HASOMED

RehaCom®

Cognitive therapy

Visual Attention

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HASOMED®
HARDWARE AND SOFTWARE FOR MEDICINE

HASOMED
RehaCom®

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).

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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.

Table of contents

1 Training description

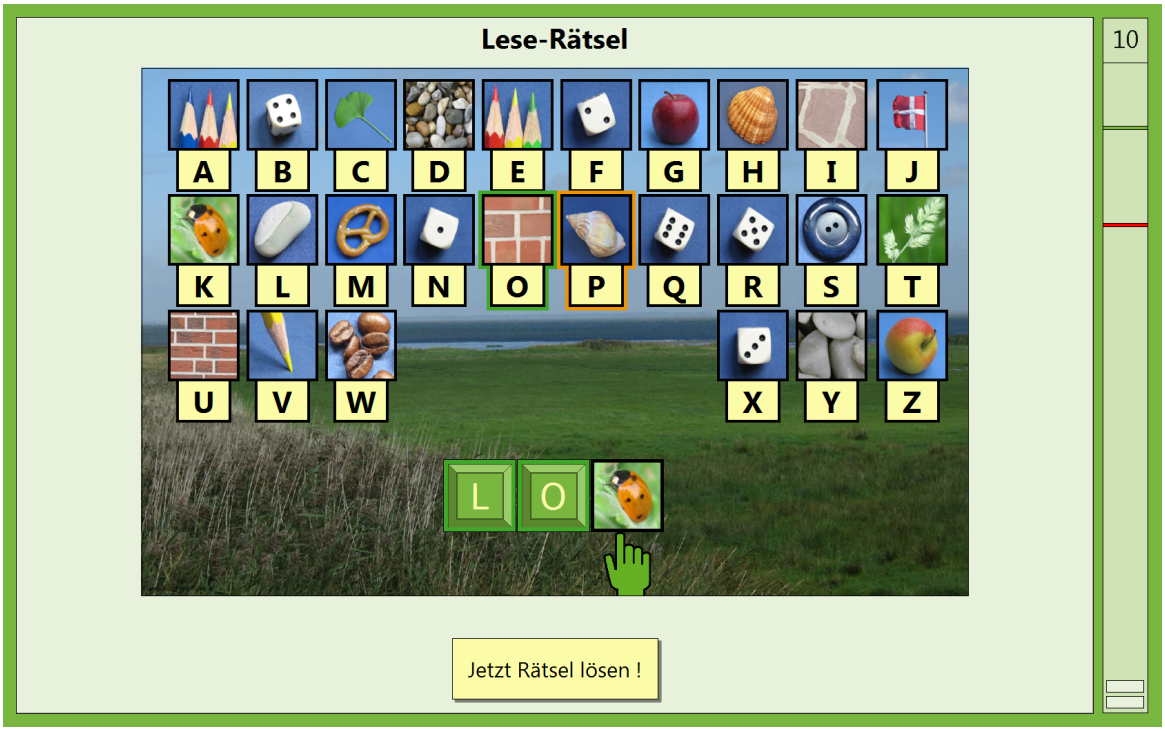
1.1 Training task

With the module **Visual Attention**, the perception precision, the serial reading processes, the concentration, and the controlled control of the eye movement is trained.

The training session (consultation) is divided into several tasks. One task is a cohesive block of templates, which have to be processed successively.
The number of templates is determined by the parameter "Number templates".

First of all, every new situation on the screen requires a moment of personal orientation. The screen page is displayed, without showing the "task".
At the beginning of each task is a orientation phase. Here, the view of the first screen is shown (background, pictures, and letters of the surrounding). The requested word is hidden.

The message "Solve puzzle now!" is shown. After OK (RehaCom Keyboard or spacebar or enter key or mouse click) the task is completed and the first letter can be looked for (see figure 1).



A template has always (at least) one or more letters, which have to be found.
The letter the client has to look for is indicated with a green hand.

Procedure per letter:

The letter is shown with a green hand.
The client has "Processing time per letter" time, to choose the correct letter.
As soon as the client has found the letter, it is inserted in the word.
The letter receives a green frame.
The green hand is placed under the next letter.
If the client has not found the letter, "Help 1" follows.

Help 1:
The green hand moves towards the correct letter.
A yellow hand still shows the sought letter.
When the green hand arrived at the correct letter, it waits until 3 seconds have passed.
If the client has found the correct letter now and clicked on it, it is inserted in the word.
The letter in the search word receives a pink frame
and the search starts again with the next letter.
If the patient has not found the letter, "Help 2" follows.

Help 2:
The yellow hand moves towards the correct letter.
A white hand still shows the sought letter.
If the client has found the correct letter now and clicked on it, the letter in the search word receives an orange frame
and the search starts again with the next letter.
If the client has not found the letter, "Help 3" follows.

Help3:
The correct letter is inserted in the word.
The green hand is placed under the next letter.

The selection of the matching picture can be done by the client with the big cursor keys of the RehaCom Keyboard, the mouse or via touchscreen.

When using the big **cursor keys** an *orange frame* marks the picture. The frame moves across the screen up to the selected picture according to the arrows on the keys by pressing the cursor keys. When the frame marks the requested picture, the OK button must be pressed.

This module is suitable for clients with disorder of the visuomotor coordination, with tremor, and other disorders of the hand motor function.
The big cursor keys can also be operated with the feet.

The **mouse** provides a more comfortable working. An arrow is moved across the screen. The selection has to be confirmed with the spacebar again. Alternatively, the left mouse button can be used by skilful clients to confirm. Additionally, the visual

motor skills are trained.

The easiest way is the operation via **touchscreen**. The client touches a picture and the orange frame appears. As long as the finger touches the screen, it is possible to move the frame to another picture. If the finger is removed from the screen, the picture with the orange frame is evaluated. This training version is especially recommended for children.

1.2 Performance feedback

After the Selection of a picture by the client, the system evaluates the decision:

- if the letter selected by the client is incorrect, it is marked with a red "X" and an error tone is heard. The cross disappears after five seconds.
- if the selected letter is correct, a frame is drawn around the letter in the search word.

green	found in the processing time
orange	found letter after help (hand moved to the letter)
red	letter not found

- a performance bar (in figure 1 right) is enlarged (correct reaction).

The task is completed, when all templates are solved. A performance feedback appears. When the number of letters set in Level up was found successfully, the programme switches to the next Level of difficulty. The previous Level of difficulty starts, when the number of letters set in Level down was not found successfully. Otherwise, the client continues training in the same level of difficulty.

The number above the performance bar shows, in which degree of difficulty the client is currently training.

1.3 Levels of difficulty

An adaptive adjustment of the difficulty is ensured. Chart 1 shows the levels of difficulty. There are 20 levels of difficulty.

Level	Main group	Subgroup	Description	Errors
1	01 Search task	4 Images	Image + matrix, Images close to the middle Image size with frame 80x80 Pixel	2

2	01 Search task	4 Images	Image + matrix, Images in greatest distance Image size with frame 80x80 Pixel	3
3	02 Picture reading	1. Fixed image-letter-combinations (once A=shell, always A=shell) word list A - letter at beginning word list B - letter at end after each 5 requirements word list changes	Image size with frame 80x80 Pixel	2
4	02 Picture reading B	2. Changing image-letter-combinations (first A=shell, then A=cube etc.) also 2 word lists	(then no ½ hidden image per word, word length neglected, positions primarily, new word lists for final letter …) Image size with frame 80x80 pixel	3
5	03 Cryptograph A	1. Just 4- letter words	Word is broken down and shown on the screen, Spatially closer Image size with frame 80x80 pixel	2
6	03 Cryptograph A	2. Just 4- letter words	Spatially more distanced Image size with frame 80x80 pixel	3
7	04 Spaghetti-reading	1. Just 4- and 5- letter words	Mix „HEAVEN“ Letter box with frame 80x80 pixel	2
8	04 Spaghetti-reading	2. All others with mixed background just 4- and 5- letter words	More letters Letter box with frame 80x80 pixel	3
9	05 Cryptograph B	1. (a) Apple or (b) Pumpkin 3- and 4- letter words	Image size with frame 80x80 pixel	2
10	05 Cryptograph B	2. Sea 3- and 4- letter words	Image size with frame 80x80 pixel	3
11	06 Cryptograph C	1. (a) Beetle or (b) Seagull 3- and 4- letter words	Image size with frame 80x80 pixel	2
12	06 Cryptograph C	2. Duck 3- and 4- letter words	Image size with frame 80x80 pixel	3

13	07 Cryptograph D	1. (a) Leaves, (b) Heaven, (c) Heaven 3-, 4- and 5- letter words	Image size with frame 80x80 pixel	2
14	07 Cryptograph D	2. Sea 3- to 11-letter words	Image size with frame 80x80 pixel	3
15	08 Cryptograph E	1. (a) Evening ring, (b) Heaven ring 3- to 9- letter words	Image size with frame 80x80 pixel	2
16	08 Cryptograph E	2. (a) Aircraft , (b) Flower I and flower II mixed pot 3- to 5- letter words	Image size with frame 80x80 pixel	3
17	09 Cryptograph F	1. (a) Port short words, (b) Ebb just verbs 3- to 6- letter word	Image size with frame 80x80 pixel	2
18	09 Cryptograph F	2. (a) Flood all (b) Ebb difficult words 3- to 6- letter words	A and b are possibly in one pot here Image size with frame 80x80 pixel	3
19	10 Mixed performance	04 – 09 (level 7-18) change stage 1	Always 5 tasks of the same kind, afterward changing	
20	10 Mixed performance	04 – 09 (level 7-18) change stage 2	Change after each task	

Chart 1 Levels of difficulty

Meaning of the columns in the chart :

Level:
Serial number of the level of difficulty

Main group:
Practice mode, structure according to Digi-Rigs template

Subgroup:
Per main group 2 levels of difficulty
In the cryptograph-level B-F often 2 or more subgroups are mentioned. The subgroup remains constant during one task (see parameter "Number templates"). If the task must be repeated, another subgroup is chosen randomly

Description:
Short description of the essential way of proceeding

Errors:

No. allowed wrong selected letters

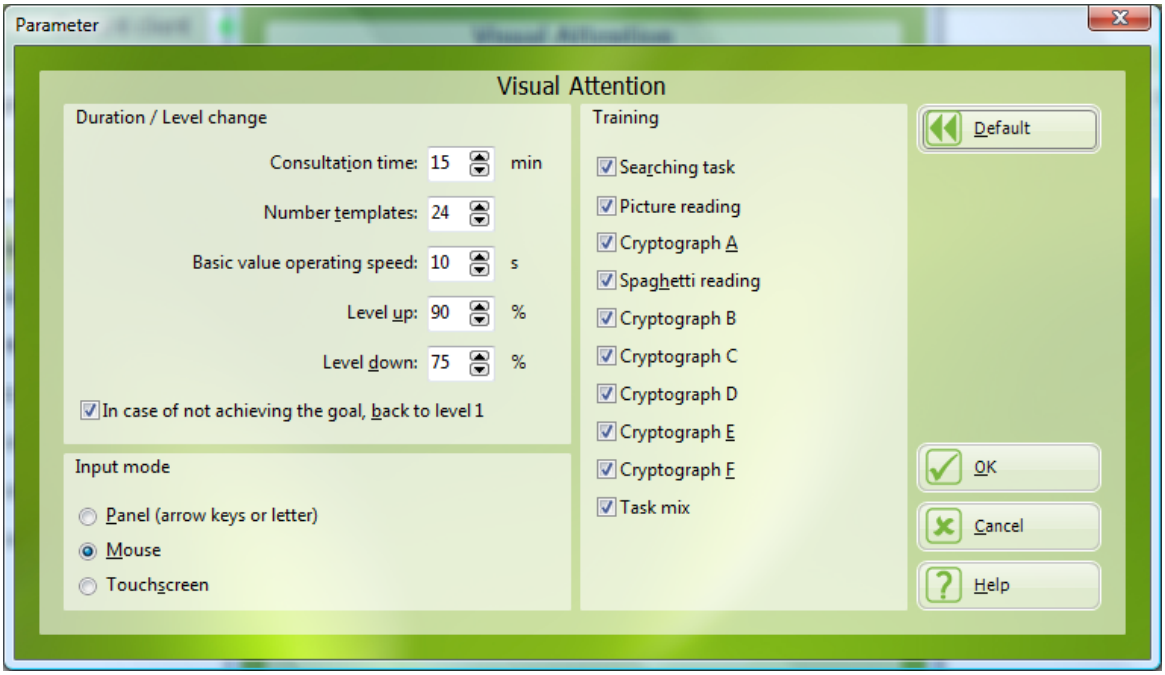
Specified picture size:
The whole training works with a constant picture size of the back- and foreground pictures.
The given picture size of 80x80 for the foreground pictures and 920x580 for the background pictures apply to the minimum screen resolution of 1024x768 pixel.
At higher resolution the pictures size is adjusted.

Screen height in pixel	Image size foreground in pixel	Image size background in pixel
768 or 800	80x80	920x580
864 or 900	88x88	1060x680
960	96x96	1120x720
1024 or 1050	104x104	1200x768

No. allowed wrong clicked letters:
Maximum number of the numbers/letters that can be clicked incorrectly per task.
When exceeding the number of errors there is no climb to the next level,
even if the client did find the required number of letters correctly.

1.4 Training parameters

In the Basic manual RehaCom general hints are given about the training parameters and their effects. These hints shall be taken into consideration subsequently.



Consultation time in min:
In RehaCom common term for the duration of the session. After the expiry of the

consultation duration, the training is finished automatically.
Default setting 15 min.

Number templates:
Per level of difficulty, N pages are displayed. After these pages an evaluation is made.
Default is 24. (24, because 2 times 12 pictures in picture reading (level 3+4 and ring presentation in cryptograph D)).
16 is recommended as a minimum value. Number must be divisible by 4 (evenly distribution right-left level 1,2 and 5,6 (cryptograph A)).

Basic value operating speed:
Basic parameter to control the speed of the training (**processing time**).

Level up:
When the client finds >=90% (default) of all letters within the processing time (before help 1), the degree of difficulty is increased.

Level down:
When the client finds <=75% (default) of all letters within the processing time (before help 1), the degree of difficulty is decreased.

In case of not achieving the goal, back to level 1:
If the the client is not able to solve the first training task, the degree of difficulty is set to level 1.

Input mode:
The operating possibilities are described in the section Training task.

Training:
The here chosen task groups are trained.

Group	Level(s) of difficulty
Searching task	1,2
Picture reading	3,4
Cryptography A	5,6
Spaghetti reading	7,8
Cryptography B	9,10
Cryptography C	11,12
Cryptography D	13,14
Cryptography E	15,16
Cryptography F	17,18
Task mix	19 (Difficulty change after 5 tasks) 20 (Difficulty change after every task)

Processing time:

How long the client needs on average to find a letter?
This value depends on:

- parameter setting (basic value working speed)
- level of difficulty
- if a scotoma/neglect is presumed (parameter)
- input mode (mouse or keyboard)

Calculation rule „processing time per letter“

B = „Processing time per letter“
G = „Basic value working speed“

Input mode = mouse

Level	Scotoma yes	Scotoma no
1-6	B = G	B = G
7-14	B = G * 1,5	B = G
15-20	B = G * 2	B = G * 1,5

Input mode = keyboard
all B-values are doubled compared to the mouse mode

The visual field loss can be set in the client data in the main menu.

1.5 Data analysis

There are various possibilities of analyzing the data in order to find strategies how to continue the training which are described in the Basic manual RehaCom.

In the graph as well as in the charts you find - beside the setting of the training parameters - the following information:

Level	Current level of difficulty
Effect. time	Effective duration of the training
Breaks	Number of breaks during training caused by the client
Level type	Task group
No. tasks	Number of the tasks
No. letters	Number of the letters
No. letters found(before H1)	Number of the found letters (without help)
No. wrong letters	Number of the incorrectly chosen letters
Median per task	Median solution time per task
Neglected page	Neglected page (left - none - right) Calculation on t-Test, difference 2 Sigma, 5% significance limit
1. Source letter	Searched letter is the first letter of the word. When spaghetti-reading the source letter is the position of the number
1. Source letter no. letter	Number of letters in the area
1. Source letter median searching time per letter	Median searching time per letter
1. Source letter min. searching time per letter	Minimum searching time per letter
1. Source letter no. correct answers	Number of correct solutions (without help)
1. Source letter no. answers H1-H2	Number of answers H1-H2 (green hand moves to the target letter)
1. Source letter no. answers H2-H3	Number of answers H2-H3 (yellow hand moves to the target letter)
1. Source letter no. no answers	Number of no answers (letter not found)
Middle source letter	Searched letter is a middle letter of the word
Middle source letter no. letter	see **1. Source letter**
Middle source letter median searching time per letter	
Middle source letter min. searching time per letter	
Middle source letter no. correct answers	
Middle source letter no. answers H1-H2	
Middle source letter no. answers H2-H3	
Middle source letter no. no answers	

Last source letter	Searched letter is the last of the keyword
Last source letter no. letter	see **1. Source letter**
Last source letter median searching time per letter	
Last source letter min. searching time per letter	
Last source letter no. correct answers	
Last source letter no. answers H1-H2	
Last source letter no. answers H2-H3	
Last source letter no. no answers	
Target letter left	Target letter is in the left third of the screen
Target letter left no. letters	see **1. Source letter**
Target letter left median searching time per letter	
Target letter left min. searching time per letter	
Target letter left no. correct answers	
Target letter left no. answers H1-H2	
Target letter left no. answers H2-H3	
Target letter left no. no answers	
Target letter middle	Target letter is in the middle third of the screen
Target letter middle no. letters	see **1. Source letter**
Target letter middle median searching time per letter	
Target letter middle min. searching time per letter	
Target letter middle no. correct answers	
Target letter middle no. answers H1-H2	
Target letter middle no. answers H2-H3	
Target letter middle no. no answers	
Target letter right	Target letter is in the right third of the screen
Target letter right no. letters	see **1. Source letter**
Target letter right median searching time per letter	

Target letter right min. searching time per letter	
Target letter right no. correct answers	
Target letter right no. answers H1-H2	
Target letter right no. answers H2-H3	
Target letter right no. no answers	

2 Theoretical concept

2.1 Basics

Visual impressions are processed by the brain in three phases: global, detailed and elaborative. At first sight, no details are yet perceived. Initially is the overall impression stands. Thereby the information is immediately categorised (e.g. creatures, house, etc.) and assigned to a pattern in the wealth of experience.
After there is an overall impression, saccadic movements are done across the picture. During those movements, certain areas are fixated and analysed in detail. The visual information are re-categorised and mentally organised. The gaze saccades initially follow the conventional reading direction. Afterwards, the eye automatically looks for those areas which aroused the brain's interest, e.g. areas that are extraordinary and distinctly different than the entire picture. Only thereafter, the available visual Information is specifically evaluated. The previously perceived now enables a model for the translation of the visual information into a mental model, which seems to be suitable for the task to be solved. Then only those details are considered which seem to be relevant for the formation of the mental model. Minor details are hidden and not considered in the mental model and thus not perceived. Mistakes in the selection, meaning which details have to be considered and which not, are common in this process and can only be reduced by experiences and exercising.

This skill to select and integrate defined stimuli or ideas is closely associated with the term *power of concentration*; the latter is defined as short time (lasting for some minutes), active turning and focusing of the attention with selective registration of relevant features of the situation (cf. Sturm, 1990). Essential for the performance ability is to consciously increase the attention and to be able to tie it to a defined aim. The better the patient is able to concentrate on a certain content and to ignore irrelevant details the more efficient a task can be managed and processed.

Disturbances of these basic functions can manifest in higher delicateness to distraction, tendency to perseveration or symptoms of neglect.
Disturbances of attention and concentration can manifest themselves in a reduced *perception and processing capacity*, reduced *information processing capacity*, rapid signs of *fatigue* especially when strained, but also higher *delicateness to distraction;* altogether intellectual and practical actions may be impaired to a high degree.
The ability for *directed attention* and perception is a basic precondition for a general capability regarding different cognitive demands.

Two main reasons can lead to an impairment or a loss in the visual exploration after a brain damage:

- impairments to the field of vision and
- visual neglect.

Impairments of the visual field are ranked among the most common neurologically-based vision disorders. The visual capacity is to be estimated significantly lower, because the parallel and serial processing of visual information contents happens considerably restricted and slower. The routing is affected. Due to the visual field defects, the overview is mostly only possible with restrictions. This usually requires a reduction of the visual exploration ability.

2.2 Training aim

The aim of the module is to improve the perception accuracy, the serial reading process, the concentration and the controlled regulation of the eye movement. Furthermore, it is to expect that the training has a beneficial effect on the ADL-area (Activities of Daily Living).

In any case, the therapy should be preceded by a differentiated disorder-specific neuropsychological diagnosis (specific tests see section Basics).

For additional and structured training, the RehaCom-modules **Attention and Concentration** (AUFM), **Exploration** (EXPL), **Overview and Reading** (ZIHL) and Saccadic Training (SAKA) are recommended.

2.3 Target groups

The use of the module to train the visual attention is recommended for patients with diagnosed impairments after neurological injuries (stroke, TBI, MS, incipient dementia, geriatric rehabilitation and others). It is recommended, among other things, as supplement for neuropsychologists, occupational therapists,educators and private persons. It is also suitable for special education teachers and remedial as additional and specific material.

The visual field loss should be compensated to the extend necessary that a processing of the task is possible.

The application in children without important intellectual delayed development is possible. However, it is recommended that at least in the first training sessions, support by a therapist is ensured. The training is not recommended for patients with pronounced intelligence deficits.

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