HASOMED

RehaCom®

Cognitive therapy

Calculations

www.rehacom.com

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 RehaCom module *Calculations* it is possible to improve the arithmetic abilities of the client, which are needed in many areas of daily life. The tasks to be solved are diversely structured. Depending on the type of disorder basic mathematical operations or complex tasks can be trained.
The mathematical basics include size comparison, quantity comparison, arranging of quantities, and basic arithmetic operations in different levels of difficulty.
Tasks for dealing with money and written addition and subtraction are intended for the training of complex mathematical problems.

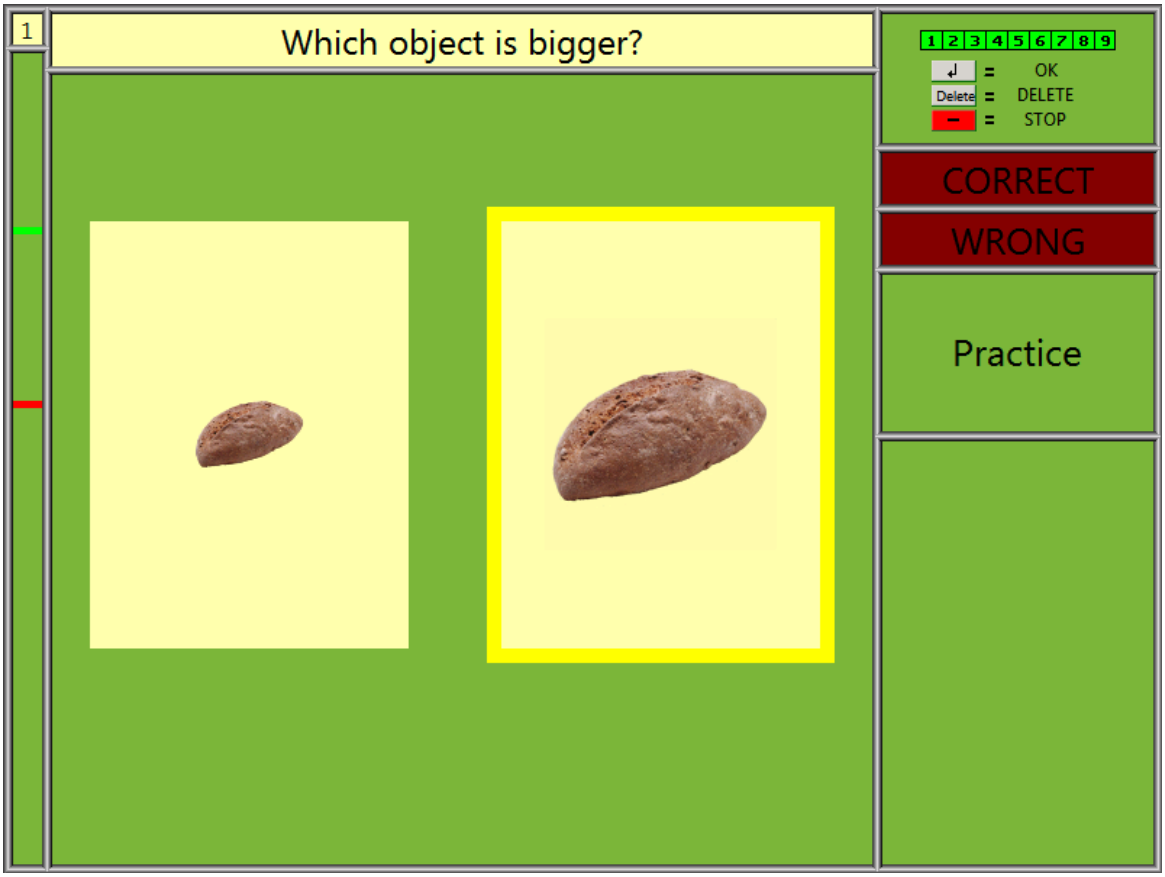
This training module can be operated using the mouse, a touchscreen, the RehaCom Keyboard or a standard computer keyboard. The setting of the input device occurs in the Parameter menu. The control elements differ in the different parts of the training and are further described in the following chapters.

The training consists of different task types. An overview is described in chapter Levels of difficulty.

Practice mode:
In order so make the client familiar with the requirements of the individual task types, a *practice mode* can be set in the Parameter menu.
If the parameter *practice* is enabled, it is explained at the beginning of every task type how to solve the tasks. This is done by guiding the client step by step through the task always showing what to do next.
The practice mode is not left, until 2 tasks are consecutively and correctly solved. All tasks processed in the practice mode are not included in the Performance analysis.

1.1.1 Compare objects size

Level 1 - Compare the size of the objects

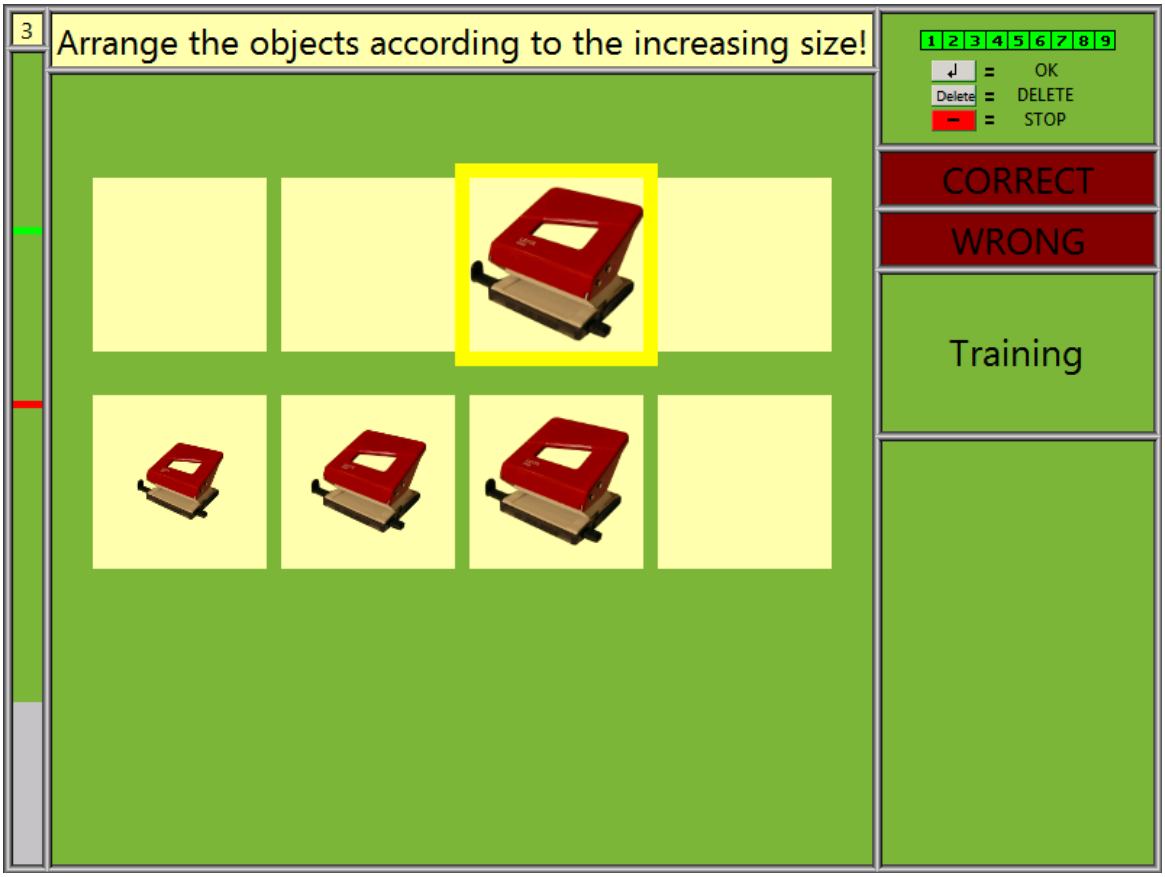


The aim of the task: Recognize and compare sizes

The task is to choose the larger object by moving the yellow frame to the correct side.
The frame can be controlled with the selected input device (mouse, touchscreen, RehaCom Keyboard or PC keyboard).
The task is completed with the OK-button.

1.1.2 Arrange objects by size

Level 2, 3 and 4 - Arrange objects by size

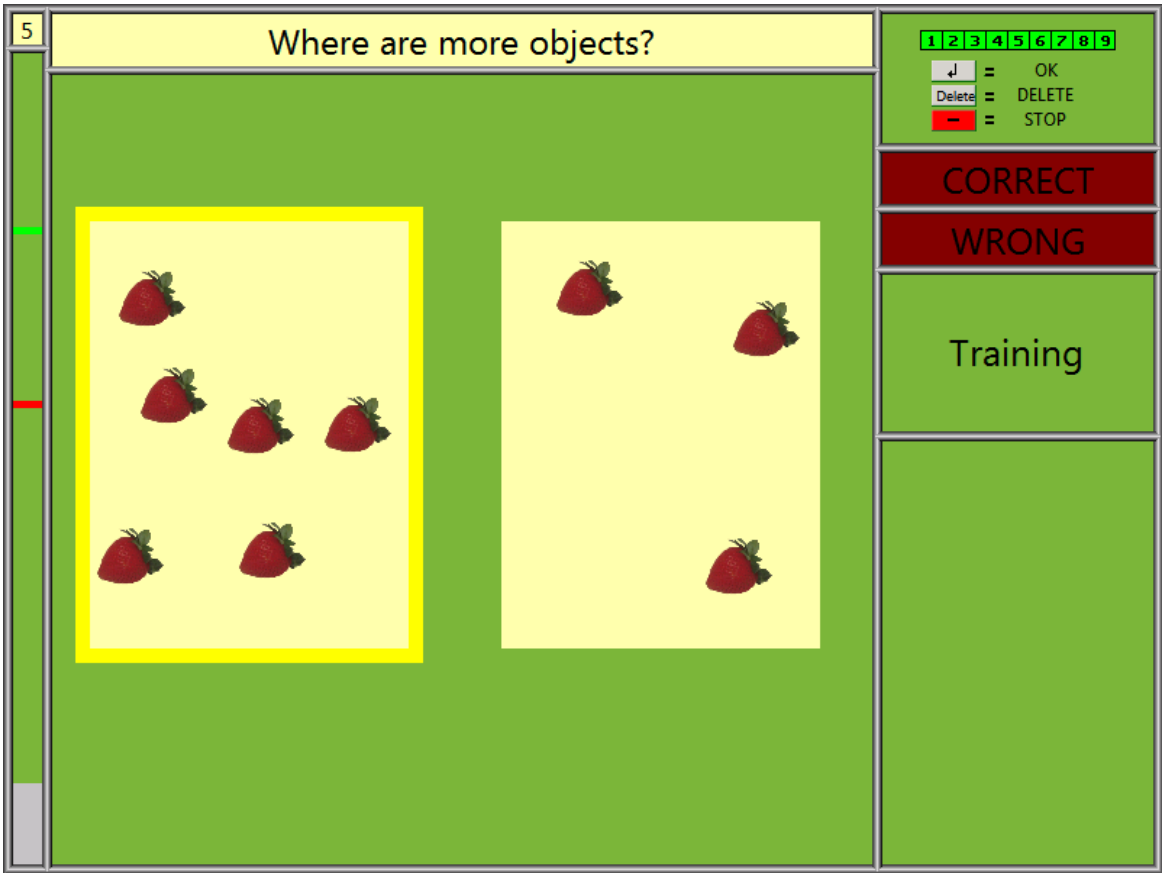


The aim of the task: Recognize, compare, and arrange sizes

To solve the task it is important to arrange different sized objects according to its size.
At the beginning the objects are shown randomly in the upper line.
The objects must be selected in the correct order and moved in the bottom line by pressing the OK-button.
By selecting an object in the bottom line and pressing the OK-button, this can be moved up again, and the entry is corrected.
If all objects are in the bottom line, the button "Ready" appears. The task is completed with this button and the OK-button.
The selection of the objects and the button "Ready" can be made using the mouse, the touchscreen, the RehaCom Keyboard or with the computer keyboard.

1.1.3 Compare quantities of objects

Level 5, 6 and 7 - Compare the amount of objects

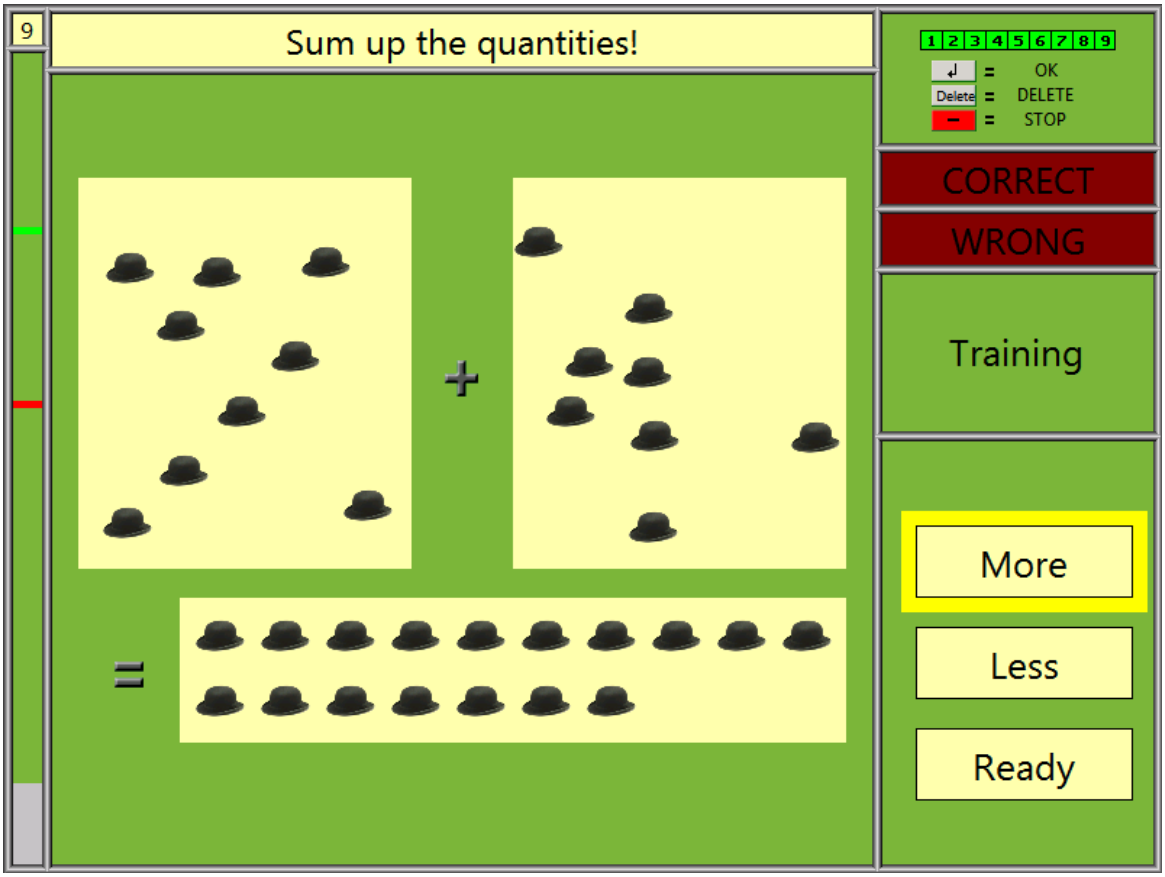


The aim of the task: Entry of quantities, recognize and compare quantities (count and estimate)

The task is to choose the larger quantity by moving the yellow frame to the correct side.
The frame can be controlled with the selected input device (mouse, touchscreen, RehaCom Keyboard or PC keyboard).
The task is completed with the OK-button.
The difficulty of the levels differs in the number of objects and in the differences of both quantities.

1.1.4 Add/Substract objects

Level 8, 9, 10 and 11 - Add / subtract objects

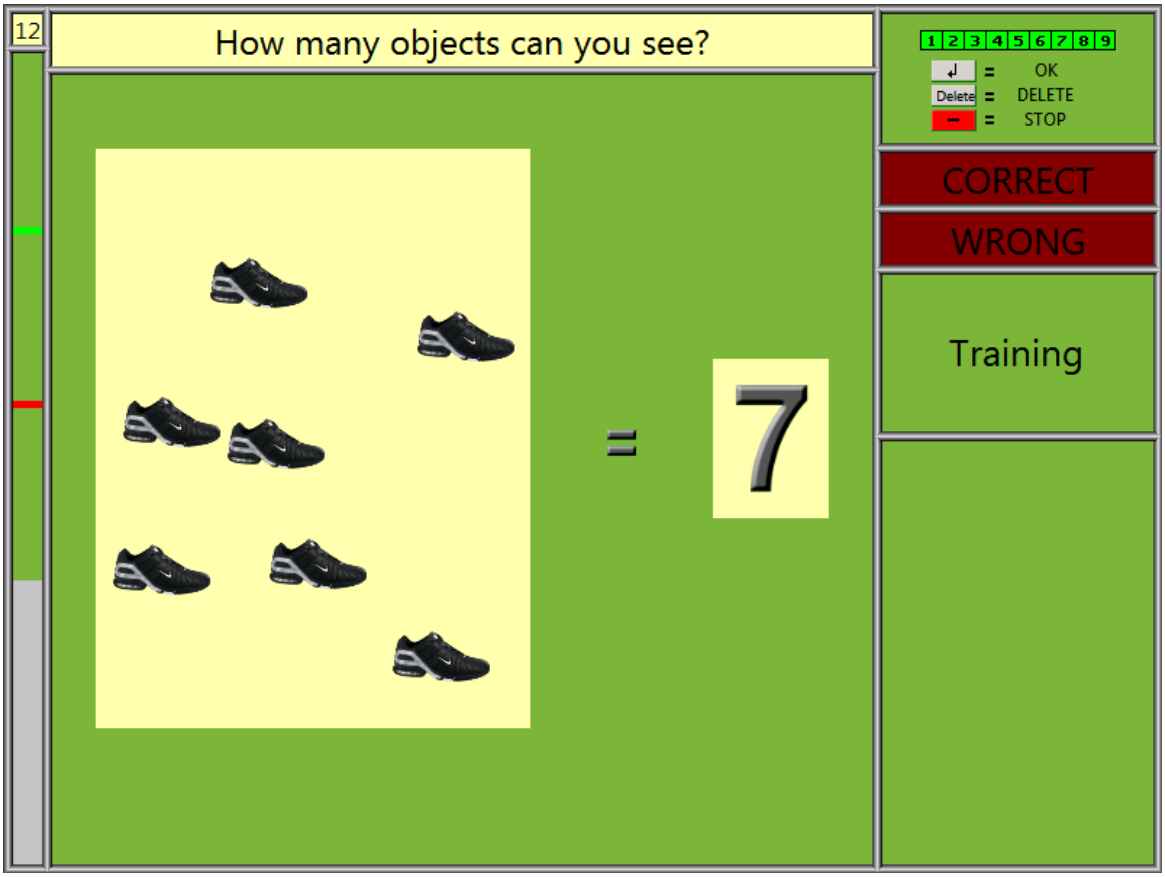


The aim of the task is: Learn basics of addition on the basis of quantities

The number of objects in the resulting quantity must be set in a way that it corresponds exactly to the sum or to the difference of both initial quantities.
In order to change the number of objects, the buttons "More" and "Less" and the OK-button should be used. After having entered the results, the task is completed with the button "Ready" and the OK-button.
The active button is indicated by the yellow frame.
The control of the frame can be made using the mouse, the computer keyboard, the RehaCom Keyboard or the touchscreen.

1.1.5 Count objects

Level 12 and 13 - Count objects

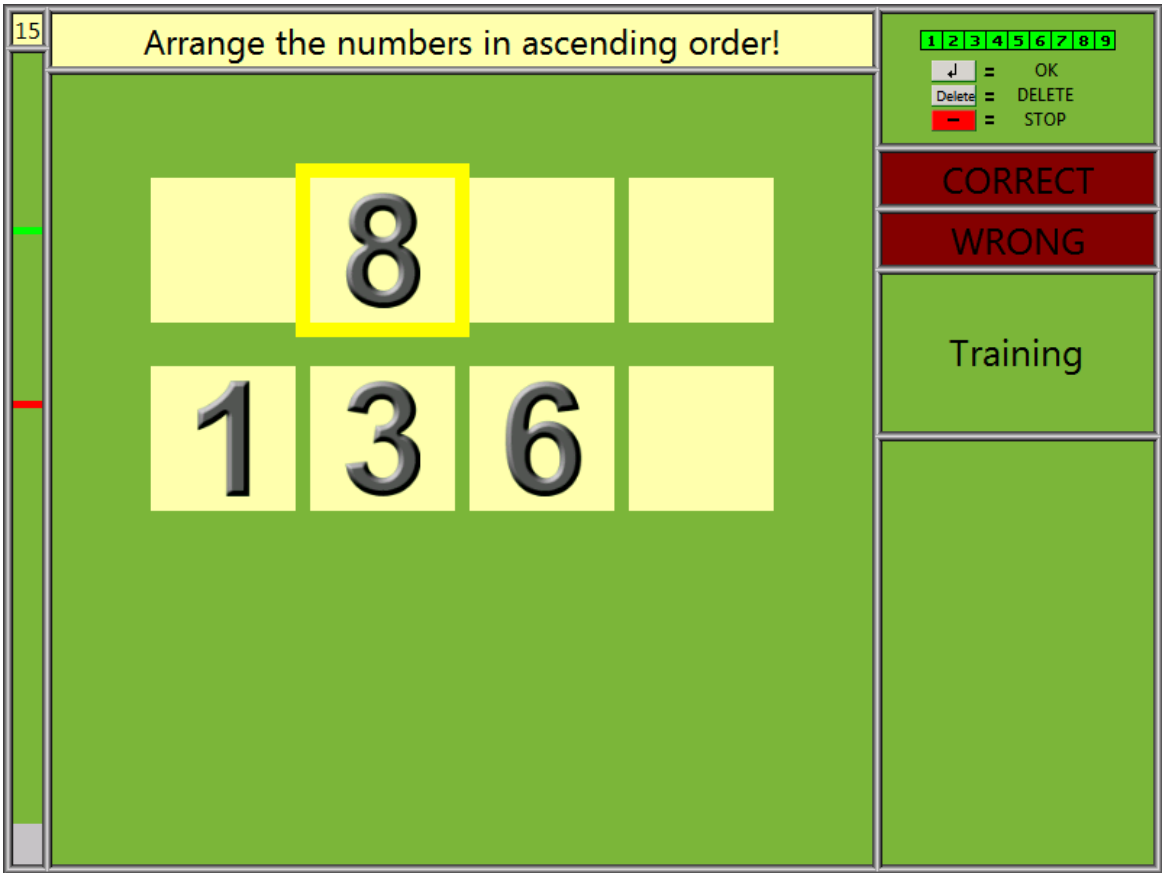


The aim of the task: Introduction of numbers

The task is to determine the number of objects and to enter it as a digit.
To enter the digit, it is necessary to use the numeric keypad on the right side.
The currently active numeric key is highlighted.
The selection of the active button can be made using the mouse, the computer keyboard, the touchscreen or the RehaCom Keyboard. With the OK-button or by clicking on the appropriate button, the current digit is added to the yellow results field.
Use the "Remove" button to delete the last entered number from the yellow results field.
After having entered the results, the task is completed with the button "Ready" and the OK-button.

1.1.6 Arrange numbers

Level 14, 15 and 16 - Arrange numbers

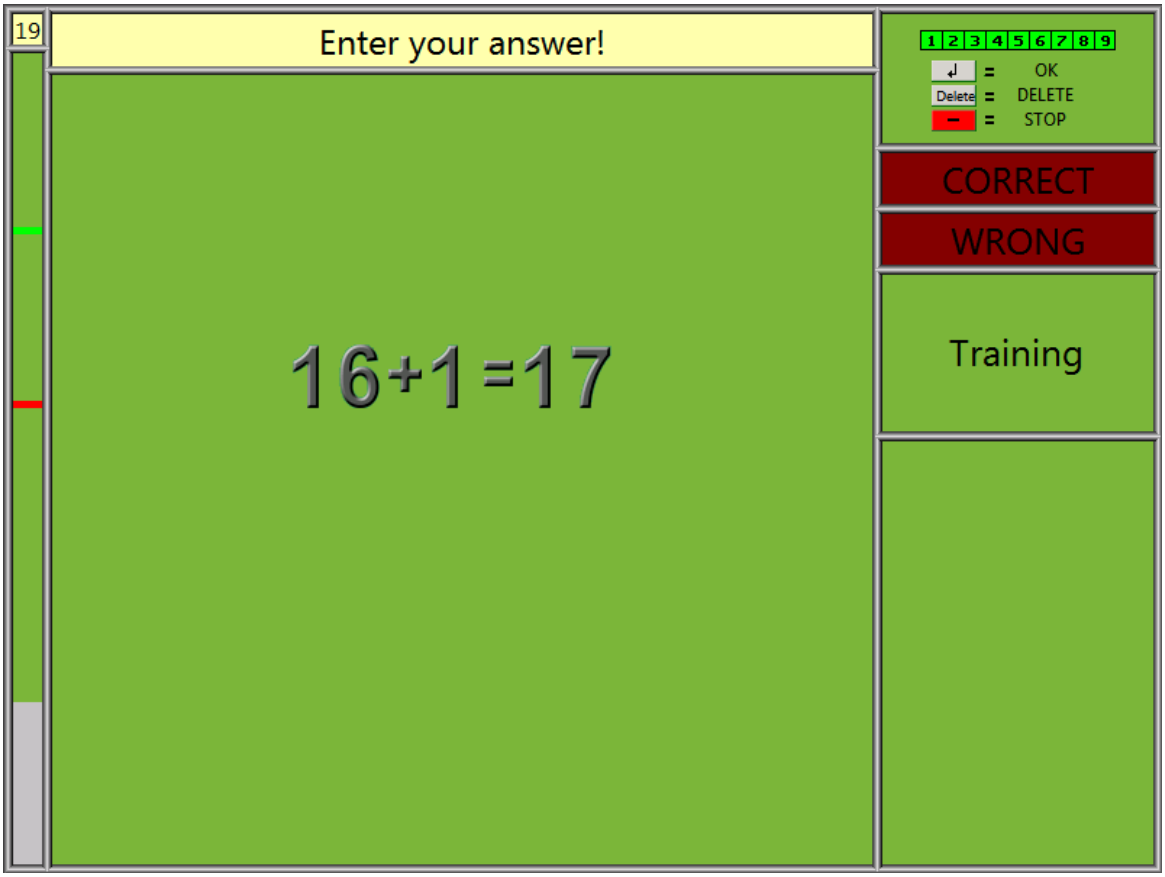


The aim of the task: Recognize the size of the numbers

To solve the task, numbers must be organized according to their size. At the beginning, the numbers are shown randomly in the upper line.
The numbers must be selected in the correct order. They are moved in the bottom line by clicking the OK-button.
By selecting a number in the bottom line and pressing the OK-button, this can be moved up again, and the entry is corrected.
If all objects are in the bottom line, the button "Ready" appears. The task is completed with that button and the OK-button.
The selection of the numbers and of the button "Ready" can be made using the mouse, the touchscreen, the RehaCom Keyboard or with the computer keyboard.
The difficulty of individual levels differs in the number of digits, which have to be arranged.

1.1.7 Addition/Subtraction mental arithmetic

Level 17, 18, 19, 20, 21 and 22 - Addition / subtraction mental arithmetic



The aim of the task: Solving simple additions and subtractions

The task is to solve addition and subtraction tasks by means of mental arithmetic.
To enter the result, it is necessary to use the numeric keypad on the bottom right side or directly the computer keyboard.
The currently active numeric key is highlighted.
The selection of the active button can be made using the mouse, the computer keyboard, the touchscreen or the RehaCom Keyboard.
With the OK-button or by clicking on the appropriate button, the current digit is added to the results field.
Use the "Remove" button to delete the last entered number from the results field.
After having entered the results, the task is completed with the button "Ready" and the OK-button.

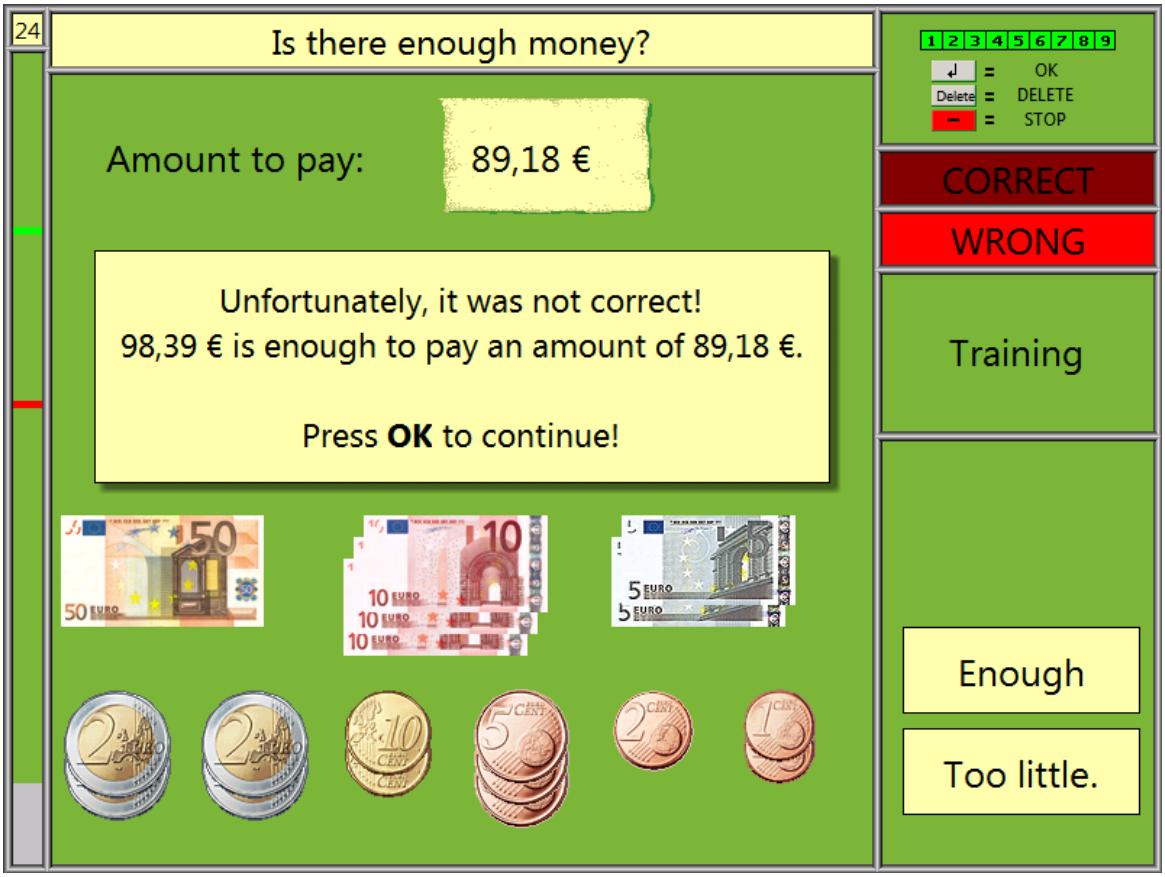
1.1.8 Is there enough money

Level 23, 24, 25 - Is there enough money for paying?

The aim of the task: Enter the amount of money and recognize its value

The task is to check whether the given invoice amount, which is displayed in the upper part, can be payed with the bills and coins in the lower part or not.
The decision can be confirmed with the buttons "Enough" and "Too little" and it is completed with the OK-button.
The currently active button is indicated by a yellow frame.
The selection of the buttons can be made using the mouse, the computer keyboard, the touchscreen and the RehaCom Keyboard.

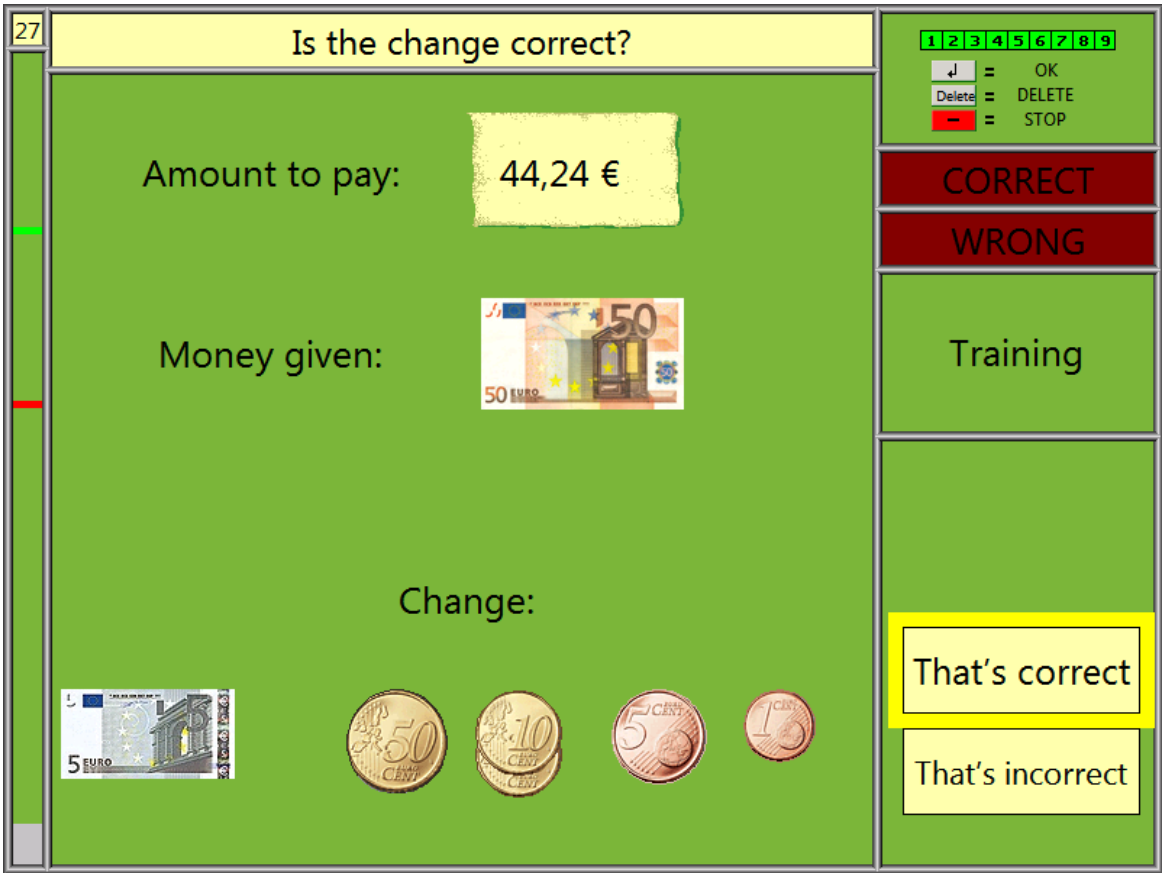
If an answer was incorrect, a feedback shows why the decision was wrong.



This feedback is intended to encourage the client to recalculate.

1.1.9 Check change

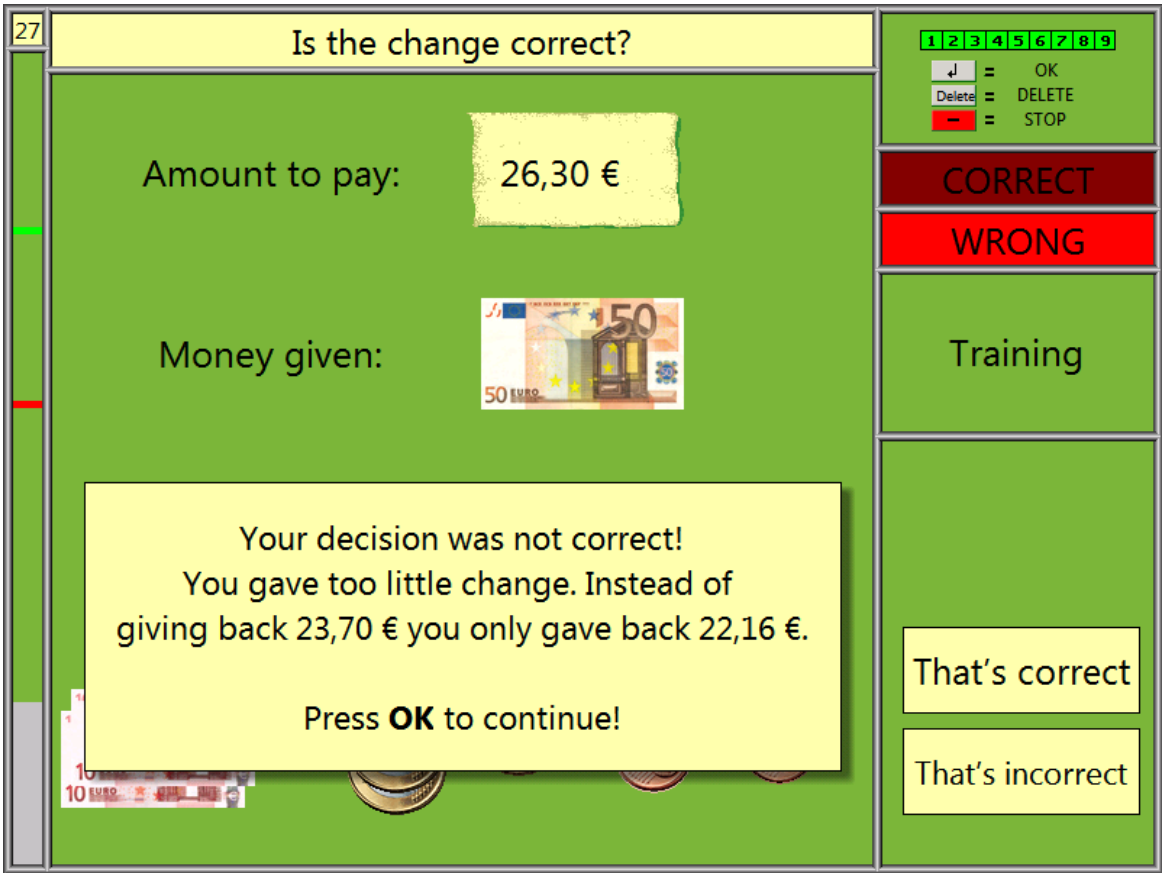
Level 26, 27 and 28 - Check change



The aim of the task: Exercise everyday skills in shopping (passive)

In the upper part of the window, an invoice amount is displayed. Below it, the money is shown, which is given to pay the invoice amount.
It is to decide whether the change, which is shown below, is correct.
The decision can be inserted by the buttons "That's correct" and "That's incorrect" and it is completed with the OK-button.
The currently active button is indicated by a yellow frame.
The selection of the buttons can be made using the mouse, the computer keyboard, the touchscreen and the RehaCom Keyboard.

If an answer was incorrect, a feedback shows why the decision was wrong.



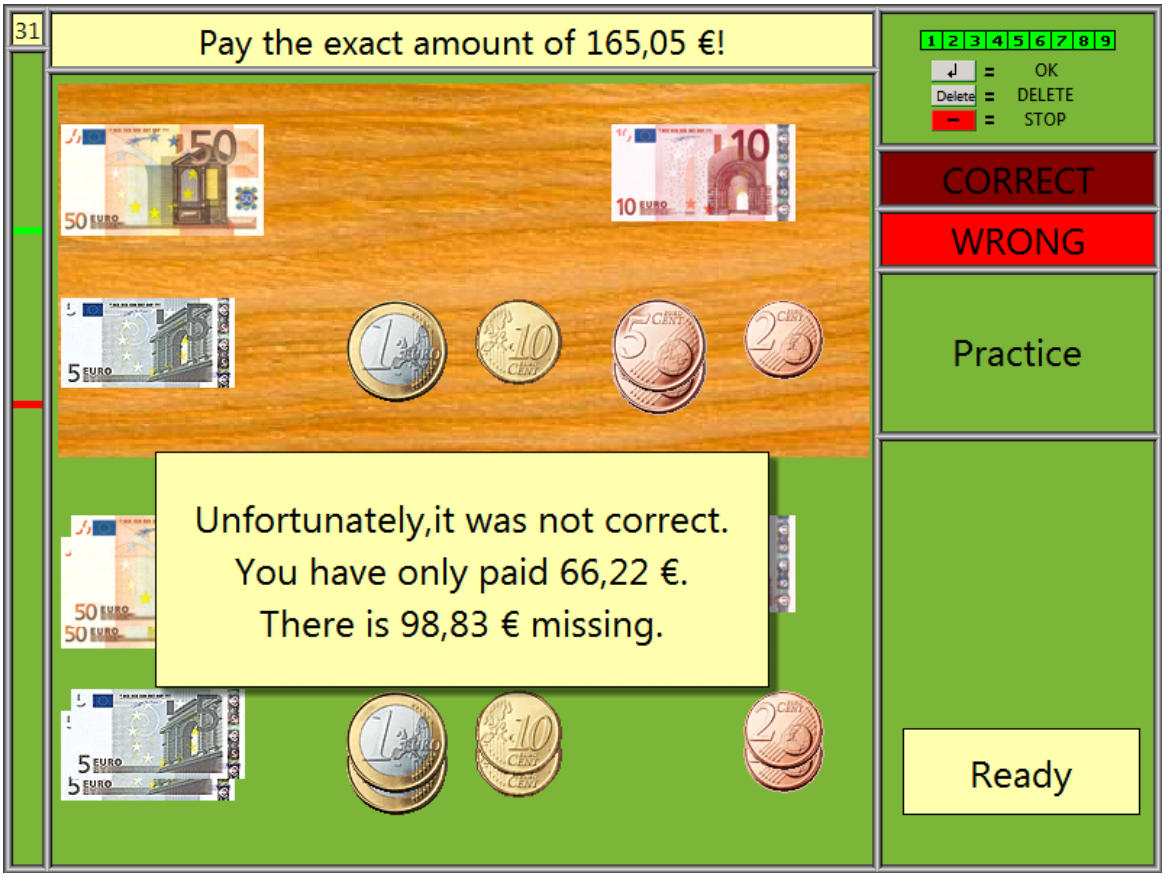
1.1.10 Pay the exact amount

Level 29, 30 and 31 - Pay the exact amount

The aim of the task: Exercise everyday skills in shopping (active)

The task is to exactly pay the invoice amount, which is shown in the upper half.
The available coins and bills are displayed in the bottom half of the window.
To pay the invoice amount, the appropriate coins and bills are moved to the "counter" in the upper half of the window.
To put a coin or bill on the "counter", it must be selected with the yellow frame and then moved with the OK-button. In the same way, a coin or a bill can be removed from the "counter".
The control of the frame can be made with the mouse, the computer keyboard, the touchscreen or the RehaCom Keyboard.
Once the correct amount is on the "counter", the task must be completed with the button "Ready" and the OK-button.

If the answer was incorrect, a feedback shows the difference to the correct amount, so the client is encouraged to recalculate.



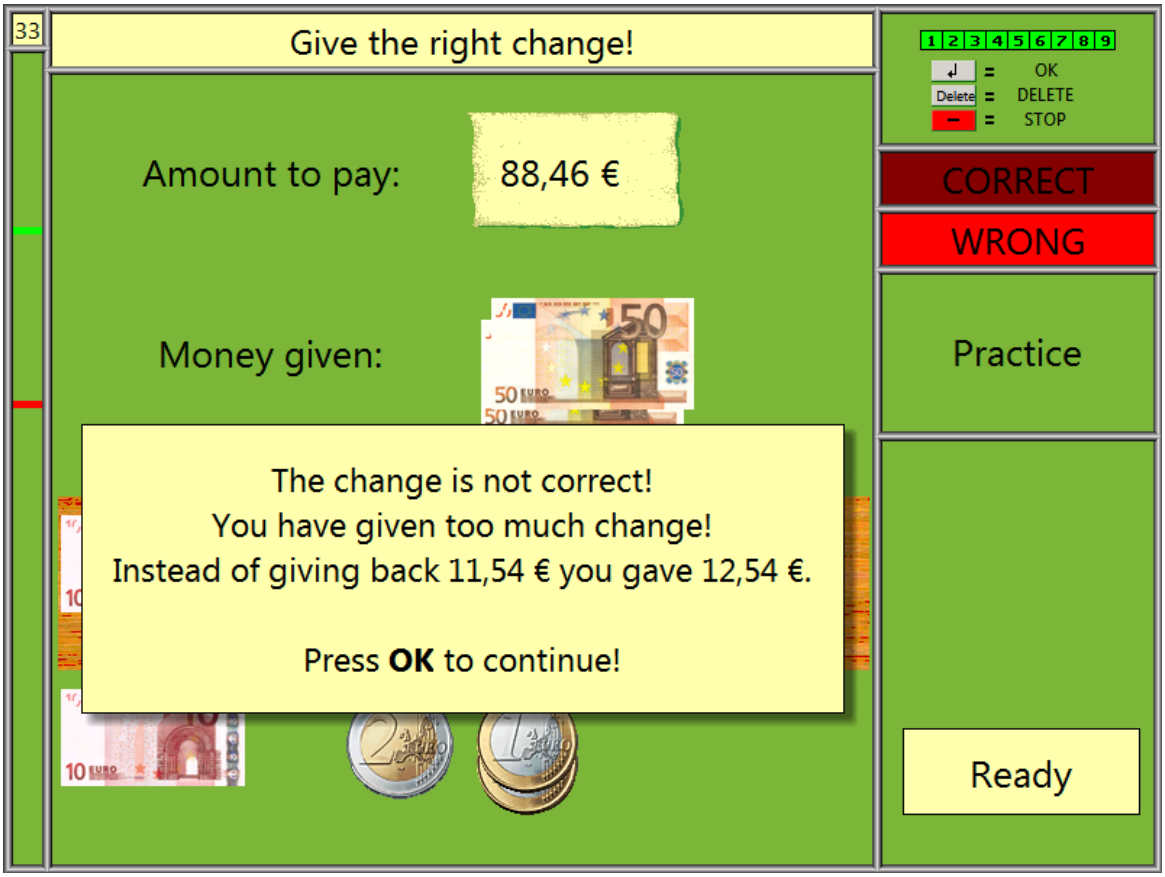
1.1.11 Give change

Level 32, 33 and 34 - Give change

The aim of the task: Exercise enhanced skills in handling money

An amount of money is given, which was paid with a certain bill.
To solve the task, it is necessary to put the exact amount of change on the "counter".
The bills and coins, which are available as change, are displayed on the bottom line.
To put a coin or bill on the "counter", it must be selected with the yellow frame and then moved with the OK-button.
In the same way, a coin or a bill can be removed from the "counter".
The control of the frame can be made using the mouse, the computer keyboard, the touchscreen and the RehaCom Keyboard.
After the correct amount of change is on the "counter", the task is completed with the "Ready"or OK-button.

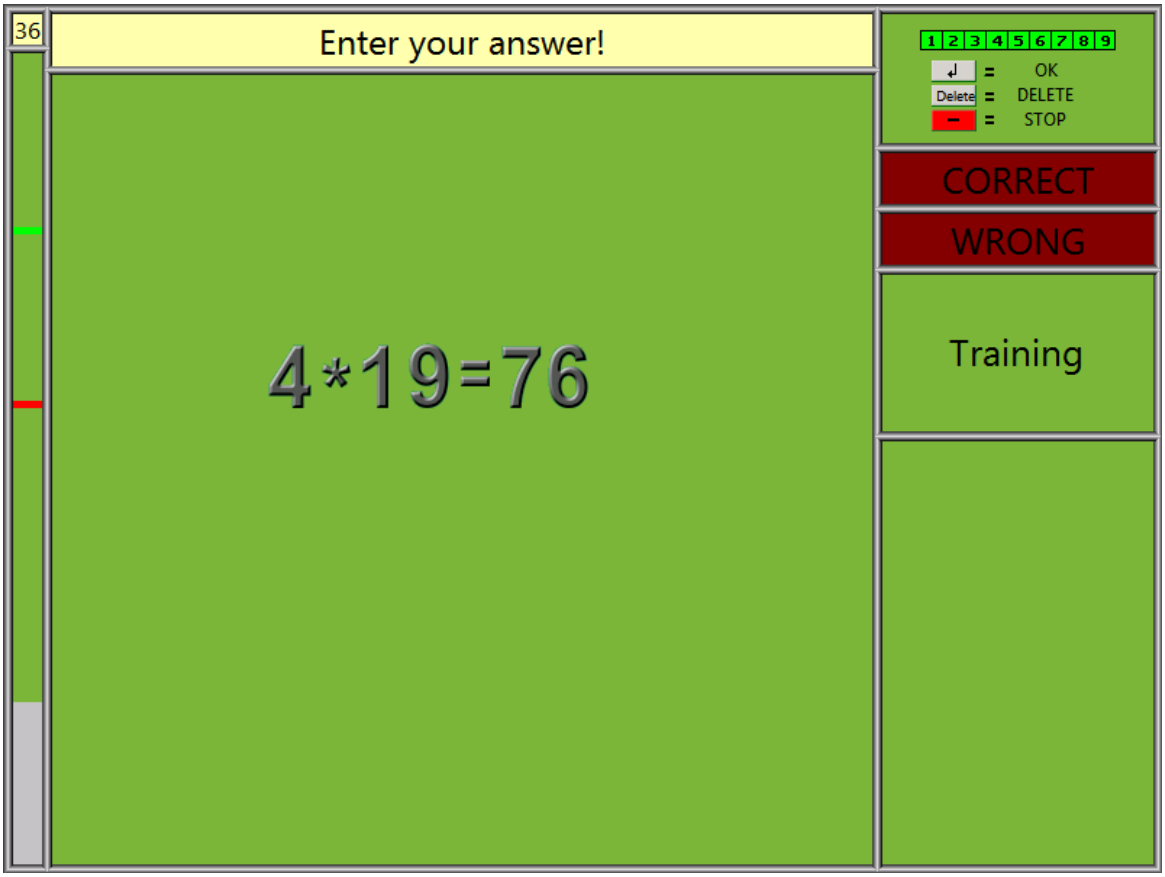
If the answer was incorrect, a feedback shows, which amount of money would have been correct and which amount was actually given back.



This feedback is intended to encourage the client to recalculate, to achieve a learning effect, even if an incorrect answer was given.

1.1.12 Multiplication/Division mental arithmetic

Level 35, 36, 37 and 38 - Multiplication and division mental arithmetic

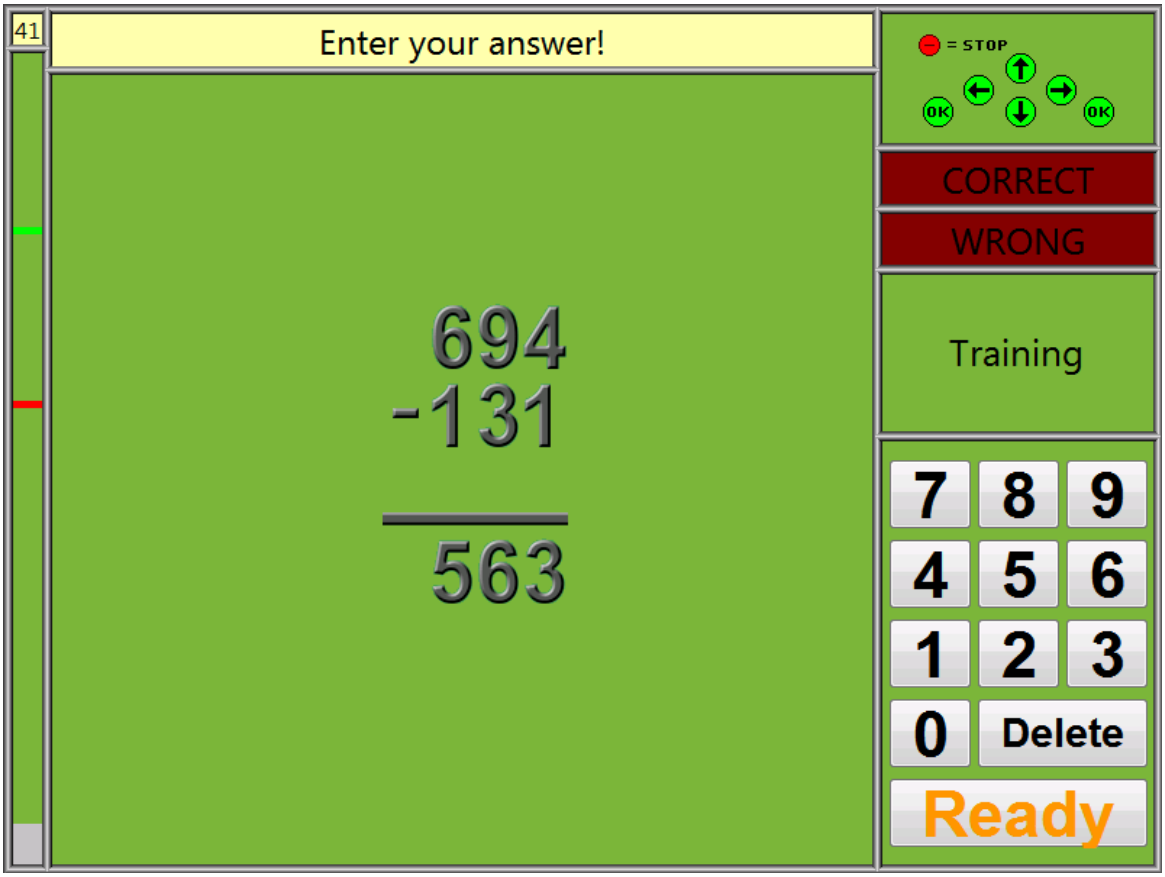


The aim of the task: Exercise of multiplication and division

The task is to solve multiplication and division task in the mind.
The result can be inserted, either directly via the computer keyboard or using the numeric keypad.
The numeric keypad appears only, when the control with the mouse, the touchscreen or the RehaCom Keyboard is set in the parameter menu.
To select a number from the numeric keypad, the arrow keys or the mouse is used.
The active numeric key is highlighted.
The corresponding digit is added to the result field with the OK-button.
With the button "Delete", the entered digit can be erased from the result field.
After the result was entered completely, the task must be completed with the "Ready" and the OK-button.

1.1.13 Written addition/subtraction

Level 39, 40, 41 and 42 - Written addition and subtraction



The aim of the task: Exercise written addition and subtraction

The task is to solve addition and subtraction tasks in writing.
Each digit is entered individually in the result.
If the option *With carry* is selected in the Parameter menu, the carry for each column is queried. Whether a carry or a figure is expected, can be recognized by the position of the flashing cursor.
The result can be inserted, either directly via the computer keyboard or using the numeric keypad. The numeric keypad appears only, when the control with the mouse, the touchscreen or the RehaCom Keyboard is set in the parameter menu.
To select a number from the numeric keypad, the arrow keys or the mouse is used. The active numeric key is highlighted.
The corresponding digit is added to the place of the flashing cursor with the OK-button.
With the button "Delete", the entered digit can be erased from the result field.
After the result was entered completely, the task must be completed with the "Ready" and the OK-button.

1.2 Performance feedback

The performance feedback of the module *Calculations* happens visually and, if desired, acoustically. The acoustic feedback can be en- or disabled by the therapist in the parameter menu (see Training parameter).
An error tone signals incorrect answers, if the acoustic feedback is enabled. The visual feedback occurs via big fields named "Correct" or "Incorrect". They flash for a short time after every completed task . The "Correct" field flashes in green and the "Incorrect" field flashes in red.
In the task type "Sort objects or numbers by size" the correct order is shown, even the incorrect answer was given, to achieve a learning effect.

Furthermore, a performance bar is available. With each correct solved task a grey bar increases on the left edge of the screen. When it reaches the red mark (see Parameter Level down), the previous performance is enough to continue training in the same level. When the column goes beyond the green mark (see Parameter Level up), the degree of difficulty is increased in the next task.

In the top right of the screen, the current level is shown.

After every level, the client is informed about its performance. This indicates, whether the client remains training in the same level due to its performance, or continues in a more difficult / easier level.

It is important to note that the client has the possibility to prepare itself for the next task in a special practice mode without performance evaluation and therefore without pressure to perform. The proceeding of solving this tasks is described step by step. The practice mode can be enabled in the parameter menu (see Training parameter).

1.3 Levels of difficulty

Each level consists of different task types, which are described in detail below.

Level 1:
Task type : Compare the size of the objects
Level 1: On the screen two identical but different sized objects are displayed. The bigger one has to be selected.
Level 2, 3 and 4:
Task type: Arrange the objects according to the increasing size
Level 2: Arranging of three objects according to the size in the proper order.
Level 3: Arranging of four objects according to the size in the proper order.
Level 4: Arranging of five objects according to the size in the proper order.
Level 5, 6 and 7
Task type: Compare two quantities with each other
Level 5: Compare two quantities of maximum six objects with each other. The difference is at least three objects.

Level 6: Compare two quantities of maximum six objects with each other. The difference is less than three objects.
Level 7: Compare two quantities of maximum six objects with each other.
Level 8 and 9
Task type: Add objects
Level 8: Add two quantities of objects to a total sum, in which the total number of the objects is less than 10.
Level 9: Add two quantities of objects to a total sum, in which the total number of the objects is less than 20.
Level 10 and 11
Task type: Subtract objects
Level 10: Subtract two quantities of objects from each other and form a total sum. The number of objects in the second quantity (minuend) is less than 10.
Level 11: Subtract two quantities of objects from each other and form a total sum. The number of objects in the second quantity (minuend) is less than 20.
Level 12 and 13
Task type: Count object
Level 12: The number of objects in a quantity (maximum 10) must be determined and entered as a number.
Level 13: The number of objects in a quantity (maximum 20) must be determined and entered as a number.
Level 14, 15 and 16
Task type: Arrange numbers
Level 14: Arranging three digits according to its size in proper order.
Level 15: Arranging four digits according to its size in proper order.
Level 16: Arranging five digits according to its size in proper order.
Level 17, 18 and 19
Task type: Addition mental arithmetic
Level 17: Mental arithmetic - Addition of two numbers, in which the result is less than 10.
Level 18: Mental arithmetic - Addition of two numbers, in which the result is less than 20.
Level 19: Mental arithmetic - Addition of two numbers, in which the result is less than 100.
Level 20, 21 and 22
Task type: Subtraction mental arithmetic
Level 20: Mental arithmetic - Subtraction of two numbers, in which both operators and the result is less than 10
Level 21: Mental arithmetic - Subtraction of two numbers, in which the result is less than 20.
Level 22: Mental arithmetic - Subtraction of two numbers, in which the result is less than 100.
Level 23, 24 and 25
Task type: Is there enough mone for paying
Given is an amount of money in coins and bills and an invoice amount. The task is to check whether the amount of money is sufficient to pay the invoice amount.
Level 23: The invoice amount is less than 50€.

Level 24: The invoice amount is less than 200€.
Level 24: The invoice amount is less than 1500€.
Level 26, 27 and 28
Task type: Check the change
An invoice amount, a certain amount of money to pay and the change are given. The task is to check whether the change is correct.
Level 26: The invoice amount is not greater than 30€.
Level 27: The invoice amount is not greater than 100€.
Level 28: The invoice amount is not greater than 1000€.
Level 29, 30 and 31
Task type: Pay an invoice amount appropriately
The task is to pay an invoice amount appropriately from a stock of coins and bills.
Level 29: The invoice amount is less than 100€.
Level 30: The invoice amount is less than 1000€.
Level 31: The invoice amount is less than 1500€.
Level 32, 33 and 34
Task type: Give the exact amount of change
An invoice amount and a certain amount of money to pay the bill are given. The task is to select the difference as change from a stock of coins and bills.
Level 32: The invoice amount is less than 20€.
Level 33: The invoice amount is less than 200€.
Level 34: The invoice amount is less than 1000€.
Level 35 and 36
Task type: Multiplication mental arithmetic
Level 35: Multiplication of two numbers. Both factors are less than 10.
Level 36: Multiplication of two numbers. One factor is less than 10 and the other one is less than 20.
Level 37 and 38
Task type: Division mental arithmetic with integer result
Level 37: Division between two numbers. The dividend is between 1 and 100 and the divisor between 1 and 9.
Level 38: Division between two numbers. The dividend is between 1 and 200 and the divisor between 1 and 99.
Level 39 and 40
Task type: Written addition
Level 39: Written addition of 2 numbers. The summands are between 10 and 999.
Level 40: Written addition of 2 numbers. the summands are between 10 and 9999.
Level 41 and 42
Task type: Written subtraction
Level 41: Written subtraction of 2 numbers. Minuend and subtrahend are between 10 and 999.
Level 42: Written subtraction of 2 numbers. Minuend and subtrahend are between 10 and 9999.

The training level always increases, when the required number of tasks, which corresponds to the set percentage in level change up, are correctly solved in the training. The level change upwards occurs independent of the task type.

When the number of the right solved tasks is less than the number, which corresponds to the set percentage in level change down, the training level is reduced and the tasks get easier. Thereby, it can be set in the Parameter men, whether the level change down also changes the task type.
If the task type change is not selected, training goes on in the same degree of difficulty in case of level change down, if the next lower level correspondents to a different task type. In the case that the task type change is selected the easiest level of the next task type is set.
Example: in case of a level change down with task type change, level 23 (is there enough money for paying) will become level 17 (addition mental arithmetic - easiest level).

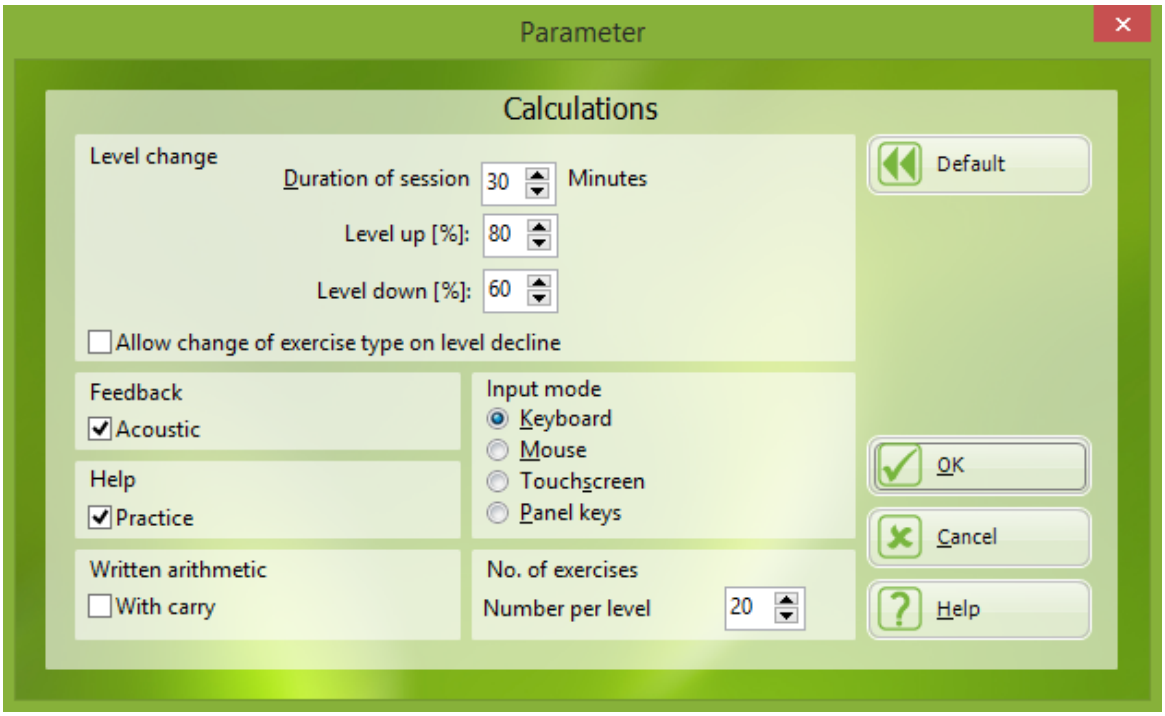
In the following chart the structure of the level change is shown. The possible task type changes are marked in blue.

Start level	Level up	Level down without task type change	Level down with task type change
1	2	1	1
2	3	2	1
3	4	2	2
4	5	3	3
5	6	5	2
6	7	5	5
7	8	6	6
8	9	8	5
9	10	8	8
10	11	9	9
11	12	10	10
12	13	12	8
13	14	12	12
14	15	14	12
15	16	14	14
16	17	15	15
17	18	17	14
18	19	17	17
19	20	18	18
20	21	19	19
21	22	20	20
22	23	21	21
23	24	23	17
24	25	23	23
25	26	24	24
26	27	26	23
27	28	26	26
28	29	27	27
29	30	29	26
30	31	29	29
31	32	30	30

Start level	Level up	Level down without task type change	Level down with task type change
32	33	32	29
33	34	32	32
34	35	33	33
35	36	35	32
36	37	35	35
37	38	36	36
38	39	37	37
39	40	39	35
40	41	39	39
41	42	40	40
42	42	41	41

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 in the following. On the picture below, the parameter menu is shown.



Individual parameters are further described below.

Duration of session in minutes:
We recommend a length of 20 - 30 minutes. The training is automatically finished after the set training time elapsed.

Level up/ Level down in %:
The parameter *Level up* determines the percentage of the tasks, which have to be solved correctly in order to reach the next higher level. When this value is increased, the change to the next higher level becomes more difficult.
The next lower level starts, when the number of correctly solved tasks is below the percentage, which is set in the parameter *Level down*. The value of the parameter *Level down* has to be set smaller than the value of the parameter *Level up.*

Allow change of exercise type on level decline:
If this option is selected, the task type might change when the level shifts downwards. The change of the task type always takes place, when the performance in the lowest level of a task type was not sufficient to keep on training in the current level.
The change is made to the easiest level of the new task type.
When this option is disabled, the lowest level of a task type is preserved in case of a level change down.

Feedback / acoustic:
This parameter defines whether the optical feedback is supported by an error tone in case a task is solved incorrectly.

Help / practice:
The practice mode is described more detailed in chapter Training task.

Input mode - PC keyboard / mouse / touchscreen or RehaCom Keyboard:
With these parameters the input device is selected, which is used for training. Basically, all task types can be operated with all input devices. It depends on the motor abilities of the client and on the equipment of the workplace which input device is the most appropriate.

Written arithmetic / with carry:
If this option is enabled, the entry of the carry as a help for the client in the tasks of level 39-42 is activated.

Number of tasks per level:
With this option, the number of tasks to be solved in a level is set.

Default values:
When newly defining a client, the system automatically uses the following default values:

Duration of session	30min
Level up	80%
Level down	60%
Exercise type change allow level upwards	Off
Feedback acoustic	On

Practice	On
Input mode	Keyboard
Written arithmetic / with carry	Off
Number of exercises per level	20

1.5 Data analysis

Various possibilities of analyzing the data in order to find strategies how to continue the training 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
Exercise type	Task type
No. exercises	Number of tasks
Correct	Number of correctly solved tasks
Correct with checking	Number of solved tasks at 2nd or 3rd try (calculating with numbers)
Mistakes	Number of incorrectly solved tasks
Min. react. time correct/ mistakes	Minimum duration for solving a single task (correct/ incorrect solutions) in [ms]
Median react. time correct/ mistakes	Average duration (median) for solving a single task (correct/ incorrect solutions) in [ms]
Max. react. time correct/ mistakes	Maximum duration for the solution of the task in all tasks (correct and incorrect solutions) in [ms]
Min. react. time correct	Minimum duration for solving a single task (correctly solved tasks) in [ms]
Median react. time correct	Average duration (median) for solving a single task (correctly solved tasks) in [ms]
Max. react. time correct	Maximum duration for solving a single task (correctly solved tasks) in [ms]
Train. time task	Effective duration of the training in [h:mm:ss]
Breaks	Number of breaks caused by the client

This makes it possible, to indicate certain problems to the client.
Specific information on the current or on all training consultations can be printed.

2 Theoretical concept

2.1 Basics

In this help file only the following sections are available in English:

- **Training task**
- **Performance feedback**
- **Levels of difficulty**
- **Training parameters and**
- **Data analysis.**

Der Umgang mit Zahlen und Rechenoperationen ist im täglichen Leben ein wichtiger Faktor, um selbstständig und ohne fremde Hilfe bestimmte Dinge leisten zu können - sei es der Umgang mit Geld oder das Ablesen der Uhrzeit. In fast in allen Bereichen werden arithmetische Fähigkeiten benötigt.
Eine Beeinträchtigung im Umgang mit Zahlen und mit Rechenoperationen stellt die Betroffenen in der Gesellschaft heute vor erhebliche Probleme.

Patienten, die an Arithmasthenie (engl. Dyscalculia) leiden, haben im Allgemeinen Schwierigkeiten beim Ausführen einfacher Rechenoperationen bei normaler Gesamtintelligenz (Teilleistungsschwäche). Rechenschwäche tritt zum Beispiel beim Gerstmann-Syndrom auf. Dieses wird durch eine Läsion im Bereich des Gyrus Angularis der dominanten Großhirnhirn Hemisphäre hervorgerufen.

Eine mögliche Unterteilung der Rechenschwäche stellt sich folgendermaßen dar:

1. Störungen im Aufbau von Zahlen und Mengenbegriffen. Zum Beispiel wird die Zahlenfolge nicht beherrscht, grafisch ähnliche Ziffern werden vertauscht oder die Zuordnung eines Zahlwortes zu einer Menge gelingt nicht. Oft ist diese Art der kognitiven Beeinträchtigung mit Schwierigkeiten bei Vergleichen räumlicher oder zeitlicher Art verbunden.
2. Störungen im Aufbau der mathematischen Beziehungen. Zeichen und Bedeutungen der Rechenoperationen (+, -, x, :) werden nicht verstanden oder vertauscht.
3. Störungen beim Verständnis der mathematischen Beziehungen. Quantitative Beziehungen in der Realität können nicht in mathematische Beziehungen umgewandelt werden oder bei der Anwendung von mathematischen Operationen werden systematische Fehler gemacht.

Mögliche Ursachen für die Rechenschwäche kann man in zwei Gruppen unterteilen.
Störungen im basalen Bereich:

- Probleme in der visuellen oder akustischen Wahrnehmung
- Probleme in der visuomotorischen Koordination
- Probleme in allgemeinen kognitiven Fähigkeiten
- Störungen im pränumerischen und arithmetischen Bereich:
  - Probleme beim Aufbau des Mengen und Zahlenbegriffs

- Falsche Vorstellungen von mathematischen Operationen
- Wissens und Verständnislücken in der Anwendung von Rechenoperationen

Das mathematische Denken gehört zu den höheren psychologischen Leistungen, die auf Grundlagen der visuellen Anschauung, der räumlichen Vorstellung und der Koordination von Rechts/Links beruhen. Praktische Studien haben ergeben, dass Arithasthenie sowie Störung der visuellen Anschauung und räumlichen Wahrnehmung durch spezielles Training positiv beeinflussbar sind. Dabei ist zu beachten, dass die Schritte des Erwerbs von arithmetischen Fähigkeiten einzeln isoliert trainiert werden sollen.
Die Arithasthenie beim Patienten tritt oft verbunden mit einer Lese Rechtschreib Schwäche (LRS) auf. Arithmetisches Denken erfordert höchste Abstraktion. Vorraussetzung dafür ist ein Ablösen vom Konkreten.

Diese Fähigkeit kann man erst erlangen, nachdem der Umgang mit realistischen Sachverhalten erlernt wurde. Dafür sind die unteren Schwierigkeitsstufen des Rechentrainings vorgesehen, zum Beispiel Vergleiche zwischen großen und kleinen Gegenständen, Mengenvergleiche (Anzahl von Gegenständen), Beziehungen zwischen der Größe von Gegenständen (ordnen der Größe nach).
Nachdem die basalen Fähigkeiten für das arithmetische Denken vorhanden sind, muss beim Patienten als nächste Stufe das Verständnis vom Zahlenbegriff erzeugt werden. Dazu sind eine Reihe von Aufgabentypen vorgesehen. Bevor der Zahlenbegriff als solches erfasst werden kann, müssen Beziehungen wie größer und kleiner, weniger und mehr sowie gleich und ungleich erfasst werden. Dazu sind im Rechentraining mehrere Aufgaben mit Mengenvergleichen enthalten.

Die Addition und Subtraktion von Mengen zu einer Gesamtmenge ist als Vorstufe zum Umgang mit Zahlen und den Grundrechenoperationen wichtig. Bei vielen Patienten mit Rechenschwäche fehlt die Fähigkeit, den Zusammenhang zwischen einer Menge von Gegenständen und einer Zahl herzustellen. Diese Fähigkeit ist aber für den Umgang mit Zahlen und arithmetischen Operationen unerlässlich. Deshalb wird im Rechentraining der Umgang mit dem Zahlbegriff und dessen Bedeutung für das mathematische Verständnis trainiert.
Die Einführung der Grundrechenarten Addition und Subtraktion mit Zahlen erfolgt, nachdem der Umgang mit Mengen mit Gegenständen trainiert wurde.
Komplexe Aufgaben werden beim Rechentraining als realitätsnahe Sachaufgaben im Umgang mit Geld gestellt. Dabei erhöht sich der Schwierigkeitsgrad der Aufgaben und damit der erforderliche Rechenaufwand für den Patienten.

Zuerst muss der Patient nur entscheiden, ob ein Geldbetrag ausreicht um einen Rechnungsbetrag zu bezahlen. Es handelt sich um eine Entscheidung zwischen "Reicht" oder "Reicht nicht". Dabei muss die Beziehung zwischen zwei Geldbeträgen geprüft werden. Diese Aufgaben dienen dazu, die erworbenen Fähigkeiten aus den vorherigen Schwierigkeitsstufen (Grundrechenarten) auf die Sachaufgaben mit Geld zu übertragen.
Bei den Aufgaben der nächsten Schwierigkeitsstufen soll geprüft werden, ob das Rückgeld stimmt. Diese Aufgabenstellung ist komplexer, weil die Beziehung

zwischen drei Geldbeträgen geprüft werden muss. Am Ende der realitätsnahen Sachaufgaben mit Geldbeträgen müssen dann bestimmte Summen selbstständig aus einem Pool von Münzen und Scheinen zusammengestellt werden. Solche Aufgaben erfordern zusätzlich basale Aufmerksamkeitsleistungen und kognitive Leistungen im Bereich des Kurzzeitgedächtnisses.
Die schriftlichen Additions- und Subtraktionsaufgaben sind zur Festigung der ereichten Ergebnisse im Bereich der Grundrechenarten und zum Konzentrationstraining vorgesehen.

2.2 Training aim

In this help file only the following sections are available in English:

- **Training task**
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Mit dem Rechentraining sollen die arithmetischen Fähigkeiten des Patienten verbessert werden. Das betrifft sowohl die Grundlagen der kognitiven arithmetischen Fähigkeiten als auch den Umgang mit komplexen mathematischen Aufgaben. Die Schulung des quantitativen Denkens ist Grundvoraussetzung für das Verständnis und die Anwendung von arithmetischen Regeln.
Zu den basalen arithmetischen Fähigkeiten gehören der Umgang mit Größenvergleichen oder der Vergleich von Mengen. Außerdem soll die Fähigkeit, eine Beziehung zwischen einer Menge und der dazugehörigen Zahl herzustellen, vermittelt werden.
Für die Verbesserung der Selbständigkeit in der Gesellschaft ist allerdings das Lösen von komplexeren mathematischen Problemen notwendig. Nachdem die Grundlagen für das arithmetische Denken gefestigt sind, soll anhand von Beispielaufgaben der Umgang mit Geld trainiert werden. Die Lösung solcher Aufgaben verlangt den kombinierten Einsatz der vorher erworbenen Fähigkeiten.

Dadurch werden zusätzlich sowohl die Aufmerksamkeit und Konzentration als auch das Kurzzeitgedächtnis trainiert.
Der Einsatz der schriftlichen Addition und Subtraktion verfolgt die gleichen Ziele wie die Sachaufgaben mit Geld. Durch das ausdauernde Training mit den komplexeren Aufgaben soll die Sicherheit im Umgang mit Zahlen und Rechenoperationen gefördert werden. Ein weiteres Ziel des Trainings ist der Erwerb der Fähigkeit zur Kontrolle und Korrektur der eigenen Ergebnisse.

2.3 Target groups

In this help file only the following sections are available in English:

- **Training task**
- **Performance feedback**
- **Levels of difficulty**
- **Training parameters and**
- **Data analysis.**

Das Trainingsverfahren Rechentraining wurde für Patienten mit Beeinträchtigungen der arithmetischen kognitiven Fähigkeiten entwickelt. Diese kognitiven Funktionsstörungen können sehr vielfältig sein.
Sie reichen von eingeschränkten basalen Störungen wie dem fehlerhaften Einschätzen von Größen und Mengen über Probleme bei der Anwendung der Grundrechenarten bis hin zu Schwierigkeiten im Lösen von komplexen mathematischen Problemen.
Für Patienten mit grundlegenden kognitiven Störungen sind Aufgaben mit Größen- und Mengenvergleichen von realen Gegenständen vorgesehen. Hier werden grundlegende Fähigkeiten für das mathematische Verständnis trainiert.
Für Patienten mit Störungen im Umgang mit grundlegenden mathematischen Operationen sind Aufgaben der Mengenaddition und Subtraktion enthalten. Die erworbenen Fähigkeiten können mit Additions- und Subtraktionsaufgaben mit Zahlen gefestigt werden.
Auch für Patienten, die Probleme der Übertragung der mathematischen Grundoperationen auf komplexere Aufgabenstellungen haben, sind im Rechentraining Aufgaben enthalten. Diese Trainingsgruppe beinhaltet zum Ersten Aufgaben, die den Umgang mit Geld in realistischen Aufgabenstellungen (z.B. Rückgeld prüfen oder passend bezahlen) trainieren und zum Zweiten Aufgaben der schriftlichen Addition und Subtraktion.

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