HASOMED

RehaCom®

Cognitive therapy

Screening:
Memory for Words

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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).

⚠ 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

1 Verbal memory disorders

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

The Memory for Words screening module tests an aspect of the verbal memory according to the paradigm of recurring characters. Words have to be read, learned by repetition and saved in long-term memory. The retrieval of learned information is done through the recognition method.

Memory disorders after brain damage

"*Memory disorder* is the generic term for all losses of the learning, the memorizing and the retrieval of learned information" (Thöne-Otto & Markowitsch, 2004). After attention disorders, memory disorders rank among the most common consequences of brain damage. In more than 60 percent of an unselected sample of 400 patients of a neuropsychological department, significant mnestic abnormalities were found (Prosiegel, 1988). Depending on the localization and the extent of the injury, the changes in performances range from relatively slight losses to serious disorders that make independent management of everyday life impossible. Memory deficits are especially stressful and, compared to the limitations of the motor functions, are more likely to lower self-esteem (Schellig, Drechsler, Heinemann, & Sturm, 2009).

After a brain injury, short-term memory is usually more affected than retrieval from long-term memory, meaning after the brain injury, the processes of encoding, retention, and retrieval are impaired, and this is quite often intensified by deficits in attention and executive function.

Memory models of general psychology and neuropsychology show that memory isn't a uniform construct, but we now assume there are different memory systems and processes that, depending on the location of the lesion, could be affected independently of each other. (Thöne-Otto, 2009)

Therefore, professional screening to differentiate the impact on the verbal and non-verbal cognitive performances is of great importance, in order to organize the rehabilitation specific to the patient's needs.

Memory diagnostics

To diagnose any issue in verbal memory, modules that measure orientation, short-term and working memory, reproduction of narrative texts (stories), and learning (in terms of a learning list)

should be used in preferably three time variants: immediately, after 30 minutes, after

24 hours. Also tests that measure free phonetic reproduction and recognition with retrieval support should be used as relevant ancillary measures. (Diener & Weimar, 2012)

PC-supported testing of verbal memory

Verbal memory tests consist mainly of aural information and free reproduction in response to a query. Computerized methods can't implement detection of free reproduction technically, but a PC-supported verbal memory screening is easy to implement when using the paradigm of recurring characters/words and the recognition method.

Kimura (1963) was the first to develop the Recurring Figures Test (RFT) to recognize nonverbal learning disorders. In addition to this material-specific test for right-hemispheric brain injuries, a verbal variant of the material-specific test for left-hemispheric brain injuries was developed when designing German versions of the RFT. These tests are known as Nonverbale Lerntest (Nonverbal Learning Test; NVLT) and Verbale Lerntest (Verbal Learning Test; VLT) (paper-pencil-version) (Sturm & Willmes, 1999).

In the verbal learning test, nonsense words (neologisms) are presented on cards for three seconds each. If there is no reply after three seconds, the card is hidden until the answer (yes, no) is given. Then, the next card is shown.
The set of cards contains some words that appear on more than one card so that there are repetitions. The patient is instructed before the test begins that when a card is presented, he/she answers with "yes" if they have seen that word on a previous card, or "no" if the word has not been shown previously during the test. A perceptual test, which checks whether similar items can be differentiated as equal or different, is administered prior to the verbal learning test.

An analysis of the unsystematic variations in the learning process of the original RFT over the seven repetitions showed that the position of the repeating item systematically influences the learning process (Büenfeld, 1988, as cited by Sturm & Willmes,1999). If the repetitions were too close together, and the word still in short-term memory, results skewed. After the positions were adjusted appropriately (distance between the repetitions in different variations between 13 and 25 words), much more homogeneous learning processes occur.

For the VLT, nonsense words (neologisms) were developed in view of the highest selectivity for the figural memory test NVLT. Those words follow the graphotactical rules of the German language and consist of 2 syllables of 3 letters each. Highly associative words are distinguished from lower associated, always based on the associative proximity to real English words. (e.g., MORULE = highly associative; HOLREN = lower associative).

But Sturm & Willmes also carried out a study that built on the work of Milner and Kimura (1964) in which **real** four-letter **words** were used. By using real words, they could also prove the material-specific memory effects. Milner and Kimura, however,

didn't develop their test further.

For the Memory for Words screening module, following the example of Milner and Kimura, real words are used. The four-letter words used are abstract, meaning they **cannot** be visualized figuratively or graphically, as with BLUE or TEXT for example. Some words that are difficult to visualize are:

- some characteristics, such as MILD WELL FAST TALL CUTE DARK
- emotions and some human characteristics, such as CALM COLD KIND NICE
- or other abstract words, such as HAVE HOPE LAST MORE LESS

A nontarget word can have a similar spelling to a target word (e.g., BELT and MELT, similar in three letters) or not similar (e.g., BELT and OPEN). A nontarget word can be **semantically** (in meaning) similar to a target word (e.g., HINT and CLUE) or not similar (e.g., HINT and ROOM).

In this screening, the words were selected in such a way that a pictorial association is impossible or very difficult.

2 Description of the test

Words are shown on a computer screen, a TV monitor, or a data projector. Some of them can be recognized because they are recurring.

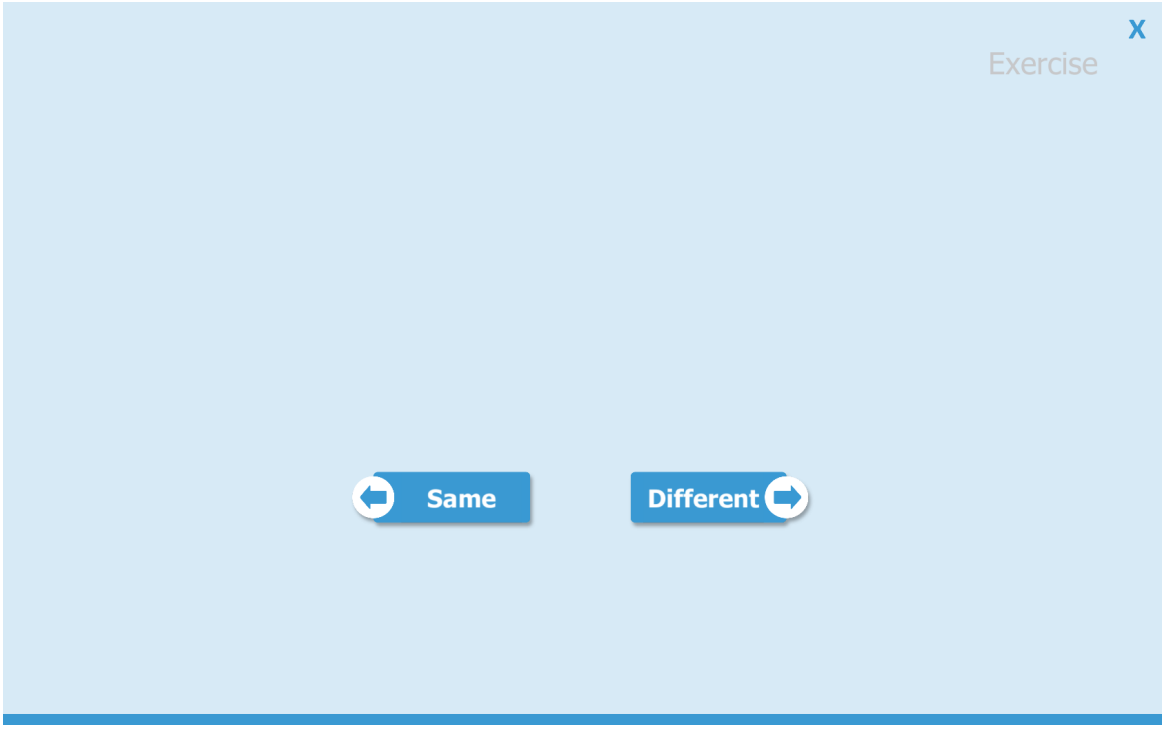

Fig. 1: Screening "Memory for words"

In the center of the screen, the word is presented, and the patient is required to determine whether he/she has seen the word before in the test.

For each word, the patient selects either "Repeated" or "New".

The subject can answer the questions by clicking on the arrows using the mouse, or if he/she uses a touchscreen, by touching the arrows on the screen.

The left and right arrow keys on a regular keyboard, or the appropriate arrow keys on the RehaCom keyboard, can be used as well.

2.1 Instruction

The actual test is preceded by a pre-test and a test run. The pre-test is to ensure that the subject is able to distinguish words in general.

Pre-test: Discrimination of words

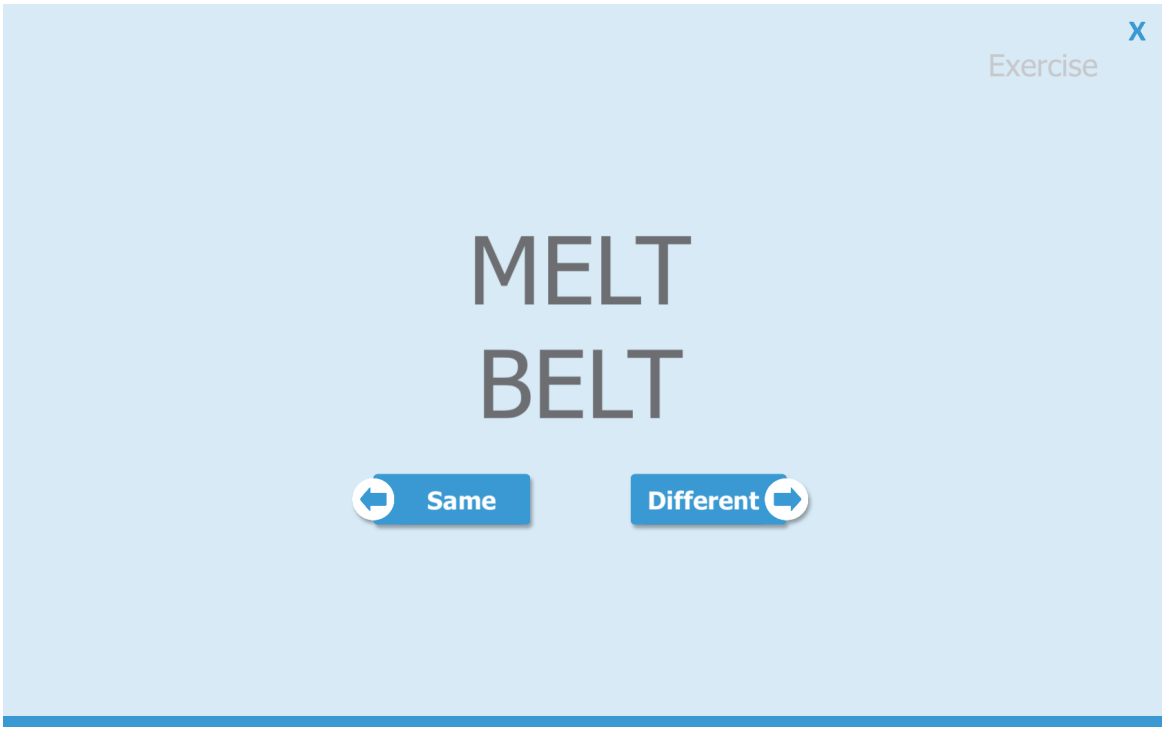

Fig. 2: Exercise 1 - words different

Two words are presented on the screen simultaneously. The patient must decide whether the words are equal or different. This can be done:

- by clicking on the appropriate arrow using left mouse button, or
- by pressing the arrow keys on the computer keyboard or RehaCom keyboard in the appropriate direction.

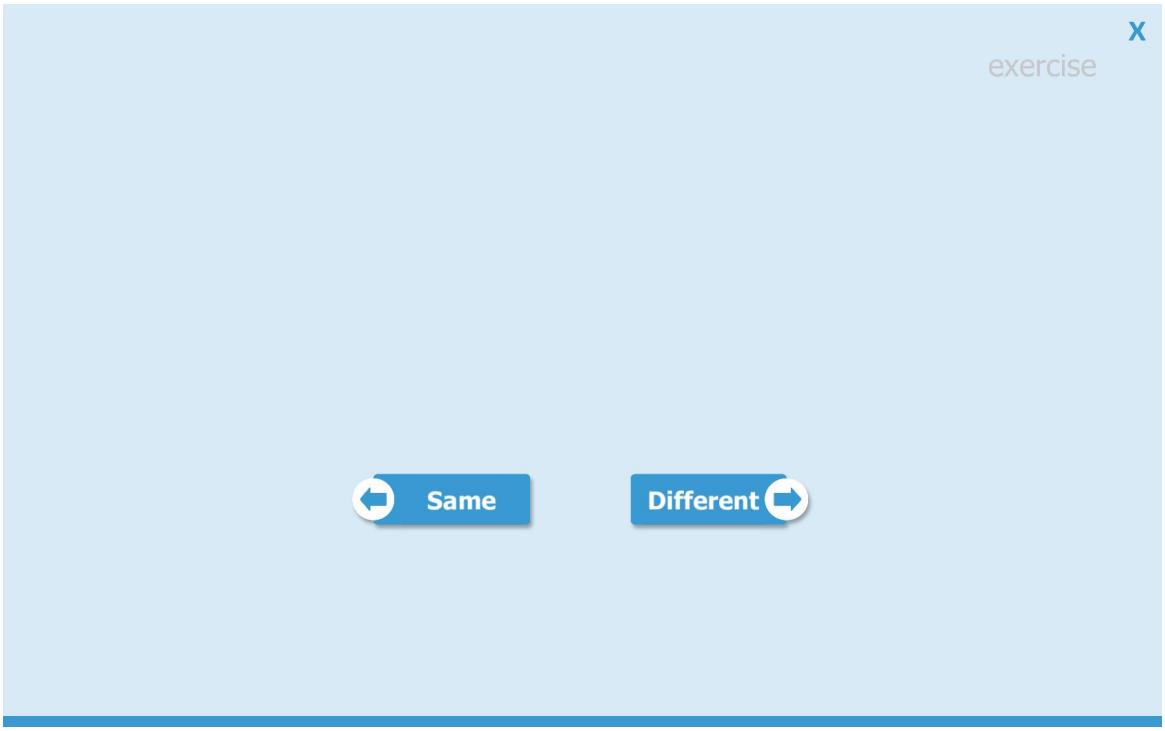

Fig. 3: Exercise 1 - words hidden - decision still possible

All words are shown for equal amounts of time (three seconds) and then hidden. The patient has additional time to answer the question once the words are hidden.

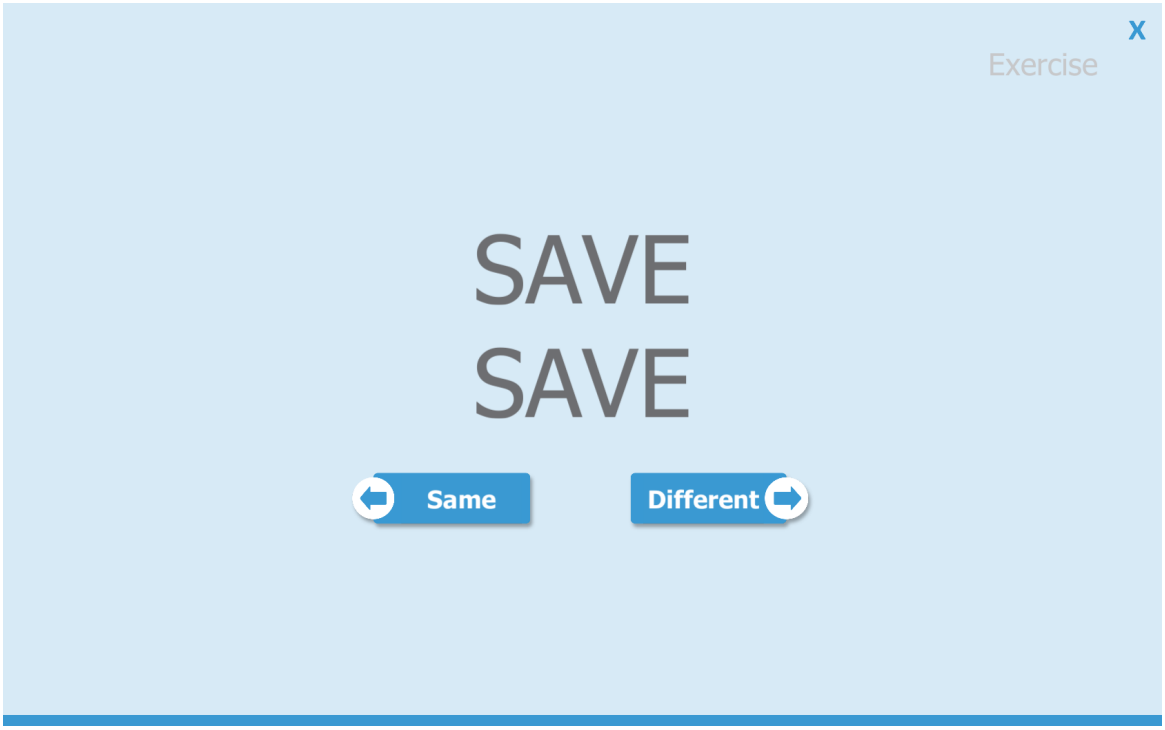

Fig. 4: Exercise 1 - words same

Test run: Recognize recurring words

For the test run, words are presented in succession. The first presented word can't be a repetition; nevertheless, the patient has to decide from the very first word whether it is repeated or new. The decision can be made either by clicking on the appropriate arrow or by using the left and right arrow keys.

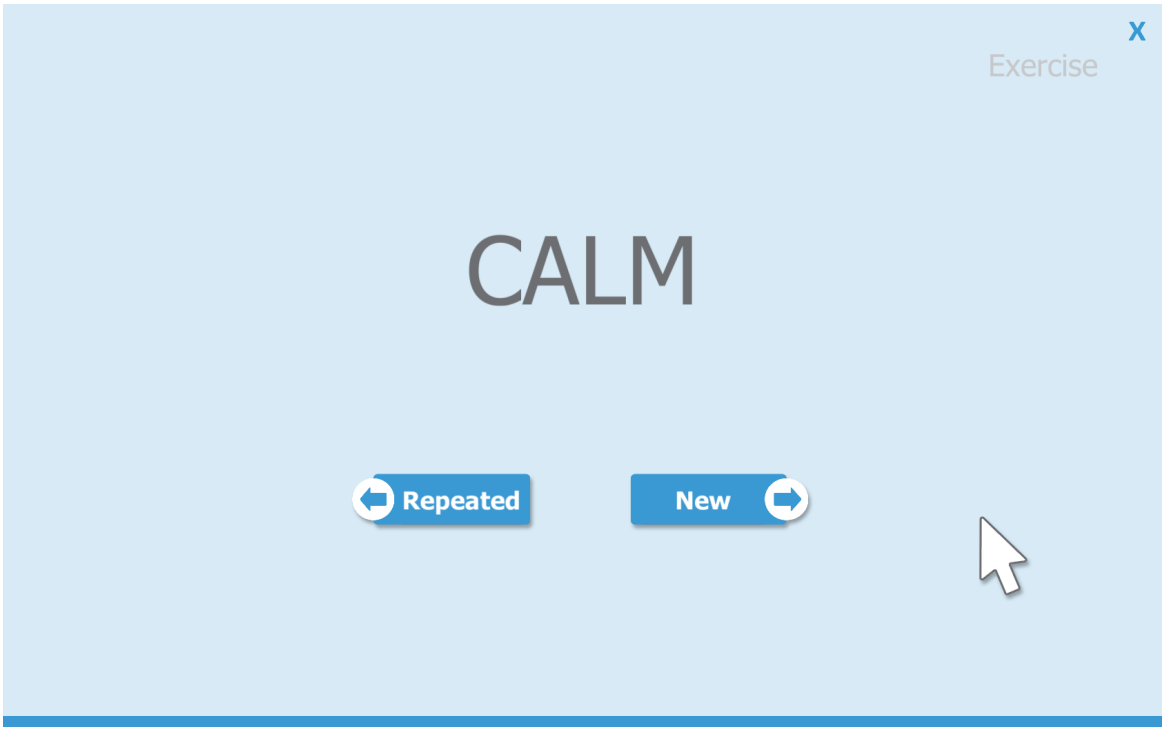

Fig. 5: Exercise 2 - First show n w ord can not be a repetition

Pre-test and test run can be repeated if errors were made. If the third implementation was still faulty, it is recommended that the screening be discontinued.

2.2 Testing

Implementation and duration of the test

When the pre-test and the test run have been completed successfully, the actually test starts.

- Altogether, 72 words are presented, whereby six blocks, with 12 words each, are created (this is an internal structure; the block structure is not noticeable in the presentation).

- There are 5 target words, which appear 6 times each (once per block). For each target word, there is a similarly spelled word and a semanticaly similar word. The remaining 32 words appear only once and they are dissimilar.
- The repetition intervals are between 9 and 20 words.
- The presentation time per item is fixed at 3000 ms.
- The patient can still decide whether he/she has seen the word before when the presentation time is over.
- If the patient still hasn't decided after 20 seconds, a note appears on the screen that he/she has to make a decision.
- If the patient still hasn't reacted two minutes later, the screening will be canceled.

2.3 Data analysis

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

For the Memory for Words screening module, three performance values are calculated: T-norm, Z-norm, and percentile rank.

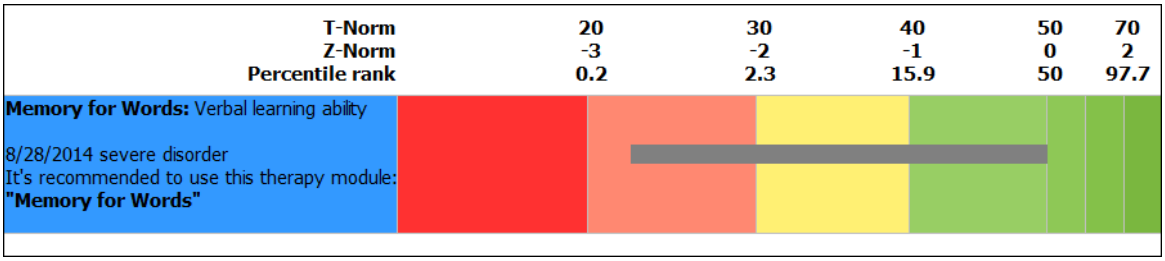

Fig. 6: Display of results in the overview -> screening

T-norms over 60 indicate an above average performance, T-norms under 40 indicate a below average performance.

Details

The detailed view can be accessed by double clicking on the colored areas of the graphic above. You can also select the screening "Memory for Words" in the list of the "Results" window, on the "Screening" tab and then click on the "Details" button on the right.

Results table

HASOMED
RehaCom® **Memory for Words**

Date	Correct	Mistakes	Difference	Median Reac. Time Correct [ms]	Median Reac. Time Mistakes [ms]	Z Value Correct	Z Value Mistakes	Z Value Verbal learning ability
05/02/2016	19 (76%)	3 (6%)	16	949	547	-2.06 (2.0%)	-0.37 (35.4%)	-1.32 (9.3%)
09/02/2016	12 (48%)	24 (51%)	-12	390	415	-5.00 (0.0%)	-5.00 (0.0%)	-5.00 (0.0%)
09/02/2016	20 (80%)	0 (0%)	20	1428	--	-1.49 (6.8%)	0.71 (76.0%)	-0.18 (42.8%)

Norm Verbal learning ability (Average value: 20.6 [22.6 - 2.0]; Standard deviation: 3.5 [1.7 - 2.8]) - Difference [Correct - Mistakes]

Screening Settings:
Repetitions (correct): **25**; Presentation time per item: **3000 ms**; Interstimulus intervall: **1500 ms**;

Fig. 7: Result table

Correct

correctly identified word repetitions

Mistakes

incorrectly identified repetitions (words that were identified as repetitions but are not repetitions)

Difference (Correct – Mistakes)

Difference represents the number of correctly recognized repetitions minus the words marked incorrectly as repetitions.

Omissions, or repetitions of words which were not recognized, are not separately displayed.

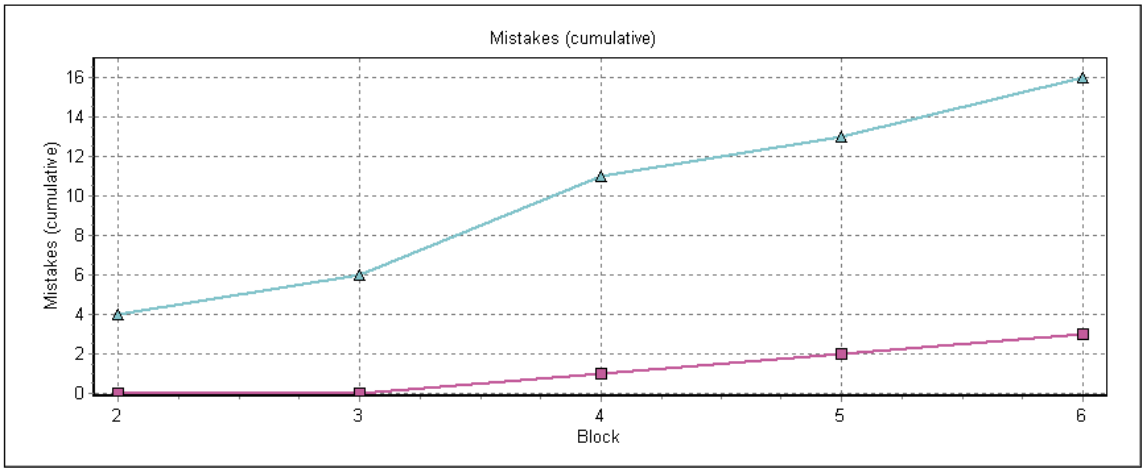

Fig. 8: Mistakes in blocks

Blocks

Block 1 is not shown because there can't be repetitions of words in block 1, because they are shown for the first time.

Median reac. time correct

This column describes the median value of the reaction time for the correct recognition of word repetitions.

Median reac. time mistakes

This column describes the median value of the reaction time of faulty marked repetitions.

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

Test parameter

You can find the settings for the test under which the screening was realized in the lower part of Fig. 7. See also the chapter "Implementation and duration of the test ".

Repetitions (correct)

This presents the total number of all word repetitions.

Presentation time per item

This presents the total fixed presentation time of a word.

Interstimulus interval

This is the fixed interval between the reaction to a word and the presentation of the next word.

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 verbal (recognition) memory must be assumed.

For the rehabilitation of the affected abilities, the RehaCom therapy modules **Memory for Words** and **Figural Memory** are suitable, because they work with the recognition method.

In therapy, encoding and retrieval strategies should be practiced (see RehaCom instructions on the use of memory strategies). For patients with serious memory disorders who are not able to take part and apply strategies for learning, the repetitive training makes little sense and should be replaced by the practice of compensatory aids (notes, lists, diary) and external environmental design.

3 Bibliography

Büenfeld, L. (1988). Entwicklung einer Testvariante zun 'Recurring-Figures-Test nach Kimura'. Aachen, Germany

Diener, H.-C., & Weimar, C. (2012). *Leitlinien für Diagnostik und Therapie in der Neurologie* (5th ed.) Stuttgart, Germany: Thieme Verlag.

D. Schellig, R. Drechsler, D. Heinemann, W. Sturm (Hrsg.) (2009). Handbuch neuropsychologischer Testverfahren, Hogrefe

Milner, B., & Kimura, D. (1964, April). Dissociable visual learning defects after unilateral temporal lobectomy in man. *35th Annual Meeting of the Eastern Psychological Association.*

Kimura, D. (1963). Recurring-Figures-Test. DK Consultants.

Prosiegel, M. (1988) *Psychopathologische Symptome und Syndrome bei erworbenen Hirnschädigungen, Neuropsychologische Rehabilitation*, Springer, Berlin

Schellig, D., Drechsler, R., Heinemann, D., & Sturm, W. (2009). *Handbuch neuropsychologischer testverfahren* (Vol. 1). Göttingen, Germany: Hogrefe.

Sturm, W. & Willmes, K. (1999). NVLT - Nonverbaler Lerntest. Tests Review. Göttingen, Germany: Hogrefe

Sturm, W. & Willmes, K. (1999). VLT - Verbaler Lerntest. Tests Review. Göttingen, Germany: Hogrefe

Thöne-Otto, A. I. (2009). Gedächtnisstörungen. In: Sturm, W., Herrmann, M., Münte, T. F. (Eds.) *Lehrbuch der klinischen Neuropsychologie*. 2. edition. Heidelberg: Spektrum Akademischer Verlag; 2009

Thöne-Otto & Markowitsch (2004). Gedächtnisstörungen. In: Flor, H., Gauggel, S., Lautenbacher, S., Niemann, H., & Thöne-Otto A.I. (Eds.)Fortschritte der Neuropsychologie (Vol 2.). Göttingen: Hogrefe

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