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# RehaCom®

Cognitive therapy

## Screening:
## Selective Attention

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# 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.

# Table of contents



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# 1 Applications

Basic information on the data analysis of screening results is available in the RehaCom manual, Chapter "Screening and Diagnostics".

The "Go/NoGo" paradigm was developed for testing selective attention.

The ability to react quickly to appropriate stimuli is tested as well as to control behavioral impulses when other stimuli are presented. It is important to be able to control behavioral impulses when presented with external stimuli.

The attention focus is directed on the foreseeable appearance of stimuli, which, when presented, requires a selective reaction, such as to react or to not react.

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# 2 Target group

Attention disorders may occur in almost all neurological diseases, which affect the central nervous system. Depending on whether these diseases lead to rather circumscribed and localized brain damages (such as a stroke) or to rather diffused impairments (such as traumatic brain injury or degenerative diseases), the malfunction in the attention area can be rather specific or global.

### Cerebrovascular Diseases

After lesions in the brain stem portion of the formatio reticularis (Mesulam, 1985) and after strokes, especially in the area of the median brain artery (A. cerebri media) of the right brain hemisphere, disorders of attention activation as well as of vigilance and the long-term maintenance of attention can occur (Posner, Inhoff, Friedrich, & Cohen, 1987).

While the reticular system of the brain stem portion is the "noradrenergic source" of attention activation (Stuss & Benson, 1984), the frontothalamic gating system controls the selective and directed allocation of this attention activation. Lesions of this system lead to a limited selectivity for external stimuli and to increased distractibility (i.e., to attention disorders).

Lesions especially of frontal parts of the left hemisphere, also cause impairments of attention selectivity, especially in situations in which decisions between relevant and irrelevant aspects of a task have to be made quickly (Dee & van Allen 1973; Sturm & Büssing 1986).

Disorders of spatial attention can be selectively affected by localized brain damages. Damages of the posterior parietal lobe seem to lead especially to disorders of disengaging attention from a stimulus, when the attention must be moved towards a target stimulus in the room on the opposite side of the lesion (Posner, Walker, Friedrich, & Rafel, 1984). Here, a cause for a unilateral neglect after a parietal lesion is seen (see the guideline "Rehabilitation of disorders of spatial cognition").

Disorders of divided attention seem to occur particularly often after bilateral frontal vascular injury (Rousseaux et al., 1996).

### Traumatic Brain Injury (TBI)

Along with memory disorders, attention impairments are the most common neuropsychological deficits after a TBI. The most consistent result after TBI is a general, non-specific slowdown of the information processing. The cause of this slowdown after TBI remains largely unclear. As a pathological correlate of the damage due mainly to the rotational acceleration of the brain, diffuse axonal injuries are discussed or a hypometabolism in prefrontal and cingulate brain areas (Fontaine et al., 1999).

### Multiple Sclerosis

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Cognitive slowing and increased variability with an often preserved performance quality at the beginning of the disease are common symptoms in patients with multiple sclerosis (MA), so tests that measure reaction time are of special significance in diagnosing this disease. It is obvious that the deficit in reaction time is relatively independent of the individual sub-functions of attention performance. Because MS is neuronal based, a diffusely localized axonal injury and demyelination is assumed, and a generally increased degree of brain atrophy could be proved (Lazeron et al., 2006).

### Neurodegenerative Diseases

Attention deficits are often seen during the early stage of Alzheimer disease (AD). They often seem to occur after memory disorders, but before impairments of language and spatial performances (Perry, Watson, & Hodges, 2000). Other results indicate a relative maintenance of the cognitive control of attention activation and visuo-spatial attention, but also early disorders of selective attention. In the course of the disease, disorders of inhibitory control also increase.

In Lewy body dementia (LBD), fluctuating attention performances and deficits in the visuo-spatial attention are a central diagnostic criterion. Some studies (Calderon et al., 2001) have reported that patients with LBD showed significantly worse results in almost all attention functions (sustained attention, selective attention, divided attention) compared to AD patients.

Patients with Parkinson's disease or Huntington's disease generally show no deficits in phasic alertness and vigilance tasks, whereas patients with progressive supranuclear palsy (Steele-Richardson-Olszewski-Syndrome) suffer from such deficits. Deficits in divided attention seem to be a general problem in later stages of the diseases.

### Depression and Attention Disorders

Even in the case of depression, memory and attention disorders are to the fore of the cognitive functional impairments. Primarily, conscious cognitive controlled functions are affected. Especially the performance during tasks for the attention distribution has been identified as a prognostic parameter (Majer et al., 2004). Disorders of automatic processing can be present only in case of very severe depression (Hartlage, Alloy, Vásquez, & Dykman, 1993). In comparison to patients after traumatic brain injury (TBI), depressed patients often estimate their performances worse than they actually are in the psychometric examination. Farrin et al. (2003) could show that this negative self-assessment (e.g., during task for sustained attention) can lead to "disaster reactions" after mistakes with increased reaction times immediately afterwards. TBI patients did not show such reactions.

Source: Diener, H.-C., Putzki, N., Berlit, P., Deuschl, G., Elger, C., Gold, R., ... Weller, M. (2008). *Leitlinien für Diagnostik und Therapie in der Neurologie* [Guidelines for diagnosis and therapy in neurology] (4th rev. ed.). Stuttgart, Germany: Georg Thieme Verlag.

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# 3 Structure

The following task is to process:

A focal point is presented in the middle of the screen.

In random intervals, stimuli presenting either horizontal lines or vertical lines are presented.

When the stimulus with horizontal lines is shown, the patient has to press the OK button as soon as possible.

When the stimulus with vertical lines is shown, the patient should not react.

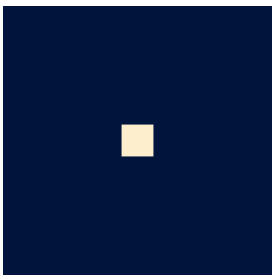

Fig. 1: Fixation

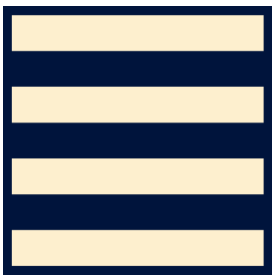

Fig. 2: Go

Fig. 3: No/Go

The stimuli are easy to distinguish, so it is expected that patients with no impairment can control impulsive reactions when presented with the stimuli with vertical lines. Therefore, a patient who lacks the ability to control the impulse can be easily identified with the screening module.

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# 4 Implementation and Duration

The screening starts with an exercise in which messages appear if the patient reacts too early or reacts to the incorrect stimlus. The exercise is not complete until the patient reacted correctly two times in succession.

Once the exercise is completed, the screening is performed.

The patient looks at the focal point in the middle of the screen.

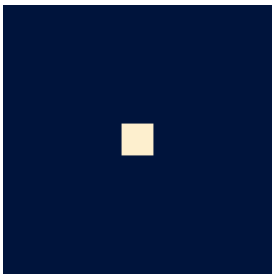

Fig. 4: Fixation

When the stimulus with horizontal lines is presented, the patient has to press the OK button as soon as possible.

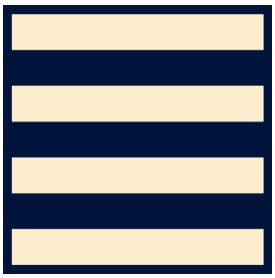

Fig. 5: Go

When the stimulus with vertical lines is presented, the patient should not react.

Fig. 6: No/Go

**Duration**

2min (without exercise)

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# 5 Data analysis

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

In the *Selective Attention* screening module, two Z-values are calculated.

**Z-value 1: Reaction speed**

Median of the reaction time on relevant stimuli´

**Z-value 2: Reaction control**

Number of reactions on irrelevant stimuli

**Details**

Detailed information on the results of the screening can be displayed via the "Details" button. On the right side of the Details display, all conducted screenings for Selective Attention are listed by date. Results marked with an asterisk (*) indicate that the particular screening was canceled. In this case, the evaluation is incomplete (i.e., no Z-values are displayed).

The detailed analysis allows the presentation of a maximum of three results at the same time. The first and the last fully completed screening is preselected; however, you can change the selection by clicking the checkbox next to the date of the results you want to see. The display in the diagrams changes accordingly. The background color of each row of results corresponds to the line color in the diagrams.

You can analyze a patient‘s ability to control impulse reactions by looking at the number of mistakes. An increased number of mistakes is an indication of impaired impulse control.

The mean, median, and standard deviation of the reaction times can provide information on the speed of the decision process. Controlling impulsive reactions is more likely when median reaction times are longer.

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

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**Meyer Maik** B-Day.: 05/05/1955

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| Date | Correct | Mistakes | Omissions | Outliers | Anticipations | Avg. Reac. Time [ms] | Median Reac. Time [ms] | SD Reac. Time [ms] | Z Value React. speed | Z Value React. control |
|---|---|---|---|---|---|---|---|---|---|---|
| 31/03/2016 | 20 (91%) | 4 | 2 (9%) | 0 | 0 | 482 | 450 | 123 | -0.29 (38.7%) | -1.48 (7.0%) |

Norm Reaction speed (Average value: 463 ms; Standard deviation: 84 ms) - Average reaction time
Norm Reaction control (Average value: 1.5; Standard deviation: 1.7) - Number of mistakes

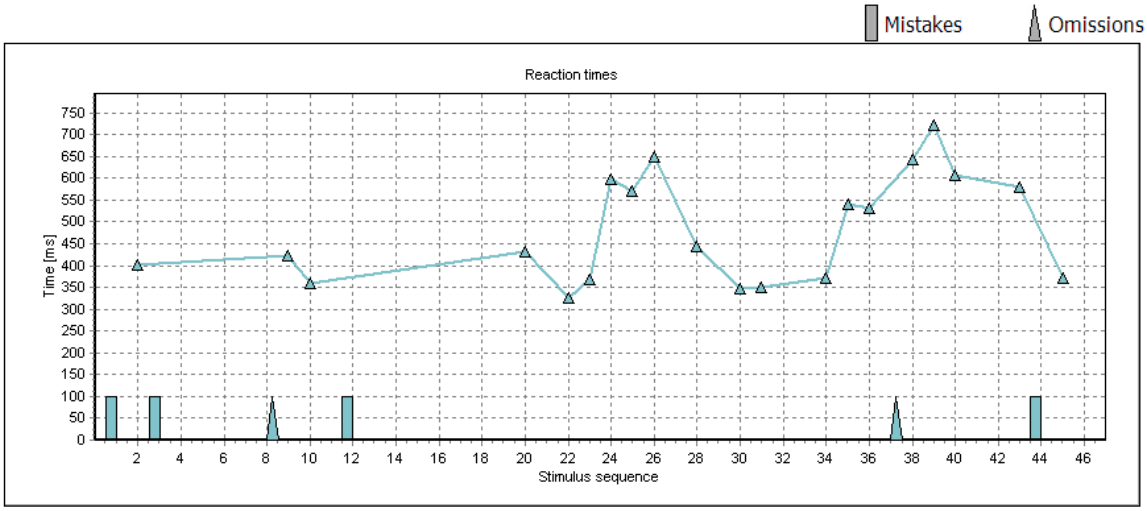


Fig. 7: Detailed data analysis

In the table, a row of results is assigned for every date selected on the right side. The columns have the following meaning:

| | |
|---|---|
| **Date** | End of the screening |
| **Correct** | Number of reactions to relevant stimuli (max. 20) |
| **Mistakes** | Number of reactions to irrelevant stimuli |
| **Omissions** | Number of omitted relevant stimuli (max. 26) |
| **Outliers** | Number of outliers (each reaction time, which lies over the mean reaction time plus the 2.35-times standard deviation) |
| **Anticipations** | Number of incorrect reactions by anticipating (reaction time is less than 100 milliseconds [ms]) |
| **Avg. Reac. Time** | Average of all reaction times to relevant stimuli in ms |
| **Median Reac. Time** | Median of all reaction times to relevant stimuli in ms |
| **SD Reac. Time** | Standard deviation from the mean value of the reaction times to relevant stimuli in ms |

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| | |
|---|---|
| **Z-Value React. speed** | Calculated Z-value for the reaction speed |
| **Z-Value React. control** | Calculated Z-value for the reaction control |

The diagram "Reaction times" shows all single reaction times on relevant stimuli. If the patient didn't react to a stimulus or reacted before the stimulus was presented, no marker is set. Typically, the patient has to react to 20 stimuli during the training. If errors are made, the number increases to a maximum of 26.

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# 6 Bibliography

Calderon, J., Perry, R. J., Erzinclioglu, S. W., Berrios, G. E., Denning, T. R., & Hodges, J. R. (2001). Perception, attention, and working memory are dispropotionately impaired in dementia with Lewy bodies compared with Alzheimer's disease. *Journal of Neurology, Neurosurgery, & Psychiatry, 70*, 157–164.

Dee, H. L., & van Allen, M. W. (1973). Speed of decision-making processes in patients with unilateral cerebral disease. *Archives of Neurology, 28*(3), 163–166.

Diener, H.-C., Putzki, N., Berlit, P., Deuschl, G., Elger, C., Gold, R., ... Weller, M. (2008). *Leitlinien für Diagnostik und Therapie in der Neurologie* [Guidelines for diagnosis and therapy in neurology] (4th rev. ed.). Stuttgart, Germany: Georg Thieme Verlag.

Drewe, E. A. (1975a). An experimental investigation of Luria's theory on the effect of frontal lobe lesions in man. *Neuropsychologia, 13*, 421–429.

Drewe, E. A. (1975b) Go-Nogo learning after frontal lobe lesions in humans. *Cortex, 11*, 8–16.

Farrin, L., Hull, L., Unwin, C., Wykes, T., & David, A. (2003). Effects of depressed mood on objective and subjective measures of attention. *Journal of Neuropsychiatry and Clinical Neurosciences, 15*(1), 98–104.

Fontaine, A., Azouvi, P., Remy, P., Bussel, B., & Samson, Y. (1999). Functional anatomy of neuropsychological deficits after severe traumatic brain injury. *Neurology*, *53*(9), 1963–1968.

Hartlage, S., Alloy, L. B., Vázquez, C., & Dykman, B. (1993). Automatic and effortful processing in depression. *Psychological Bulletin, 113*(2), 247–278.

Kawashima R., Satoh K., Itoh H., Ono S., Furumoto S., Gotoh R., ... Fukuda H. (1996). Functional anatomy of GO/NO-GO discrimination and response selection - a PET study in man. *Brain research, 728*, 79–89.

Lavie, N. (2005). Attention and inaction: Mechanisms for preventing distractor responses. In G. W. Humphreys & M. J. Riddoch (Eds.) *Attention in Action* (pp. 151–169). Hove: Psychology Press.

Lazeron, R. H., de Sonneville, L. M., Scheltens, P., Polman, C. H., & Barkhof, F. (2006). Cognitive slowing in multiple sclerosis is strongly associated with brain

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volume reduction. *Multiple Sclerosis, 12*(6), 760–768.

Luria, A. R. (1970). *Die höheren kortikalen Funktionen des Menschen*. Berlin: VEB Deutscher Verlag der Wissenschaften.

Majer, M., Ising, M., Künzel, H., Binder, E. B., Holsboer, F., Modell, S., & Zihl, J. (2004). Impaired divided attention predicts delayed response and risk to relapse in subjects with depressive disorders. *Psychological Medicine, 34*(8), 1453–1463.

Mesulam, M. M. (Ed.). (1985). *Attention, confusional states, and neglect. In*: Mesulam M.M., ed. *Principles of behavioral neurology*. Philadephia: Davis, 125-168 Oxford University Press.

Perry, R. J., Watson, P., & Hodges, J. R. (2000). The nature and staging of attention dysfunction in early (minimal and mild) Alzheimer's disease: relationship to episodic and semantic memory impairment. *Neuropsychologia, 38*(3), 252–271.

Posner, M. I., Inhoff, A. W., Friedrich, F. J., & Cohen, A. (1987). Isolating attentional systems: A cognitive-anatomical analysis. *Psychobiology, 15*(2), 107–121.

Posner, M. I., Walker, J. A., Friedrich, F. A., & Rafel, R. D. (1984). Effects of parietal injury on covert orienting of attention. *Journal of Neuroscience, 4*, 1863–1874.

Rousseaux, M., Godefroy, O., Cabaret, M., Benaim, C., & Pruvo, J. P. (1996). Analyse et évolution des déficits cognitifs après rupture des ané urysmes de l'artère communicante antérieure. *Rev Neurologique* ;152, 517– 527.

Sturm, W. (2002). Diagnostik von Aufmerksamkeitsstörungen in der Neurologie. *Aktuelle Neurologie, 29*, 25–29.

Sturm, W., & Büssing, A. (1986). Einfuss der Aufgabenkomplexität auf hirnorganische Reaktionsbeeinträchtigungen - Hirnschädigung oder Patienteneffekt? *European Archives of Psychiatry and Clinical Neuroscience, 235* (4), 214–220.

Stuss, D. T., & Benson, D. F. (1984). Neuropsychological studies of the frontal lobes. *Psychological Bulletin, 95*(1), 3–28.

Thöne-Otto, A., George, S., Hildebrandt, H., Reuther, P., Schoof-Tams. K., Sturm, W., & Wallesch, C.-W. (2010). Leitlinie zur Diagnostik und Therapie von Gedächtnisstörungen. *Zeitschrift für Neuropsychologie, 21*, 271-–281.

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