appreciate spatial relationships (such as over and under, above and below, on and off, etc.) solve puzzles, reproduce various patterns in two and three dimensions, develop visual-motor skills, directionality (up, down, left, right), and memory and concentration.



More advanced material in Track E focuses on training in visual perception of details, particularly in the context of distracting figures. These types of exercises also provide an opportunity to evaluate the individual's problem-solving skills, and various ways of completing tasks more efficiently can be integrated into the training.

SPATIAL RELATIONSHIPS AND PERFORMANCE SKILLS

Track E includes items which require relatively simple performances as well as material which explores the more complex aspects of spatial configurations.



Summary

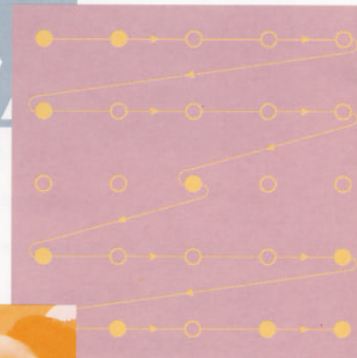


I M P R O V E D B R A I N F U N C T I O N S

The design and content of REHABIT were carefully developed to relate to both the content of the Halstead-Reitan Batteries and the theory of neuropsychological functioning that is implicitly represented by the assessment procedures. Thus, the sequence progresses from a theoretical model of brain-behavior relationships to assessment (diagnosis) of the individual person to treatment (brain retraining) through use of REHABIT. The general characteristics of the theoretical model permit a description of the neuropsychological strengths and weaknesses for the individual subject, and the results of this evaluation serve as a foundation for prescribing a brain-retraining program, using REHABIT, to improve brain functions for each subject.

The training material in REHABIT ranges from simple tasks to items which require more complex behavioral responses. The diversity of the material is sufficiently broad to provide the individual

with varied presentation and challenge. Concepts are often presented with auditory, visual, and tactile stimuli in order to effect sensory-motor integration, coordination of right and left cerebral functions, and involvement of both cerebral hemispheres in the training activity.



Design: Godel/Jonczyk

The Organization and Integration of



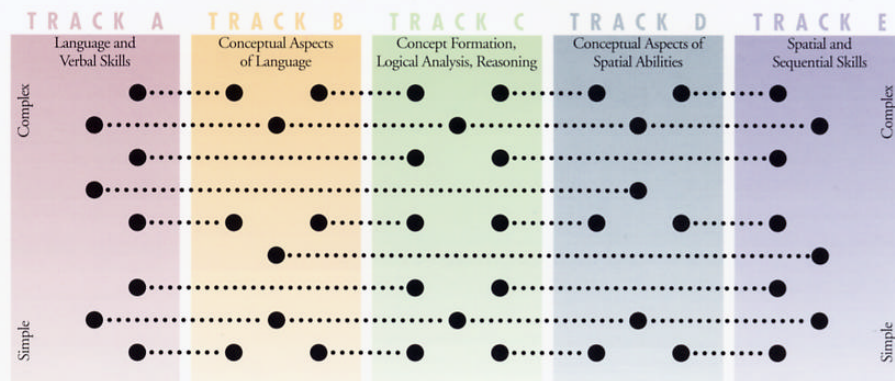
REHABIT

The REHABIT program consists of more than 600 training procedures which were carefully selected to remediate the neuropsychological impairment experienced by children and adults with brain involvement. We estimate that we have rejected about 90% of the training tasks considered for inclusion in the program, not because they do not represent clever ideas but, instead, because they were not specifically pertinent to the types of intellectual or cognitive deficits that result from brain disorders. REHABIT differs from many cognitive training programs with respect to its relevance to higher level impairment caused by brain injury.

This illustration indicates that the training materials in the REHABIT program represent five categories or tracks of neuropsychological functioning:

- Track A – Specific Language and Verbal Skills
- Track B – Conceptual Aspects of Language
- Track C – Concept Formation, Logical Analysis, Reasoning
- Track D – Conceptual Aspects of Spatial and Sequential Abilities
- Track E – Specific Spatial and Sequential Skills

The difficulty level of the items in each category (Track) ranges from simple to complex, making the material useful regardless of the subject's age or degree of impairment. The training material is applicable to both children and adults with a wide range of etiologies, including learning disabilities, and provides training across the full range of basic neuropsychological functions. Many of the individual tasks among the more than 600 procedures included in REHABIT are themselves extensive in nature, each providing many hours of training activities.



The dotted lines show that all tracks of the REHABIT program are interrelated and integrated for all areas and levels of neuropsychological functioning.

A special feature of REHABIT is represented by the integration of abilities achieved through training in each of the five categories (Tracks). Language and verbal skills, for example, must be integrated with conceptual and performance abilities to maximize their effectiveness in real-life situations. Individual training procedures in each Track were carefully selected to provide this kind of integration, as indicated by the horizontal lines in the illustration above. A "hands-on" approach of the kind used in REHABIT facilitates this practical integration of neuropsychological functions, an outcome that is more difficult (if not impossible) to achieve using only computer-assisted training procedures.