

HASOMED RehaCom[®]

Cognitive therapy





Cognitive therapy

by Hasomed GmbH

This manual contains information about using the RehaCom therapy system.

Our therapy system RehaCom delivers tested methodologies and procedures to train brain performance. RehaCom helps patients after stroke or brain trauma with the improvement on such important abilities like memory, attention, concentration, planning, etc.

Since 1986 we develop the therapy system progressive. It is our aim to give you a tool which supports your work by technical competence and simple handling, to support you at clinic and practice.

User assistance information:

Please find help on RehaCom website of your country. In case of any questions contact us via e-mail or phone (see contact information below).



CAUTION

Risk of misdiagnosis. Screening for use of RehaCom only. Use standardized tests for diagnostic.

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Dear user,
please read the entire instruction manual before trying to operate RehaCom.
It's unsafe to start using RehaCom without reading this manual.
This manual includes lots of advice, supporting information and hints in order to reach
the best therapy results for the patients.

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1 Disorders affecting logical reasoning

Basic information on the data analysis of screening results is available in the RehaCom manual, Chapter "Use of RehaCom screening modules".

Clinically, the screening can be used by neuropsychologists, clinical psychologists, neurologists, and psychiatrists for patients with an acquired brain injury, neurodegenerative disease, or mental illness such as schizophrenia.

It will measure executive functions because of its sensitivity to frontal lobe dysfunction.

The screening allows the clinician to assess the following "frontal" lobe functions: strategic planning, organized searching, utilizing environmental feedback to shift cognitive sets, directing behavior toward achieving a goal, and modulating impulsive responses. The screening can be administered to those from 6.5 years to 89 years of age.

A patient must have a number of intact cognitive functions, including attention, working memory, and visual processing, to successfully complete the screening. Patients with any sort of frontal lobe lesion generally do poorly on the test. In particular, patients with lesions of the dorsolateral frontal lobe make a higher number of perseverative errors than control participants.

In this screening module, logical reasoning skills are tested, which require convergent and deductive reasoning with figural material.

Executive functions

In psychology and neuroscience, executive dysfunction, or executive function deficit, is a disruption to the efficacy of the executive functions, which is a group of cognitive processes that regulate, control, and manage other cognitive processes ([Elliott, 2003](#)). Executive dysfunction can refer to both neurocognitive deficits and behavioral symptoms. It is implicated in numerous psychopathologies and mental disorders, as well as short-term and long-term changes in non-clinical executive control.

Executive dysfunction is not the same as dysexecutive syndrome, a term coined by Alan Baddeley to describe a common pattern of dysfunction in executive functions, such as deficiencies in planning, abstract thinking, flexibility, and behavioral control ([Wilson, Evans, Emslie, Alderman, & Burgess, 1998](#); [Baddeley & Wilson, 1988](#)). This group of symptoms, usually resulting from brain damage, tends to occur together ([Halligan, Kischka, & Marshall, 2004](#)). However, the existence of dysexecutive syndrome is controversial ([Stuss & Alexander, 2007](#))

Dysexecutive syndrome

Brain damage - especially directly or indirectly in the prefrontal cortex - often leads to

a "dysexecutive syndrome," which, depending on the brain lesion, can usually be connected and confounded with further cognitive disorders (e.g. disorders of memory, attention, or the emotional control). Therefore, particular importance is attached to the professional neuropsychological diagnostics of all disorders and the classification and interpretation of the dysexecutive disorders together.

According to [Müller](#) (2013), because impairments in executive function are complex, any assessment to identify disorders of executive function must take into account all available sources of information. In addition to testing, a clinician should also observe and analyze the patient's behavior, use questionnaires with people the patient regularly interacts with, and interview relatives. These additional information sources play an important role because formal psychological tests have a very structured setting and may not test such skills as self-initiated action and prioritizing of options for action. Some patients, therefore, will have normal results when taking a formal, structured assessment but still show great deficits in unstructured settings common in everyday life.

Basically, when suspecting the presence of a dysexecutive syndrome, the basic diagnostics should include an assessment of working memory and monitoring, planning and implementation of complex actions, problem-solving reasoning, and cognitive fluency and flexibility (see "therapy guidance of DGN and GNP (Germany)" in [Diener et al.](#), 2012).

Deductive reasoning in logical sequences

Disorders of deductive reasoning as a part of a dysexecutive syndrome are examined in subareas with tasks on divergent and convergent thinking, which originate from intelligence tests ([Schellig et al.](#), 2009).

In convergent thinking, figural tasks are often used among verbal tasks. They have to be solved in terms of completing sequences (e.g. LPS 50+; [Sturm, Willmes & Horn](#), 1993) or completing matrices (e.g. Raven SPM; [Raven](#), 1976).

Tasks on deductive reasoning, such as logical sequences, provide particular requirements for storing and manipulating information in working memory (see [von Cramon & Matthes-von Cramon](#), 1993).

Other important aspects of executive functioning: analyzing the figures (both the given sequence and the possible solutions offered) for relevant characteristics when shape, size, rotation, and position of the figures are varied.

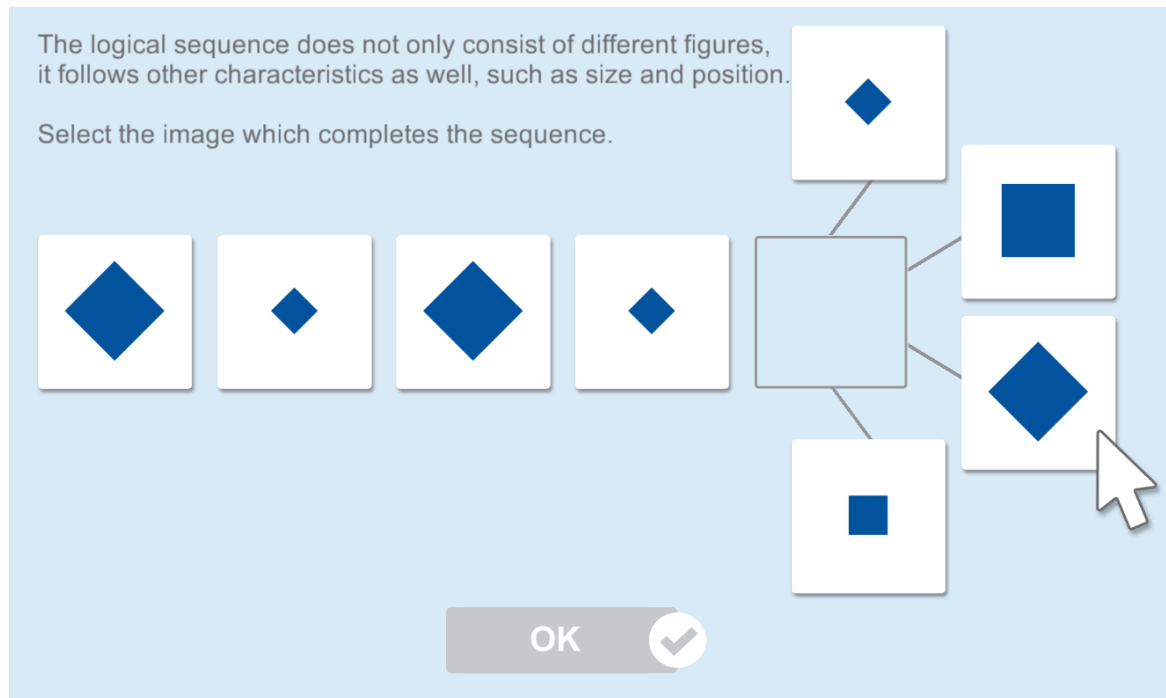


Fig. 1: Training screen during practice

To find a solution, the identified relevant characteristics have to be kept in working memory and compared with hypotheses about the logical sequence. Therefore, flexibility in generating and discarding hypotheses is necessary to decide between the possible solutions offered. Finally, the chosen solution should be checked for plausibility.

Major difficulties in problem-solving can indicate, among other things, the following abnormalities with an increasing level of difficulty:

- analyzing the figures and their characteristics superficially and incompletely
- seeking help to arrive at a solution strategy after trial and error fails
- refusing to generate a hypothesis for solution ("giving up")
- emotional comments

Reviewing the patient's working memory and figural discrimination ability before starting the test is recommended.

2 Task description

In the **Logical Reasoning Test** a series of images with figurative content are presented on a screen or TV monitor, which must be continued or completed as a logical sequence.

The test contains 2 practice series and 13 test series. The test series follow each other in ascending order of difficulty. The difficulty is increased by combining relevant characteristics of the figures, such as shape, size, rotation and position.

In addition to the increasing difficulty of the tasks, there is a time limit for each subtask and for the entire test. This adds another executive performance aspect through forward-looking time management. The screening is carried out as a power test (correct solutions) and a mild speed test (limited solution time).

In the information analysis of the task, four figures in a row on the left-hand side must be examined for their characteristics. The row is to be continued with a fifth figure. The sequence of the figures and their characteristics implicitly reveals a logical rule that must be identified. The hypotheses about possible solutions are limited by four solution options on the right-hand side. From the solution options (multiple choice), the figure that correctly continues the row of figures according to the rule or logical sequence must be placed in the target field.

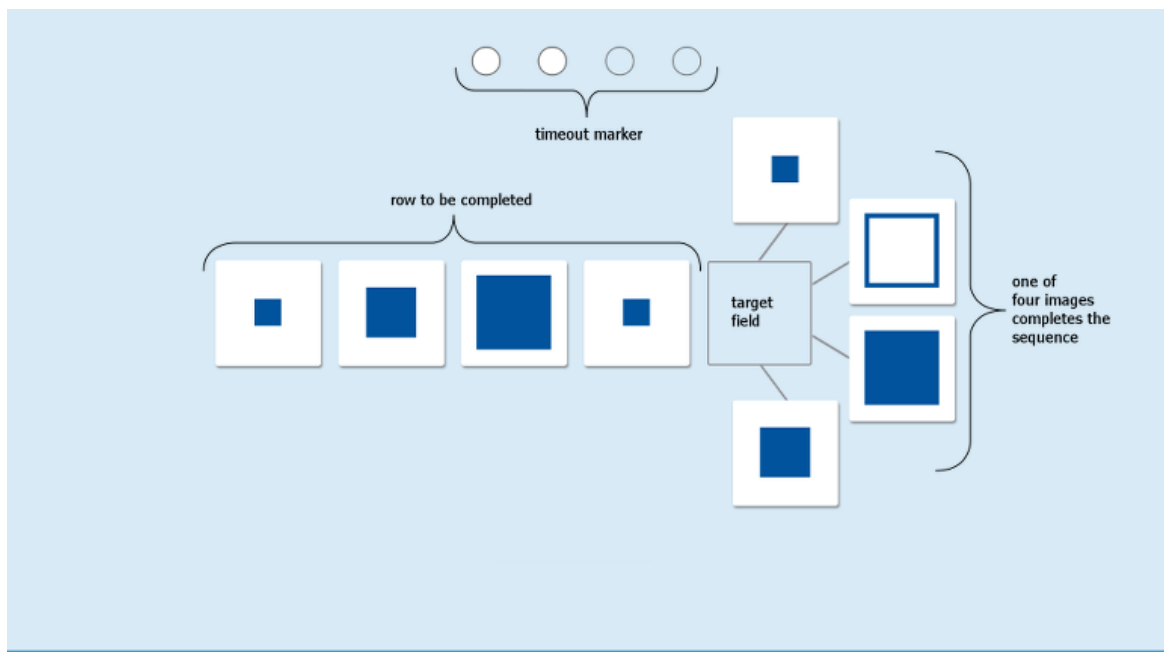


Fig. 2: Structure of screening task

2.1 Instruction

To introduce the patient to logical sequences, two instruction items are presented at the beginning.

These instruction items also help the patient to understand how to select the solution (via mouse, keyboard, touchscreen).

The instruction items are repeated in case of mistakes until the subject has understood the correct solution and he/she can reproduce it.

Instruction 1: Introduction of the task design and the creation of the solution

To complete the solution, one of the offered figures on the right has to be moved into the target field at the end of the sequence. The patient can use the mouse, the touchscreen, or the RehaCom keyboard to do so.

After the patient has chosen an image, he/she must confirm the solution. This can be done by pressing the OK button on the RehaCom keyboard, pressing the spacebar or enter key on the computer keyboard, clicking the button "OK" at the bottom of the screen with the mouse, or touching it if using a touchscreen.

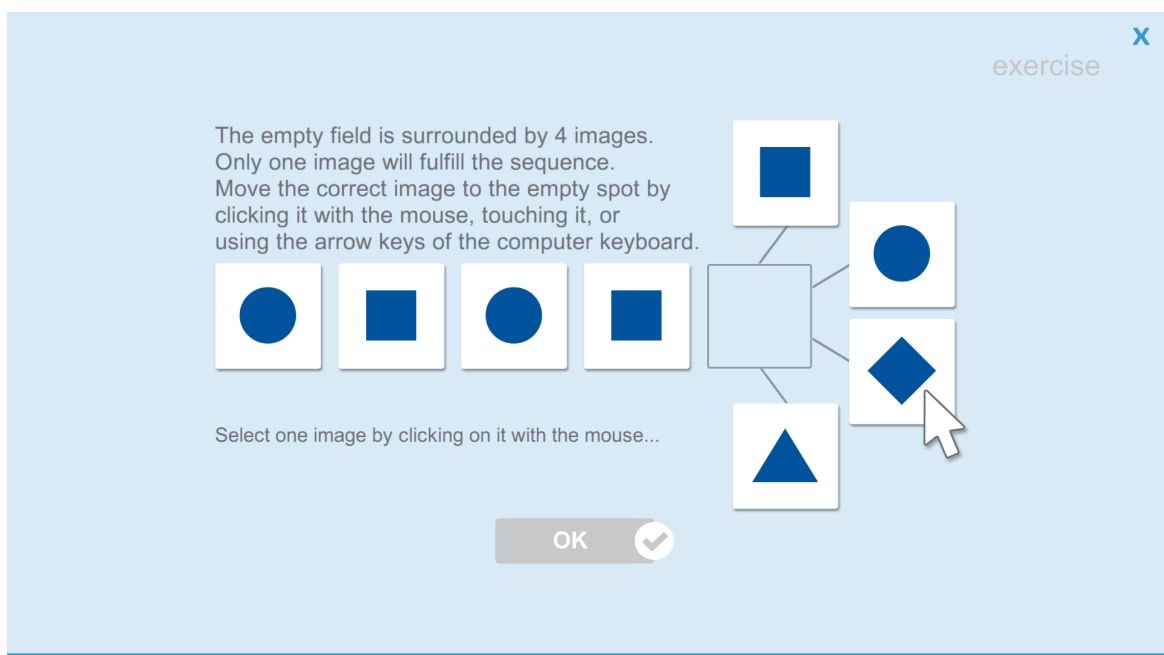


Fig. 3: Exercise 1: Advice to complete the task

If the sequence is completed correctly, the word "Correct" appears and the chosen item is highlighted in green.

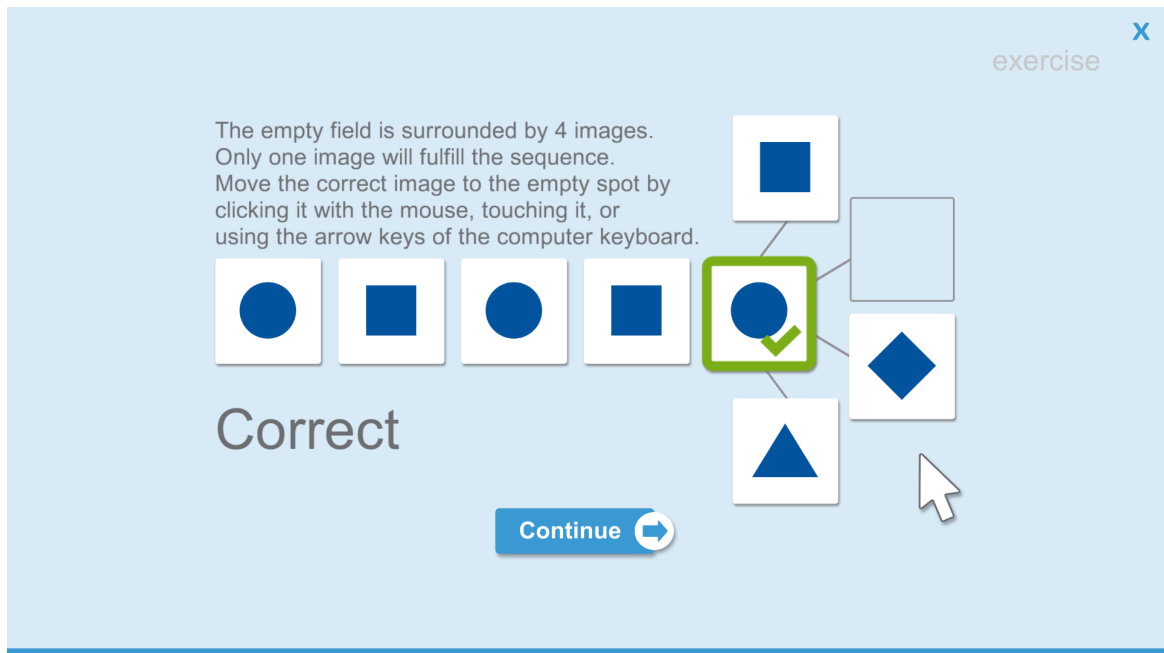


Fig. 4: Exercise 1 - Sequence completed correctly

If the sequence has been completed with an incorrect figure, the words "Wrong. Try again." appears and the chosen item is highlighted in red.

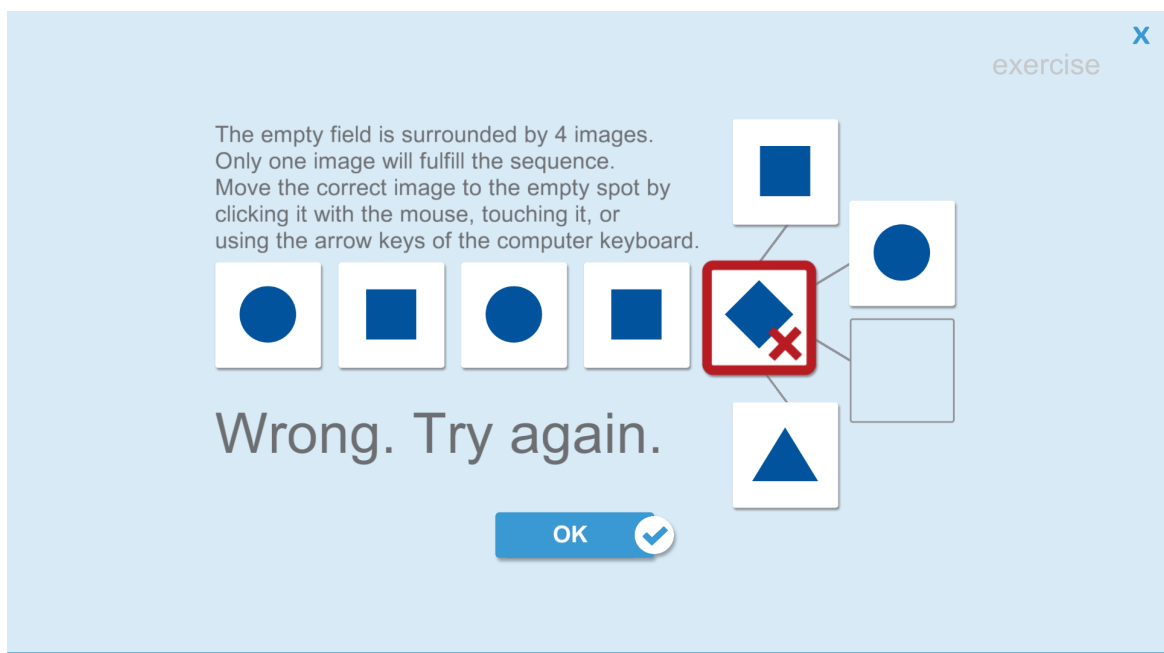


Fig. 5: Exercise 1: Incorrect sequence

If the patient waits longer than 20 seconds to decide on a solution, a message will appear to provide further instructions on how to select a solution.

Instruction item 2: Reference to different characteristics of figures

The second exercise differs from the first exercise by the variation of the characteristics of the figures offered. The subject is informed that the figures may have different characteristics (e.g., in the instruction item below: various sizes).

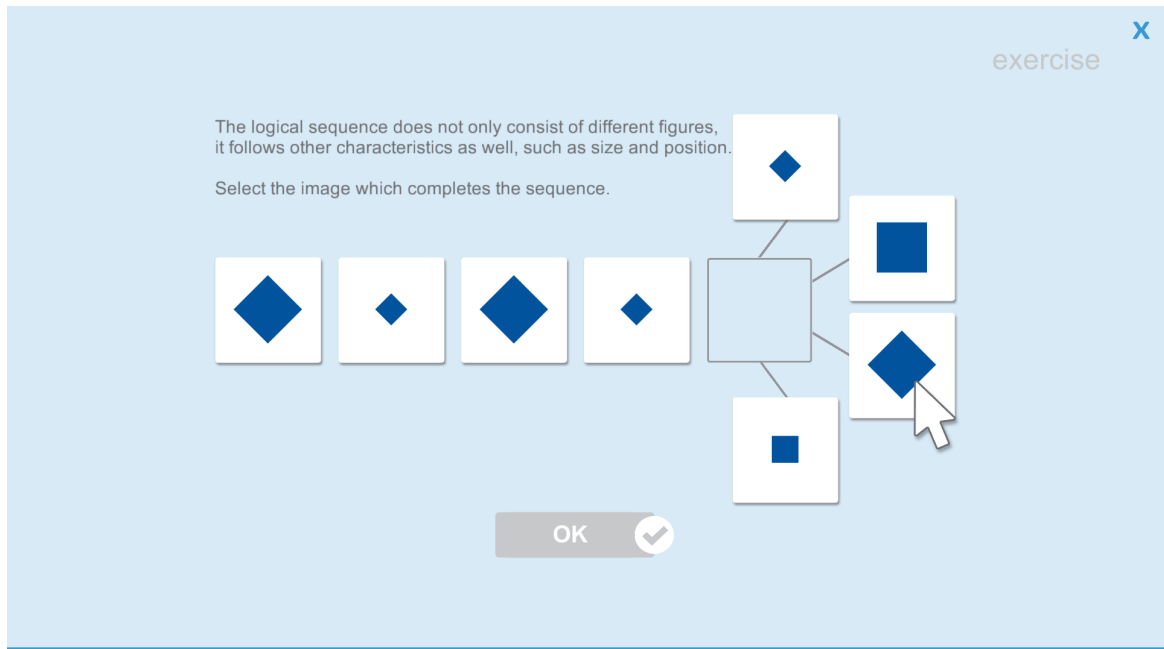


Fig. 6: Exercise 2

Time management and time limits

Subsequent to the practice items, the subject is informed that he/she has only limited time to complete the sequences.

For time management, four empty circles at the top of the screen record the passage of time when time is almost up. The circles are filled in 10-second intervals as time on any given item approaches the time limit.

The total time for all 13 test sequences is 13 minutes, meaning a patient can spend on average one minute per sequence. A "time reserve" can be obtained for more difficult sequences by working quickly during the earlier, easier sequences. Still, each item has an individual time limit of 2 minutes.

2.2 Testing

Creating the solution

There are several options to move the solution into the target field:

1. With a click of the left mouse button or a tap on the touchscreen
2. Via drag & drop using the mouse or by touchscreen
3. With the cursor keys of a regular computer keyboard or the arrow keys on the RehaCom keyboard
 - a. The arrow key down or left moves each picture in turn going clockwise into the target field
 - b. The arrow key right or up moves each picture in turn going counterclockwise into the target field

These techniques can also be used for canceling a solution or choosing another solution. The figure that had previously been selected and moved to the target field, moves back to its starting position.

To get the target field completely empty again, there are only two possibilities:

1. With a click of the left mouse button or a tap on the touchscreen on the image in the target field.
2. Via drag & drop out of the target field into the free space. It is not necessary to match the original position exactly. The only important thing is that the image is outside the target field.

Note: It is not possible to empty the target field with the computer keyboard or RehaCom keyboard once it is occupied once.

Solution time and total duration of the test

Per sequence, the patient has a maximum of two minutes to choose the solution. Not selecting a solution within the maximum solution time is considered an omission, and the next sequence is presented.

The total duration of the test is limited to 13 minutes. Sequences that have not been solved in the maximum total duration of the test are considered omissions in the result evaluation.

After three consecutive sequences, in which no solution or an incorrect solution has been chosen, the screening is discontinued (e.g., testing ends and the results will show data up through the discontinue point).

2.3 Data analysis

Basic information on the data analysis of screening results is available in the RehaCom manual, chapter "Results screening".

For the Logical Reasoning screening module, the following performance parameters are evaluated:

- **Correct:** correct figure selected and "OK" pressed
- **Mistakes:** incorrect figure selected and "OK" pressed
- **Omissions:** no figure selected and either the time limit of the item or the entire test reached

If no solution is selected, meaning no button is pressed, the maximum resolution time of the item is included in the calculation of the total time.

For the results of the screening, the number of correct solutions are considered. T-norms, percentile ranks, and Z-norms are calculated on the basis of a norm sample and displayed in a graphic:

T-norm: Number of correct solutions

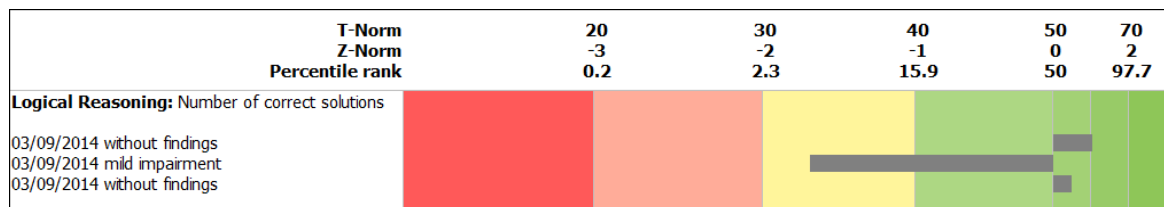


Fig. 5: Display of results in the overview results -> screening

Details

A detailed view can be accessed by double clicking on the colored areas of the graphic. Also, while on the "Screening" tab, you can select the Logical Reasoning section in the list of the "Results" window, and then click on the "Details" button on the right.

The detail view will list the number of correct solutions, mistakes, and omissions. The solution times for each sequence are presented in a chart as well.

The percentile rank is presented after the Z-value in parentheses. The given value is an approximation based on the Gaussian normal distribution.

Print results

By clicking the button "Print Results" the detail view is prepared for printout.

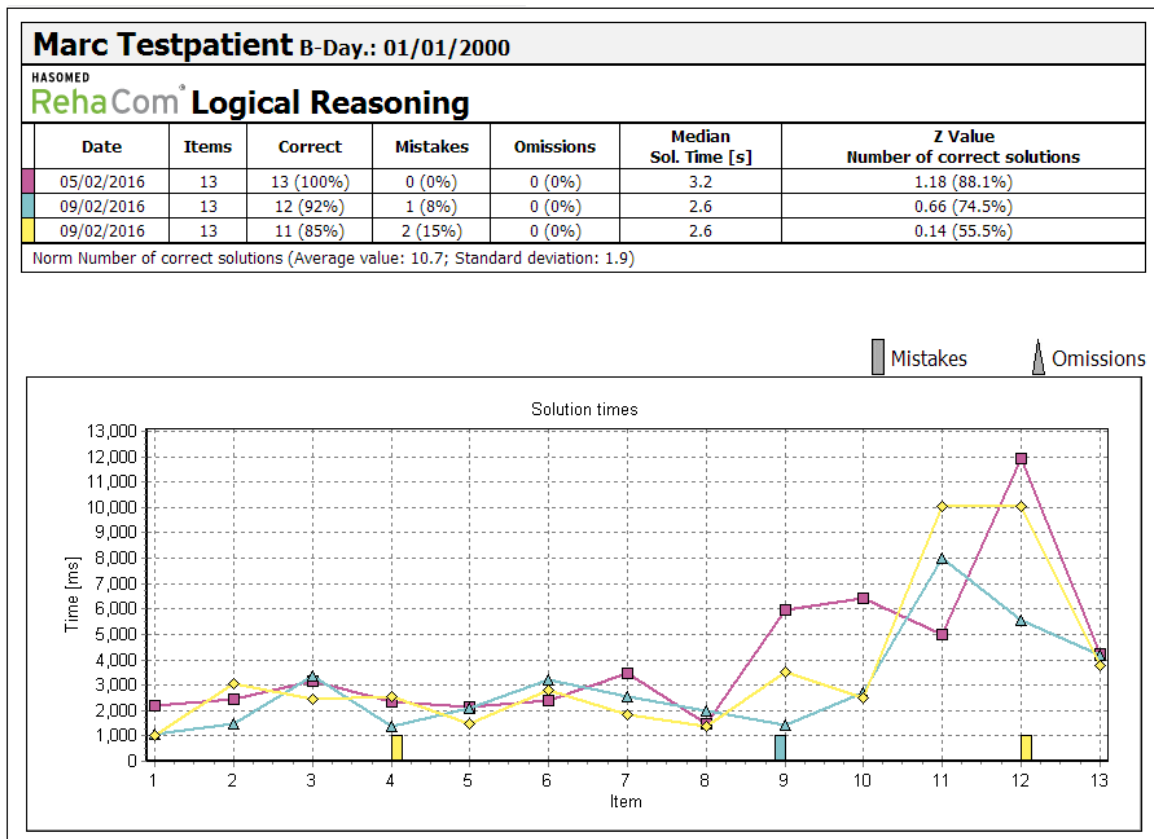


Fig. 6: Table view in the print preview

2.4 Therapy recommendation

At T-norms between 30 and 40, a minor below-average performance is to be assumed. At T-norms < 30, a broad reference to a performance deficit in the convergent deductive thinking must be assumed.

However, the global test result does not clarify yet what component contributed to the performance deficit. If not already done, working memory and attention performance should be checked because disorders in these areas should primarily be treated with exercises for working memory and attention, later with exercises for logical reasoning.

When reviewing the results of the screening with a patient, you might ask whether the patient noticed the different characteristics of the figures and which way the patient took to find a solution and test it. Answers to these questions can help you understand what to watch for.

For exercises on the convergent deductive thinking and problem solving, the Logical Reasoning therapy module, which also works with figurative tasks, is suitable.

From observing the patient's behavior during the exercises in the therapy, you can see which problem-solving strategy is applied. If the patient uses a trial and error approach, or only superficially analyzes the graphics in the series or in the solution offers, the patient should be instructed to spot and to name the relevant characteristics. Also the formation of hypotheses and the discarding of hypotheses should be followed and discussed in the therapy by "thinking aloud" by the subject, as well as the plausibility check after adjusting the solution in the target field, but before completing the item by selecting OK. When combining characteristics, the task aspects can be written down externalized on a sheet of paper or "charted" graphically to relieve the working memory.

The support by "thinking aloud" and externalizing can be gradually discontinued depending on the patient's performance level during the course of the therapy.

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