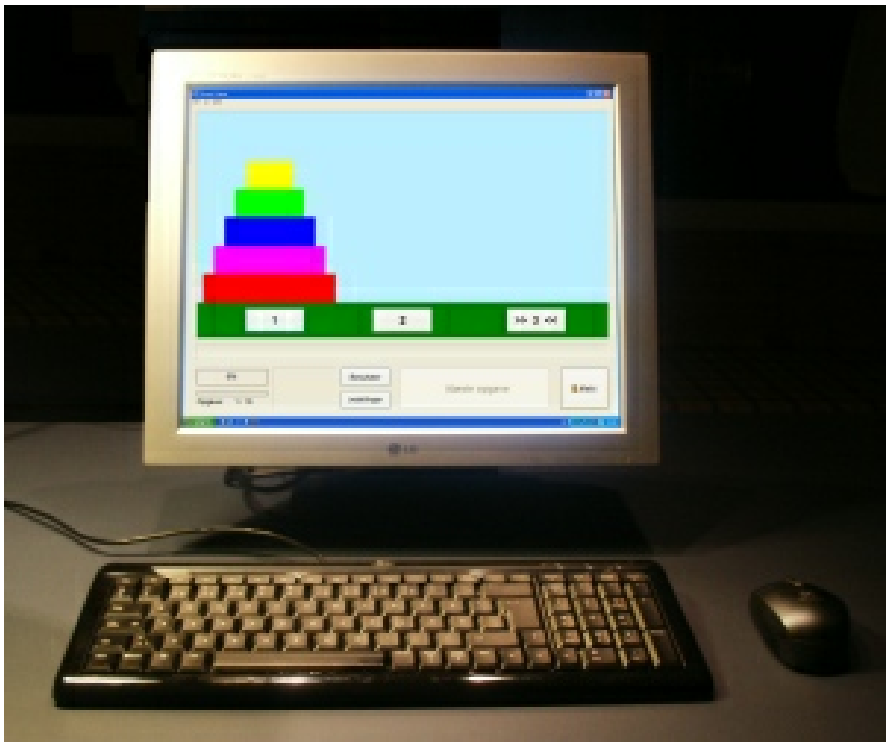
COGNIsoft-I

User Manual



Version 5.0

1 Introduction

1.1 Purpose

COGNIsoft-I consists of a series of 12 programs developed for the *cognitive rehabilitation of persons with brain injuries and brain diseases*. The programs are primarily suited to target the needs of victims with *closed head trauma* (e.g. after traffic accidents). However, some of the programs are also useful when it comes to the rehabilitation of patients suffering from *stroke*, *multiple sclerosis* and *other brain diseases* . Finally, some of the programs have specifically been designed to target the rehabilitation of symptoms that are most often seen in stroke, like *visual hemineglect*.

A compromise between user friendliness and flexibility was sought during the development of these programs. Increased program flexibility has complicated the use of these programs, as an unavoidable consequence. However, program flexibility is important, as users are likely to function at very different levels with regards to the speed and complexity of which they can cope with, as well as the level of cuing that they may need. Thus, it is due to the flexibility of these programs, that they can be used for persons with mild, as well as severe cognitive impairments.

There are no materials for cognitive rehabilitation that can replace a thorough neuropsychological assessment, as well as planning for the single patient or client. COGNIsoft programs are of no exception. They may, however, constitute a useful part of a comprehensive rehabilitation program (that should also include an assessment of the emotional state and social skills of the participant).

1.2 What can be trained

Simple and sustained attention can be trained by using Moving Lines.

Simple memory span and working memory can be trained by using Four Digits, Many Digits and Missing Digit.

Sustained attention or *concentration* can be trained, in particular, by using Serial Addition and Go, no-go. There is some evidence to suggest that this type of function can, to some extent, be rehabilitated directly.

Visual attention and *visual hemineglect* can be trained by using Spatial Addition, Visual

Scanning and Design Copy. Moving Lines, involving a single line moving in from the left or at random from both sides, may also be useful here. It is uncertain as to whether or not hemineglect can be trained directly. However, the programs may at least be able to help increase the patients' awareness of the neglect, a prerequisite for compensatory training of real life tasks.

Visuo-constructional and *other spatial abilities* can probably be trained by using Design Copy. Whether it is actually possible to train such abilities is not known. Neither is it known what the practical implications are for real life tasks.

Planning and *problem solving* are some of the so-called *executive functions* that can be impaired by prefrontal brain lesions. They can be trained by using Tower of Hanoi and Hidden Code. However, these programs are probably not going to be of any help if the user is not supervised. The therapist must demonstrate active involvement by supporting and developing verbal strategies during the tasks.

Deficient control of impulses, *stimulus dependency* and *perseverations* are other types of *dysexecutive symptoms* that can be seen after prefrontal lesions. They can be trained by using Right-left and Go, no-go. Furthermore, Moving Lines creates a demand for the user to hold back his response until the lines are on target.

Sense of time can also be impaired by prefrontal brain lesions. It can probably be trained by using Moving Lines, since the task requires response initiation a short while before the lines hit the target.

1.3 System requirements

Operating system

COGNIsoft-I v. 5.0 will work with any of the following versions of Microsoft Windows: XP, Vista and Windows 7.

Computer

The hardware requirements of COGNIsoft-I are very modest. At least 15 MB of free space on the hard disc is needed to install the programs. The display has to have at least 800 x 600 pixels. COGNIsoft-I will adapt to almost any display sizes that are above 800 x 600, and it works well with widescreens. It is recommended that the speakers be connected to the computer, although most of the programs have visual feedback in addition to oral feedback.

1.4 Installation and removal

Put the CD-ROM into the CD-drive. Installation will start automatically in most cases. If not, then double-click the 'My computer' icon on the desktop or in the Start-menu. Then, double-click the icon for the CD-ROM. Finally, double-click the icon for the Setup program on the CD.

Removal is done within the Windows' Control Panel: Add/remove programs or Remove a program.

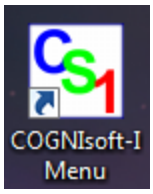
1.5 Password

A password is included as part of the program package or it is supplied after purchase on the web. The password should be entered after one of the training programs is started for the first time. It will not be asked for again. It is important that the password be kept for later reference, should the need for reinstallation, further support, or free or discounted upgrade, arise.

2 Common functions

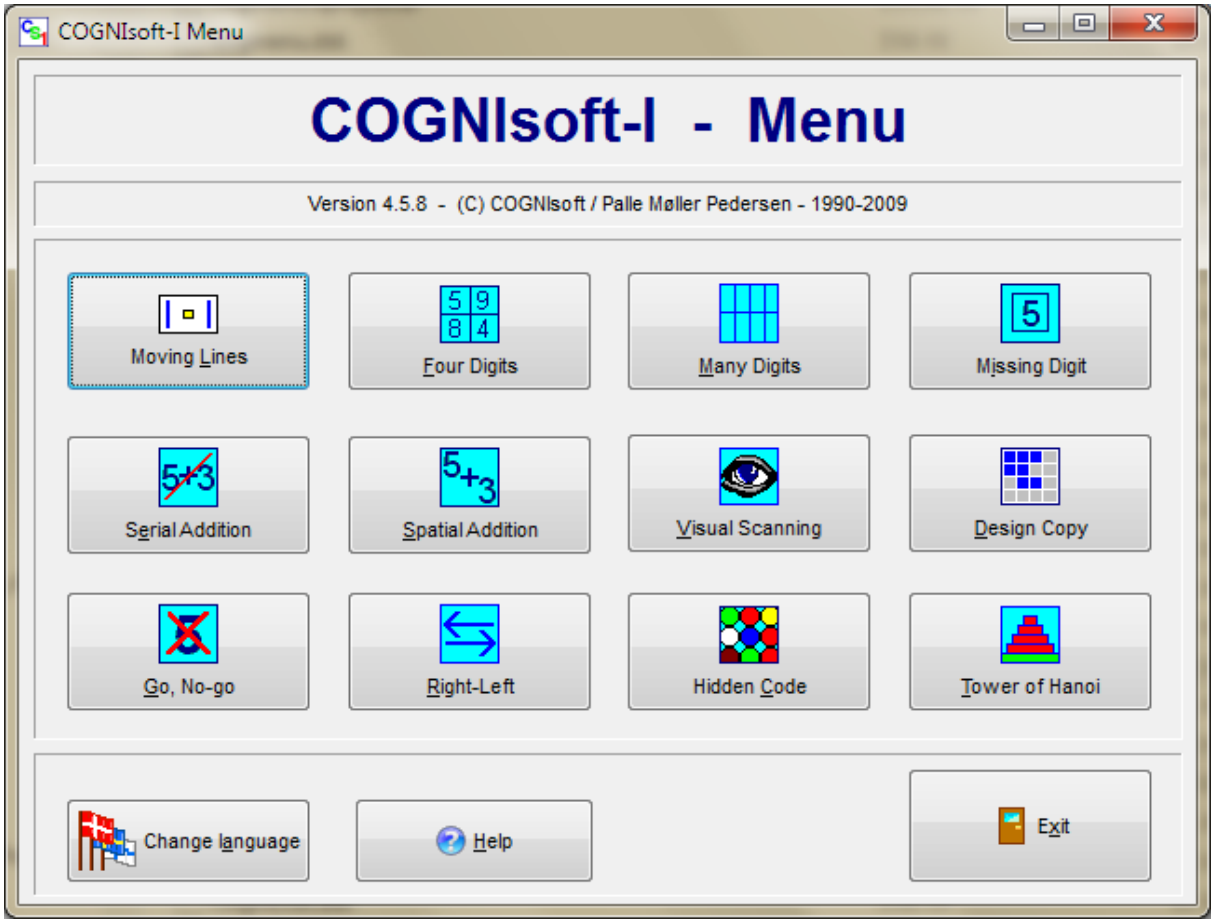
2.1 Menu program

The COGNIsoft-I Menu program can be started by clicking the icon on the desktop or in the Windows Start Menu:

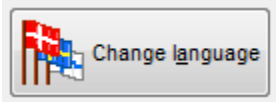


All the rehabilitation programs have their own shortcuts in the Windows Start Menu: Start | Programs | COGNIsoft-I. This way, they can be stated individually.

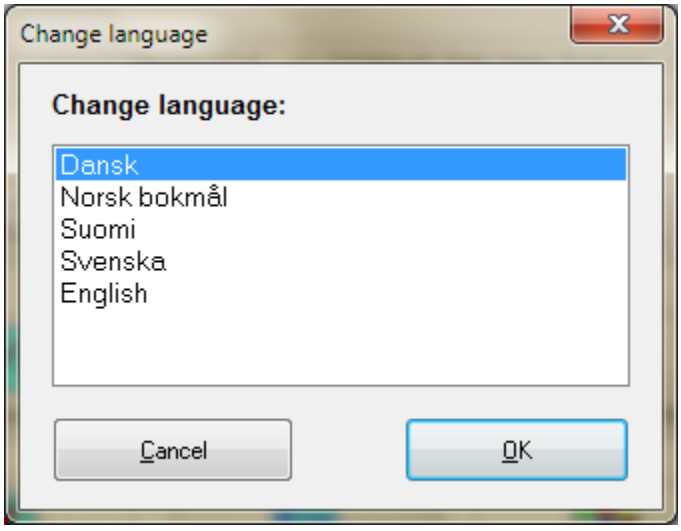
Every individual training program can be started by clicking the buttons on the menu program window:



If you want to change the language used in the menu program, the training programs, as well as the online help, click this button:

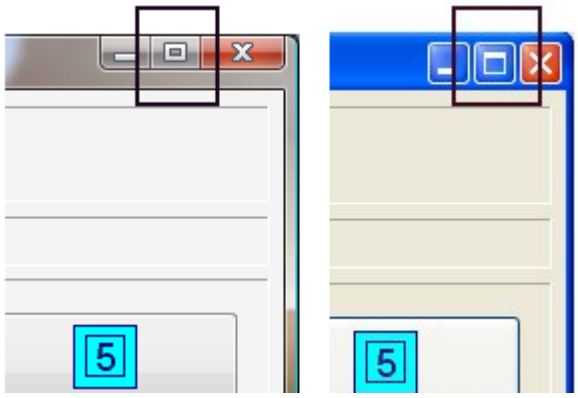


When this button is clicked, a window displaying the available languages (of the current version) will appear.



2.2 Use the entire display

All COGNIsoft-I programs are able to maximize their windows in order to fill the entire display. They can do so with any display size and dimension, including widescreen displays. Click on the middle of the three small buttons situated in the upper right-hand corner of the window frame. Here is how it will look with 1) Windows Vista and 7, and 2) Windows XP:



In most cases, it is preferable to let the program windows fill the entire display. In this way, the user will not get distracted by any irrelevant information. To restore a smaller window size, click again the middle button in the upper right-hand corner of the window frame.

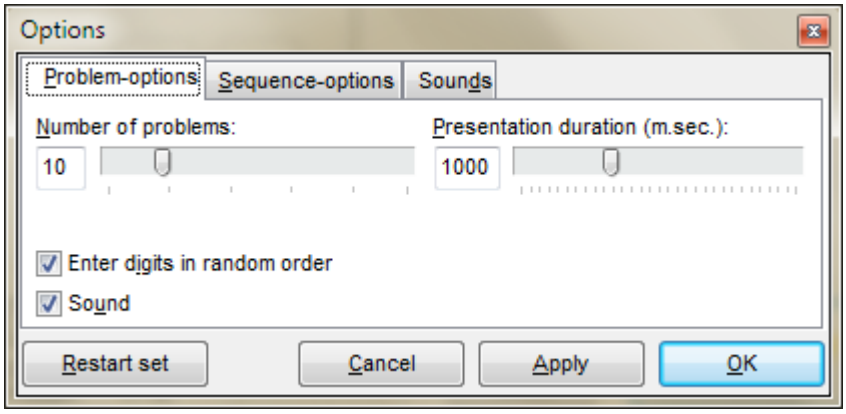
It is possible to resize the window by placing the curser on the window border, and then by holding the left mouse button down whilst dragging it. There is a limit as to how small the window display can be adjusted.

If the menu-program comprises a maximized window, the training program will start with a maximized window. The maximized window status will be kept and used the next time the programs are started.

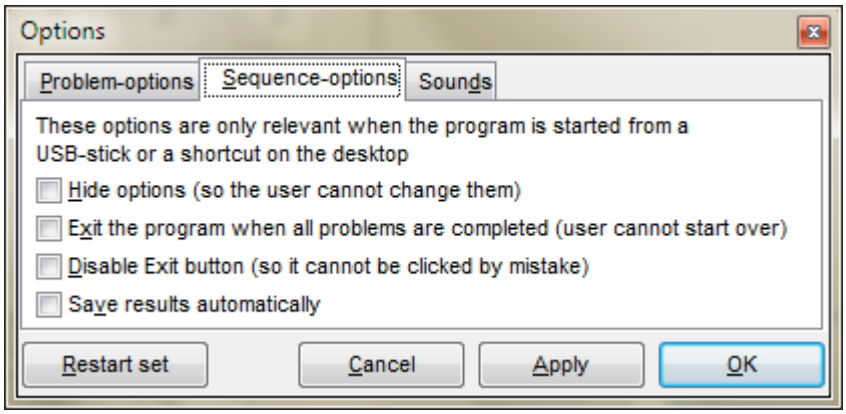
2.3 Options

All of the programs are designed to allow you to change a number of options. When the "Options" button is clicked (or the Options submenu in the Show menu is chosen), an options window will be shown.

It is possible, on the ***first tab***, to set the number of tasks, as well as to choose whether or not sounds are played after correct and erroneous responses have been entered. Most of the rehabilitation programs also include specific options, like "Enter digits in random order".



It is possible, on the ***second tab***, to set the options so that the program can be started either from a shortcut (on the desktop) or from a USB-stick (using the Home-training add-on program that can be purchased separately):

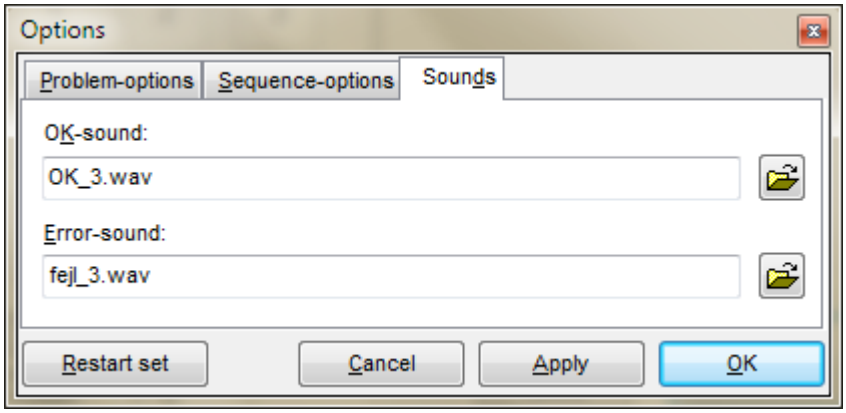


You may set the following options on this tab:

1. Hide options: ensures that the user cannot easily change the options.
2. Exit the program when all problems are completed: ensures that the program will exit after the last problem in the set.
3. Disable exit button: ensures that the user will not be able to accidentally exit the program by clicking the Exit button.
4. Save results automatically: ensures that the results are saved automatically after all of the problems have been completed. This is useful for when the user is working alone. His performance will then be evaluated at a later time.

It is possible, on the ***third tab***, to change the sounds that are played as feedback for

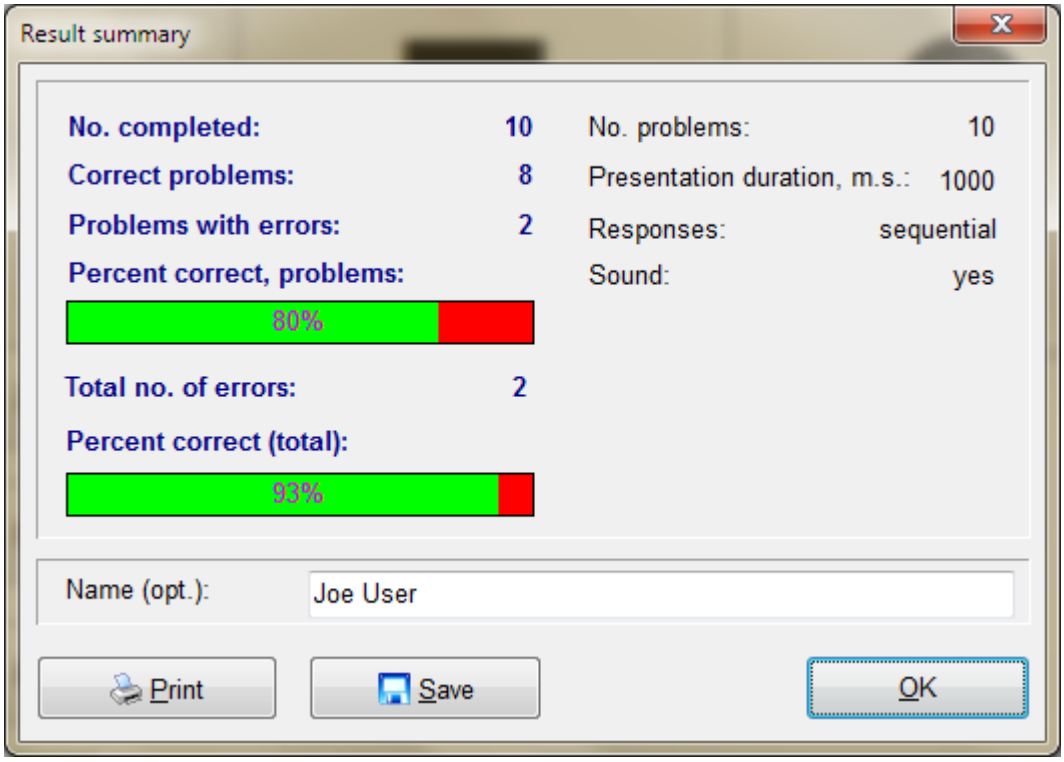
whether a problem has been solved correctly or not. If the sound file is located in the same folder as the program, only the name of the sound file (not its path) will be shown



If the button and the menu for "Options" are grey and inactive on the main window, it is because the program has been started by a set of options that do not allow the user to change the options e.g. from a shortcut on the desktop. It is possible to change the options the next time the program is started either from the Windows start menu, or the menus program.

2.4 Results summary

The *Results summary window* is more or less the same for all of the programs. It will be shown automatically when all of the problems are completed. Moreover, it is possible to open it by clicking the "Results" button or by choosing `View | Results` from the menu.



It is possible to ***print*** the results from the Results window. The name of the student (and/or a short comment) can be entered, but this is optional. The name will appear on the result print-out.

The results can be saved on disk by clicking the "Save" button. A filename will be generated automatically. It will include the current time and date.

Saved results can be viewed by choosing `View | Saved results` from the menu. Time and date for the saved results will be displayed on the top of the results window.

2.5 Shortcuts to problem sets

It is possible to create a shortcut icon for a problem set (a saved set of options) on the Windows desktop. In this way, it will be easier to find a setup that has been made for a particular student or patient. Before a shortcut can be created, it is necessary to open or save a problem set. In this way, the program will know which named problem set to create the shortcut for. A shortcut can be created by clicking the menu: `Files | Create shortcut...`. The sub-menu will be greyed out and inactive until a problem set has been opened or saved.

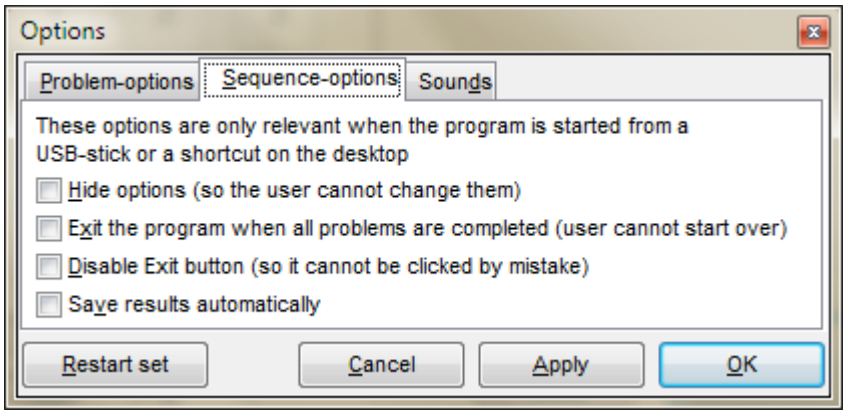
It is possible to control how the user works with the program in more detail when the program has been started by shortcut:

1. The button and the menu-item to show the option window can be hidden;

2. The program can exit after the last problem (in the set) has been completed so that the user is not allowed to start over;

3. The Exit button can be disabled so that the user is unable to leave the program before all the problems in the set has been solved (it is still possible to exit the program by using the menu or the close window button, situated in the top right-hand corner). In this way, the risk of the user hitting the wrong button accidentally will be reduced, and there will also be less information on the screen to confuse him.

These options can be found on the second tab "Sequence options" in the ***Options window***:



This type of detailed control is only activated when the program has been started by the shortcut. (Technically: when the program has been started by a command line parameter that has named the task-set. Thus, it is possible to construct a similar effect by using a shortcut that has been placed into Windows' Start Menu).

If the user has his own user account in Windows, he will only be able to see his own shortcuts on the desktop. This will help to avoid confusion.

2.6 Mouse and keyboard

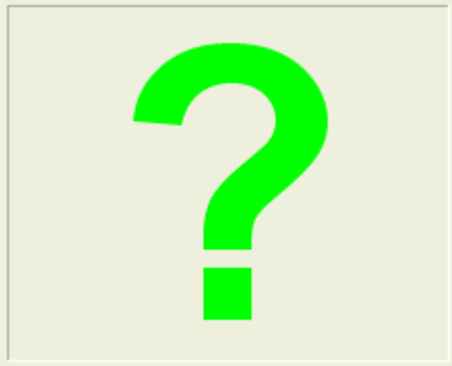
All of the programs' functions can be executed by clicking the buttons with a mouse. However, it is often more practical to use the computer's keyboard. This can aid the adaptation of severely physically handicapped users, and it may also allow for faster and more precise reactions in programs such as Moving Lines. The Start-stop button will automatically be set as the default button and it can be clicked with the space-bar. All other buttons can be accessed by pressing the key that corresponds to the letter underlined on its caption (e.g. "s" for the Start-stop button).

This also applies to the programs where a numerical 'keyboard' is shown on the display e.g. Four Digits, Many Digits, Missing Digit, Go, no-go, Serial Addition and Spatial Addition. Here you can press a digit key on the keyboard instead of using the mouse.

Some programs will also have an *'OK'-button*, which is necessary for when the response involves a number that contains more than one digit. The 'OK'-button should be clicked before the answer is evaluated by the program. In these cases, an *'Erase'-button* will also be shown, making it possible to correct the answer before the 'OK'-button is clicked.

Some of the programs include a button that has a question mark on the displayed numerical 'keyboard'. This button will insert the digit that is the correct answer. It will appear greyed-out and inactive until the user has tried it for the first time. The button is there to ensure that the user can move further ahead with the program.

Unusable buttons will be greyed-out, in all of the programs, in order to show that they are inactive. This ensures that the user will immediately be able to spot when a button is inactive. It also serves to avoid errors.

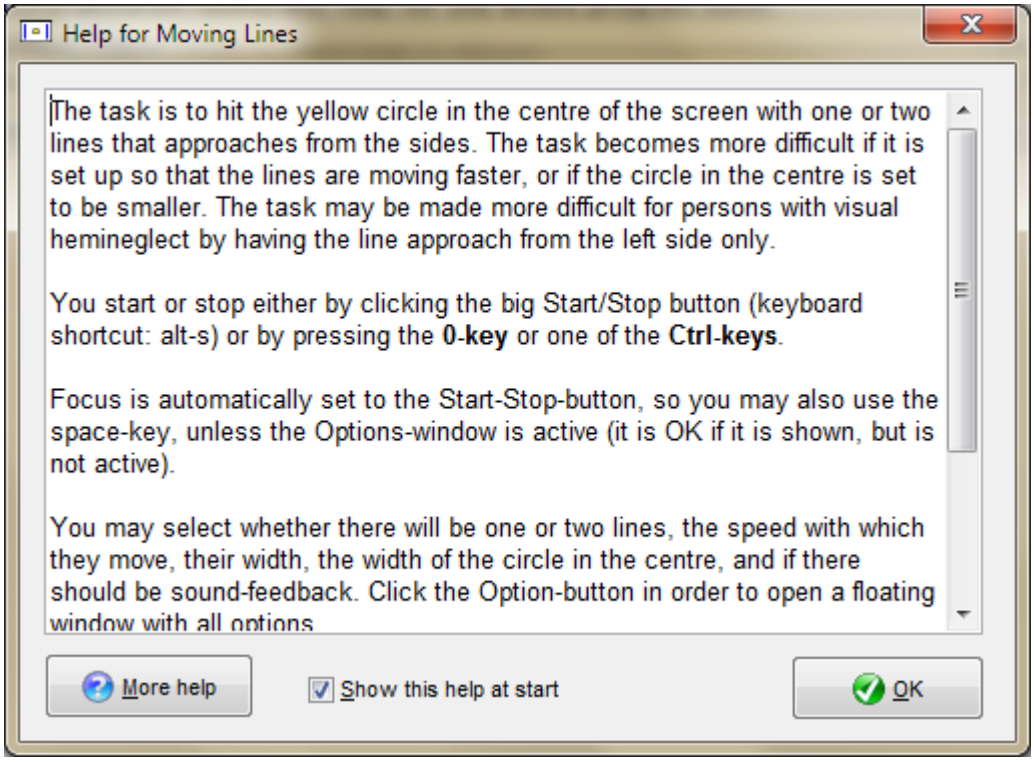


Programs, in which responses consist of digits, usually have a green question mark situated in the frame where the digit has to be inserted. In tasks like Four Digits, where there exists an option (chosen by the program) for which digits can be entered in random order (compared to the order in which they were presented), the question mark allows the user to know which digit to answer with.

2.7 Getting help

A button on the menu-program will open the help for the entire program suite.

When a training program is started, a short help text will be shown:



The *"More help" button* (situated in the lower left-hand corner) will open the full help system.

It is possible, at start-up, to choose not to have this help. You can open it by pressing the *F1-key* or by choosing the menu: `Help | Help for (program name)`. It is also possible to choose whether or not the window with the short help text is shown, at the start, from this menu: `Help | Show help at start`.

3 Training programs

3.1 Moving Lines

Purpose

This program will present a simple task that demands *attention*, *concentration*, *mental speed*, as well as *sense of time*. It is possible to adjust the speed of the program. The program can also be set to have the user attend to either the left or right side, or to either side.

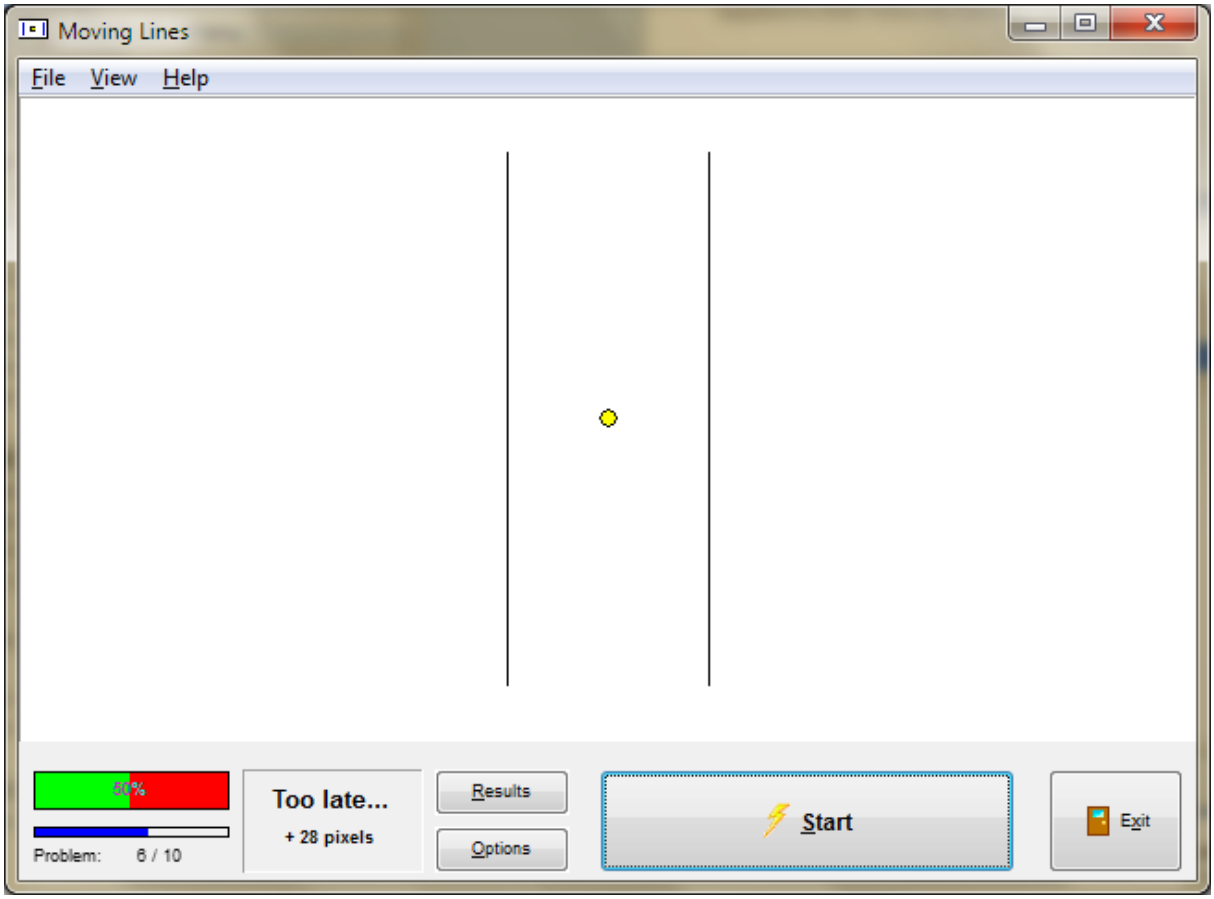
This program should not stand alone when one is training attention and concentration, as it has only minimal demands for divided attention. For patients suffering from closed head trauma, divided attention may be the most relevant target. Thus, tasks like Go No-go and Serial addition may be more relevant here (see later).

The program can be generally stimulating, as it demands *sustained attention* (vigilance), as well as some degree of *impulse control* (in order not to click too early).

Finally, the program can be used for patients with *visual hemineglect*, if it is set up so that the line will start on the neglected side. The effect of direct rehabilitation of visual hemineglect has been cast into doubt by some negative effect research. However, the task may probably serve to enhance the awareness of hemineglect.

The task

The user has to focus on a spot or circle, appearing in the centre of the screen. Either one or two vertical lines will approach from one or both sides, of the screen. The student should press the **Start-stop button**, the **0-key**, or one of the **Ctrl-keys** when the line or lines, are in touch with either the spot or the circle, in the centre. The user has to be attentive as well as fast, and should also be able to suppress the impulse to click, *before* the lines are on target.

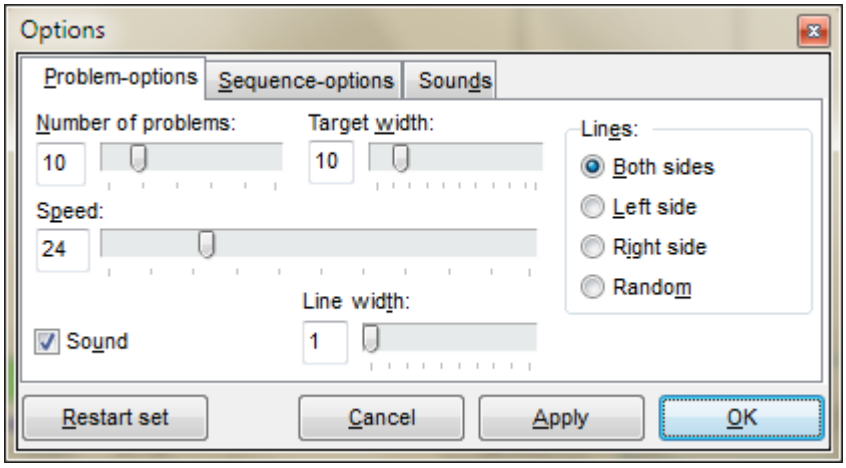


It is better to use the keyboard, as this is the preferred input device for this program.

As soon as the lines have stopped, feedback will be given as to whether or not the responses were hit precisely on target. If the responses were imprecise, feedback will be given as to how broad (pixels) the lines (either stopped too early or too late) were.

At the bottom left-hand corner of the main window, the current problem number, as well as the total number of problems (in the problem set) will be displayed as a blue-grey gauge, and as numbers.

Options



Apart from general options (that includes the number of tasks as well as feedback sound), the following options can be set in the options window:

1. *Target width:* Controls the width of the target circle in the centre of the screen. The range is from 3 to 51 pixels (dots on the screen). A broader target will make the task easier.

2. *Speed of the lines approaching the centre:* 0 is the slowest speed and 100 is the fastest speed. The actual speed will be dependent on the speed of the computer's processor, the computer's graphics card, size of the computer display etc.

3. *Lines:* Controls for whether one or two lines are shown and, if only one line is shown, whether it should start from the right or left side, or at random (from right or left). For patients with left visual hemineglect, a problem-set can be made so that the line will start from the left side. By comparing this with a problem set that has the line starting from the right side it is possible to get an impression of the severity of the neglect.

4. *Line width:* A line width of one usually works best. However, a broader line can be chosen, e.g. for the visually impaired.

3.2 Four Digits

Purpose

This program is designed to train *simple attention span* for four digits. The user's *working*

memory can also be challenged if the program is set up so that the digits have to be entered in random order. It is quite easy, and, when it is mastered, the user will be able to find more demanding tasks with Many Digits.

This (and the next) program does *not* train memory. It is designed to train *attention*, *attention span*, and to some extent, *working memory*. Memory (episodic memory – information retrieved after interferences) can probably not be trained directly. Rather, it is necessary to train compensating techniques. However, if impaired memory is secondary to impaired attention, as is most often the case with closed head trauma, multiple sclerosis as well as vascular dementia, the training of attention can have an indirect effect on memory.

The task

Four digits will be displayed for a short time (max. 3 sec.). When they have been hidden, they have to be entered manually, either by using the keyboard or by clicking the digit-buttons situated on the left-hand side of the display. A *question mark* will show which box the digit has to be entered in.

The program can be set up to accept responses in two ways. You will either have to enter the digits in continuously, or in random order. A big, green question mark will show where the next digit has to go.

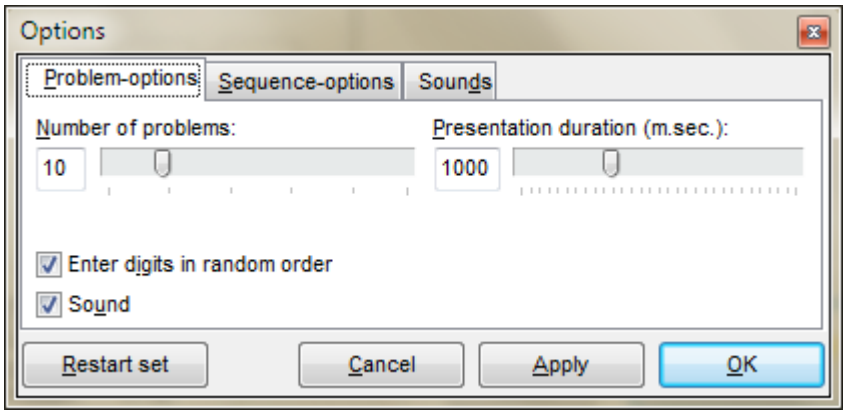
When an incorrect digit is entered, the ?question mark' button will be activated. When clicked, it will insert the correct digit (the *?-key* on the keyboard can also be used). In this way, the user will never be stuck and unable to get on with the task.

The gauge for correct responses (green and/or red in the lower left corner) will show the percentage of correct answers for each digit entered, that is, each single error.

The results summary window, will be displayed after completion of the entire problem set, and will show the percentage of correct responses for each digit, as well as the percentage correct for all of the problems (a problem is counted as incorrect if any one of the four digits are entered incorrectly).

At the bottom left-hand corner of the main window, the current problem number, as well as the total number of problems (in the problem set), will be displayed as a blue-grey gauge, and as numbers.

Options



In addition to the general options common to all of the programs, this program has the following options:

1. The duration of which the four digits are displayed in each problem (1-3000 m.sec. = 3 sec.)
2. Whether the digits have to be entered sequentially or as part of a random sequence.

3.3 Many Digits

Purpose

This program is quite similar to the previous Four digits program. However, problems can range from being very easy (a single digit for the severely impaired user) to very difficult (8 digits entered in random order is considered quite a difficult task).

This program is also designed to train *attention span*, and should be followed by more complex tasks that exert a greater load on the executive components of *working memory* , e.g. Go, No-go and Serial attention.

An additional feature of this program is that one can introduce a delay *before* the user is allowed to enter the response. This poses a challenge to working memory in that the user has to not get distracted by outside sounds, own thoughts etc. This feature is not shared by other programs in the suite.

The task

A number of digits (form 1 to 8) will be displayed for a short time (max. 3 sec.). When they have been hidden, they have to be entered manually, either by using the keyboard or by clicking the digit-buttons on the left-hand side of the display. A *question mark* will show which box the digit has to be entered in.

The program can be set up to accept responses in two ways. You will either have to enter the digits in continuously, or in random order. A big, green question mark will show where the next digit has to go.

When an incorrect digit is entered, the ‘question mark’ button will be activated. When clicked, it will insert the correct digit (the *?-key* on the keyboard can also be used). In

this way, the user will never be stuck and unable to get on with the task.

The gauge for correct responses (green and/or red in the lower left-hand corner) will show the percentage of correct answers for each digit entered, that is, each single error.

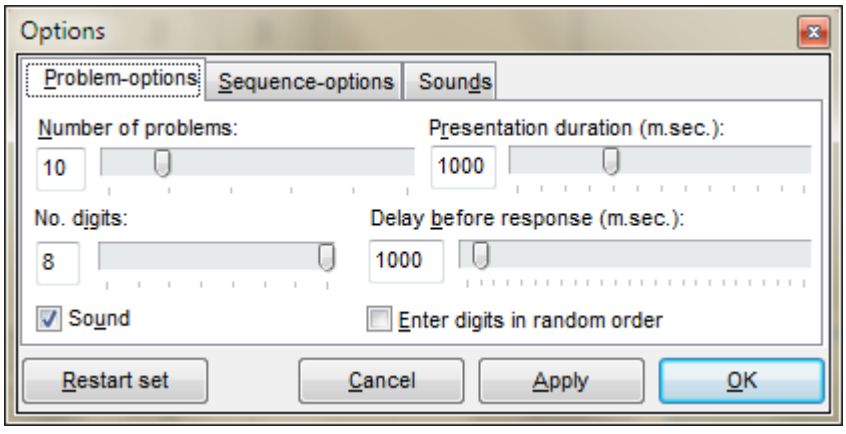
The results summary window, will be displayed after completion of the entire problem set, and will show the percentage of correct responses for each digit, as well as the percentage correct for all of the problems (a problem is counted as incorrect if any one of the four digits are entered incorrectly).

At the bottom left-hand corner of the main window, the current problem number, as well as the total number of problems (in the problem set), will be displayed as a blue-grey gauge, and as numbers.

Options

In addition to common options, it is possible to choose:

1. The *number of digits* that will be displayed;
2. The *duration* of which the digits are shown;
3. The *delay* between when the digits are hidden until a response is allowed;
4. Whether or not the digits have to be entered in *random order*.



The user's *working memory* is particularly challenged when the digits have to be entered in *random order*, and when there is a *long delay* before a response is allowed.

3.4 Missing Digit

Purpose

This program is designed to challenge *attention* and *concentration*. At a very basic level,

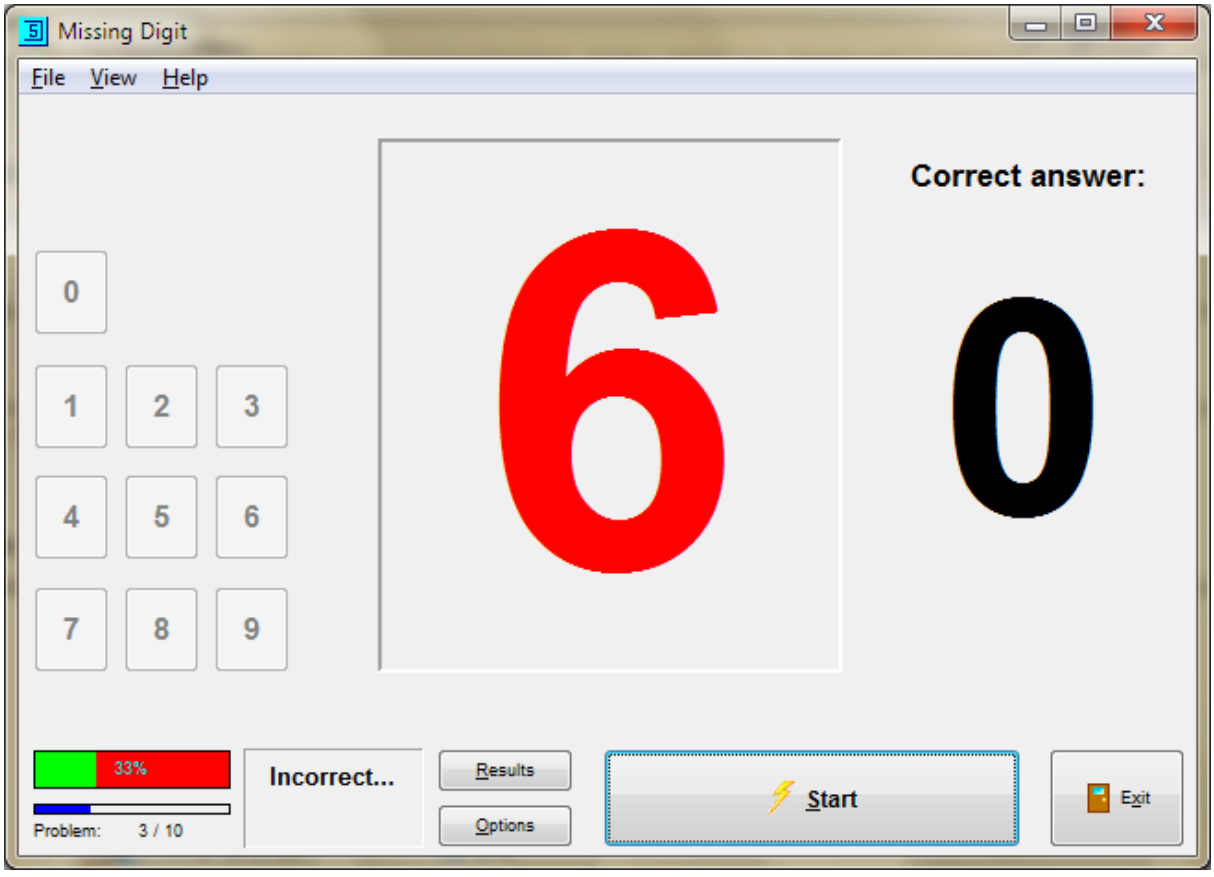
the user has to be able to *recognize digits*, and be aware of their *sequence*. The program can be used in certain cases of *dyscalculia* and *acalculia* (developmental and acquired difficulties with numbers and calculation).

Presenting digits in random order will challenge *working memory* extremely. However, this option will be too difficult for most users.

The task

Digits from 0 to 9 will be presented one at a time. However, one digit will be missing (e. g. the sequence may be 0, 1, 2, 3, 4, 6, 7, 8, and 9). The user's task is to discover the missing digit and to enter it after the entire digit sequence has been displayed.

The digits can be presented in either sequential or random order. Random order is very difficult and should normally be avoided.



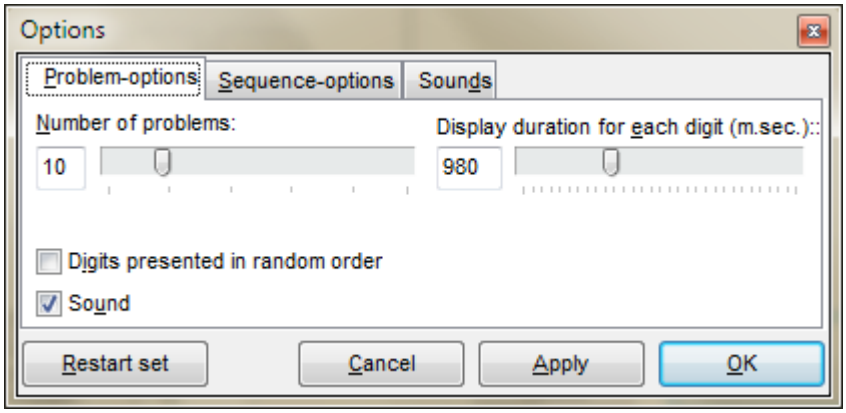
The user can enter the missing digit by using the keyboard or by clicking the appropriate button on the left-hand side of the display. Incorrect answers will be displayed in red, and the correct answer will be shown on the right-hand side of the display.

Options

It is possible to adjust:

1. The *presentation time*, which ranges from 10 to 3000 m.sec (3000 m.sec = 3 seconds);

2. Whether or not the digits are presented in *random order* (random order should normally be avoided).



3.5 Serial Addition

Purpose

This program requires *concentration* and *divided attention*. The user has to keep several items in mind at the same time, i.e. divided attention (an aspect of working memory). The user also has to maintain his concentration over time (known as vigilance). Finally, it is required that the most obvious response (continuous addition to one, large sum) be *inhibited*. All of these demands are likely to be challenging for persons with *prefrontal brain injuries*.

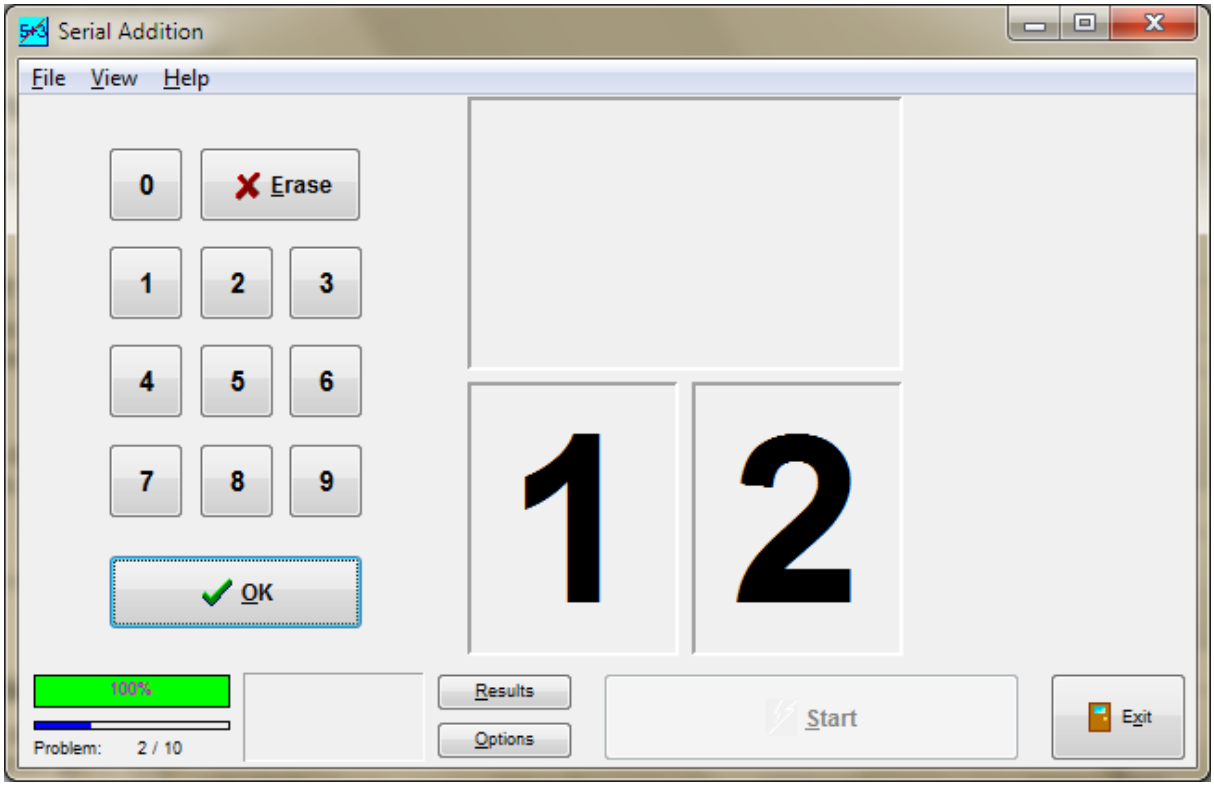
The task is somewhat similar to the PASAT-test, however it does not include pacing (the user can respond at his own pace). Moreover, the stimuli are visual (written), rather than additive (spoken).

The task

Digits will be shown, one at a time, at the top of the screen. The user's task is (always) to enter the sum of the last two digits shown by the program. The result can be entered by using the keyboard or by clicking the number-buttons situated on left-hand side of the display. The user should click the OK-button (or press the *Enter-key*) once the correct answer has been entered.

The user has to keep the previous digit in mind whilst entering the sum so that he is able to use that digit in the next addition of two digits. The difficult part is to 'forget' the result that has just been entered, and to remember to last two digits that were shown. Thus, it is necessary to remember several digits at the same time.

The task proceeds like this (but with randomly chosen digits): 5, 3 *(user answers 8)*, 3 *(answer 6)*, 7 *(answer 10)*, 9 *(answer 16)*, 2 *(answer 11)*, 4 *(answer 6)* etc.



The response can be entered by using the computer's keyboard, or by pressing the digit buttons situated on the left-hand side. The correct response may have one or two digits, therefore the *OK-button* has to be clicked (or press the *enter key*) in order to accept the response. Before the response is accepted, it is possible to correct it by clicking the *Erase button*.

If an incorrect response is entered, the last two digits will be displayed again by the program. In this way, the user will never be stuck and unable to get on with task.

The program can be set up to go on immediately after a correct response has been entered, or to wait for the user to press the Start key, before the next-digit-to-add is shown on the upper part of the display.

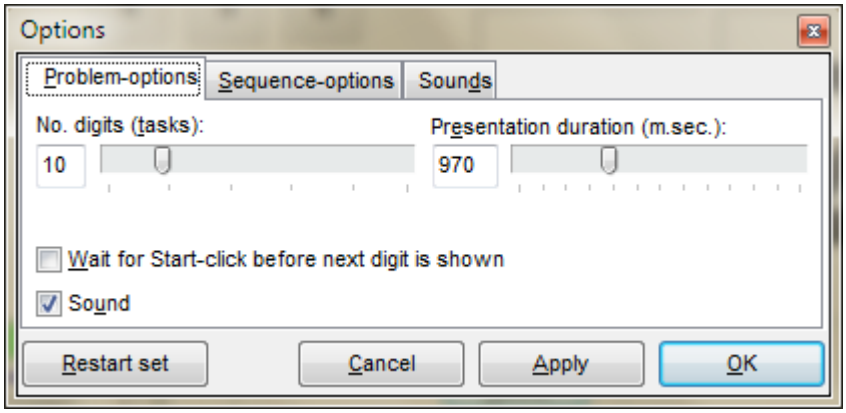
Correct answers (at first try), as well as the total number of errors, will be counted by the program and thereafter displayed on the Results window.

Options

It is possible to change:

1. The *number of digits* that are displayed in the entire sequence (= number of problems);

2. The *duration* of which each digit is shown;
3. Whether the program is set up to present the next digit immediately after a correct response has been entered, or whether *you first have to signal that you are ready to proceed by pressing the Start-button*.



3.6 Spatial Addition

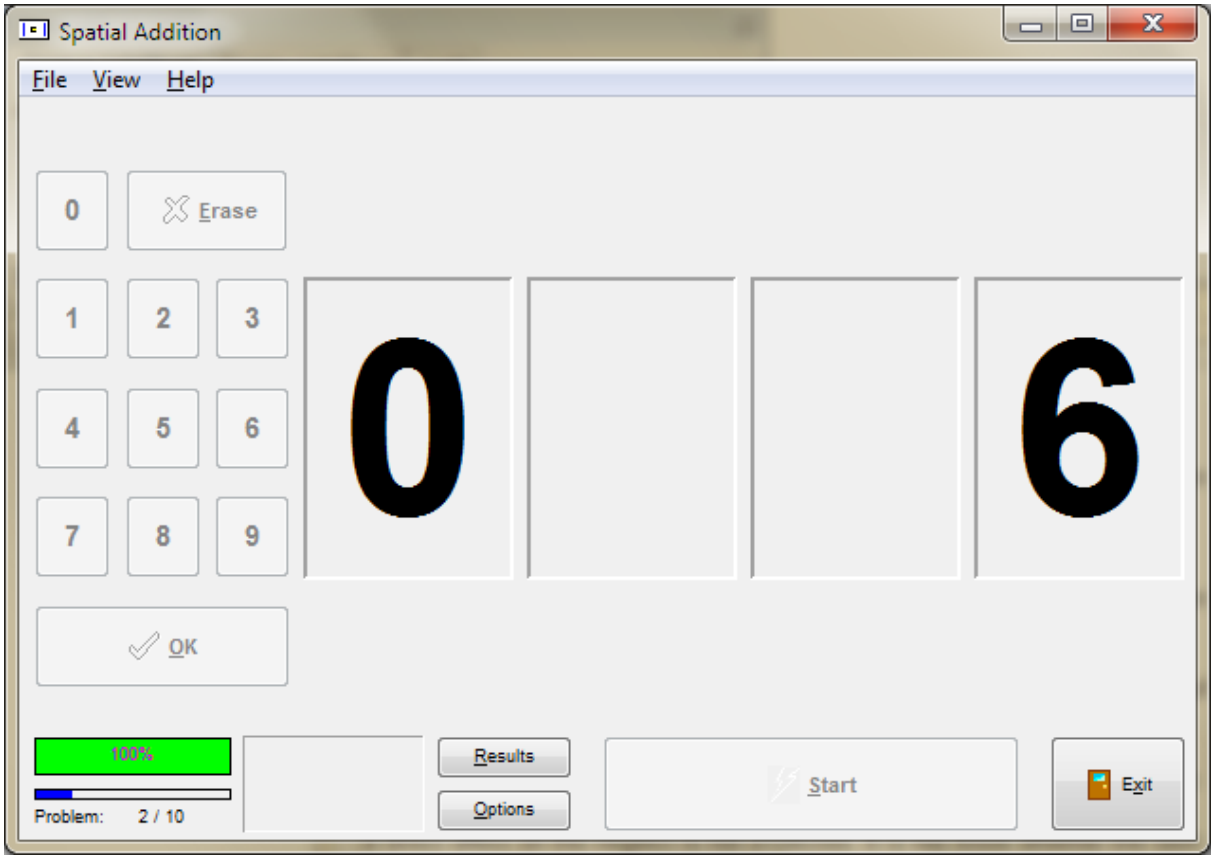
Purpose

The purpose of this program is to train *visual scanning*. Persons with *visual hemineglect* and persons with *hemianopia* are forced to look to the left in order to see both of the digits that have to be added.

The task requires *attention* for both sides of the visual field. It may help persons with visual hemineglect to become *aware* of the symptom, but this is not expected to have a direct effect on the neglect. It is not known whether the task is able to improve *visual search strategy* in persons with hemianopia (cerebral blindness to one side of the visual field).

The task

Two digits will be displayed at the same time: one to the right- and one to the left-hand side of the screen. The user's task is to add these digits, and then to enter the response by using the keyboard or by clicking buttons.

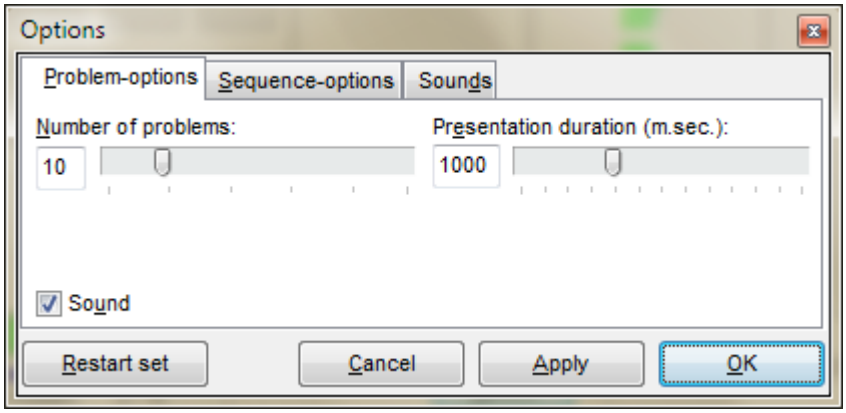


The response can by entered by using the keyboard, or by clicking the *digit-buttons* situated on the left-hand side of the display. The response can be confirmed by clicking the *OK button* (or the *Enter key* on the keyboard). It is possible to correct a response, before it is confirmed, by clicking the *Erase button*.

If the response is incorrect, both digits, as well as the correct response, will be shown on the top part of the screen. In this way, the user will never get stuck or be unable to get on with the problem set.

Options

It is possible to change the *duration* of which the digits are displayed (1 m.sec. to 3000 m.sec. = 3 seconds).



3.7 Visual Scanning

Purpose

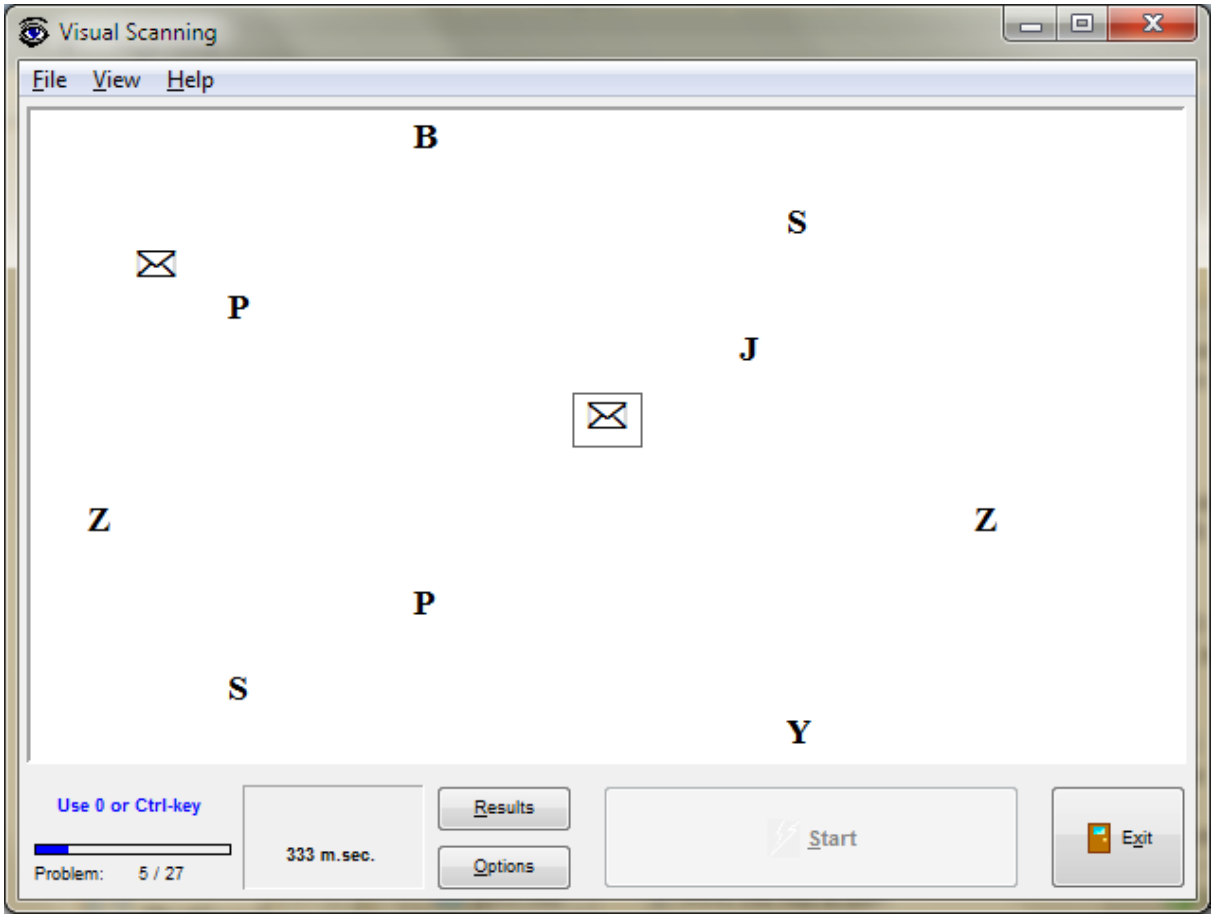
This program is designed to train *visual attention* and *visual search strategies*. It may help persons with *visual hemineglect* to become aware of the symptom, but this is not expected to have a direct effect on the neglect. It is not known whether the task can improve the visual search strategy in persons with *hemianopia* (cerebral blindness in one side of the visual field).

The program can be used to *detect* residual, mild degrees of visual hemineglect, as is it able to detect longer response latencies for the left side. The program should not be used in research because it is highly likely that the reported response times (on a Windows computer) will be imprecise – other processes running in the background (e.g. network activities) are likely to disturb the timing of the responses. Moreover, it is not feasible to generate norms for response times since the size, geometry, contrast, and speed of different displays are likely to vary considerably from computer to computer.

There exists a huge attentional component to visual hemineglect therefore the use of distracters will make the task much more difficult for persons with hemineglect. Thus, the first phase of training should not include distracters, and this should be followed by a phase that includes a few distracters, and so on thereafter.

The task

A symbol or a letter will be shown in a box situated in the centre of the display. The user's task is to detect when an identical symbol or letter is appearing in another position on the display. Once this is done, the user has to press the *0-* or one of the *Ctrl-keys*, as fast as possible (some mice are not able to transmit responses fast enough).



The task can be set up to include either *distracters*, or no distracters. If the distracters are of the same type as the target (symbols or letters), the task is likely to become very difficult. Any training involving this task is usually started on the level where no distracters are present.

The program will record the reaction times overall, as well as the reaction times for each part of the visual field. Impulsive reactions (responses occurring before the target is shown) will also be recorded. Reaction times will be reported for the left, middle, and right portions of the screen. In this way, it is possible to detect even mild cases of visual hemineglect.

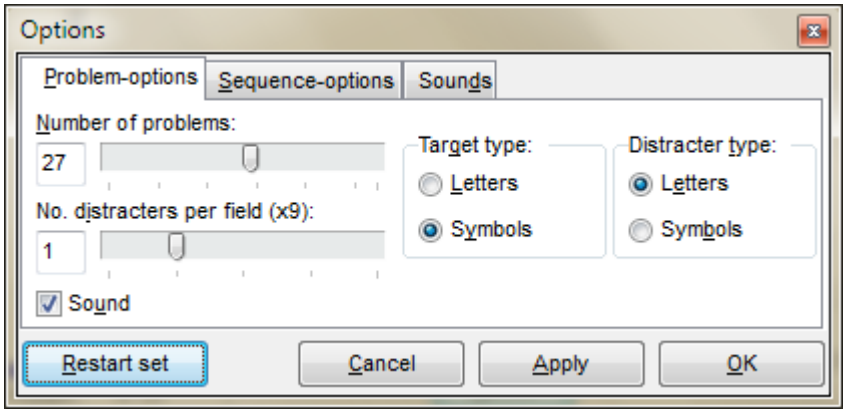
Options

It is possible to choose:

1. Whether the *target* is presented as a letter or a symbol;
2. The *number of distracters* (from 0 to 4) displayed on the screen in each of the 9 visual fields.

There exists an invisible screen division in each of the visual fields so that distracters and targets can be distributed evenly. Therefore, the number of tasks must be divisible by 9

(9, 18, 27, 36 or 45 tasks).



3.8 Design Copy

Purpose

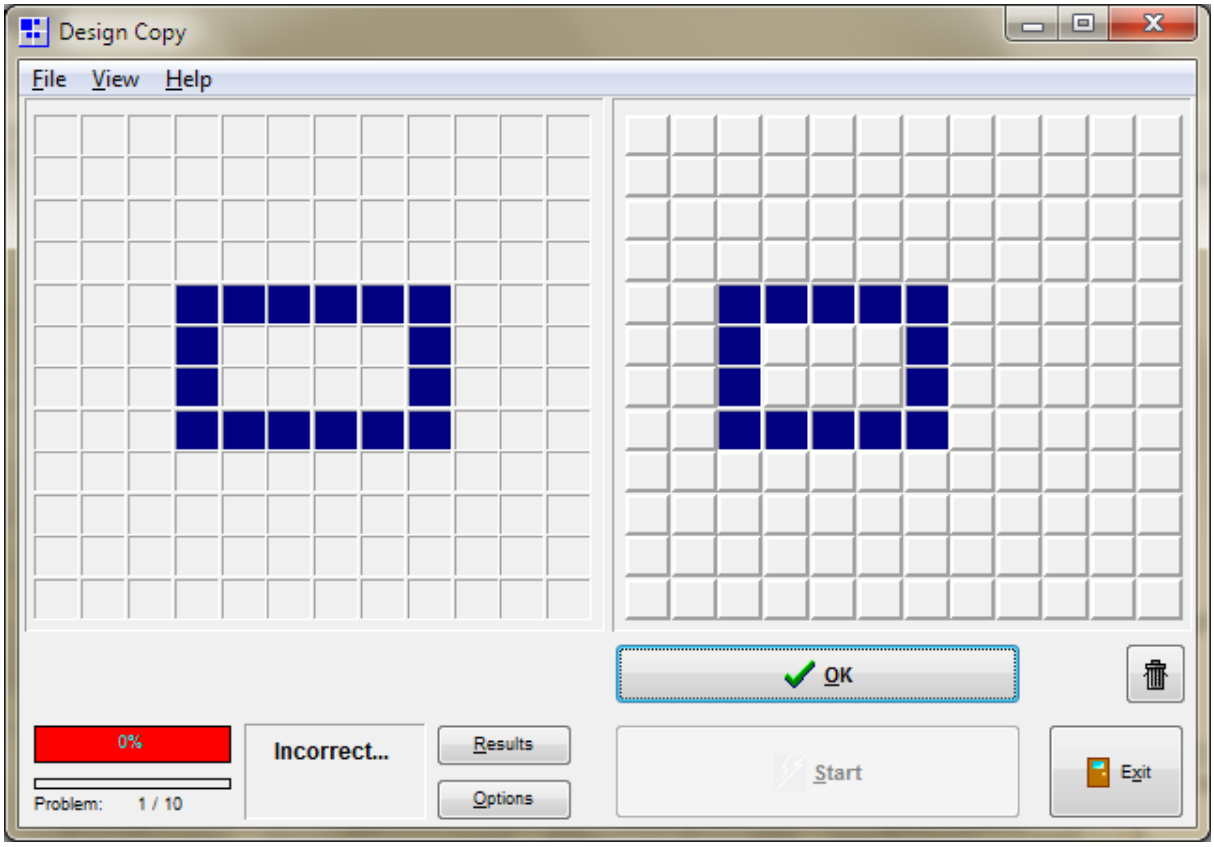
This program is designed to train *spatial* and *constructional* abilities. If it is set up as a 'memory' task, *spatial working memory* can be trained. Unfortunately, little is known about the utility of spatial and visuoconstructional disturbances for direct retraining. However, it is quite likely that spatial working memory can be trained directly.

The task

The user's task is to copy the design displayed in the left-hand field onto the right hand-field.

A design is 'drawn' by *clicking the tiles with the mouse*. Clicking a tile again will remove the colour. The user should click the *OK-button* when he thinks that the copy is correct (there were no feasible ways to make this program work exclusively with the keyboard).

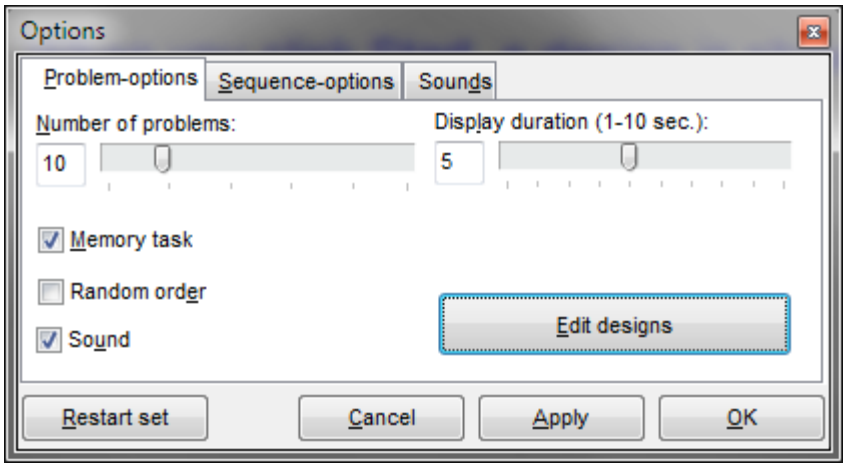
The user's task may also be a *memory task*. In this case, the design cannot be 'drawn' until after the model has been hidden. If the design is incorrect, it has to be copied thereafter. In this way, the user will never be stuck and unable to get on with the problem set.



The designs can be shown in either the same- (each time the task is started), or in random order. If it is a memory task, it is possible to choose the duration of which the model is displayed before it is hidden.

It is possible to edit the designs. Furthermore, the designs can have tiles (from 2 to 12) in each direction.

Options

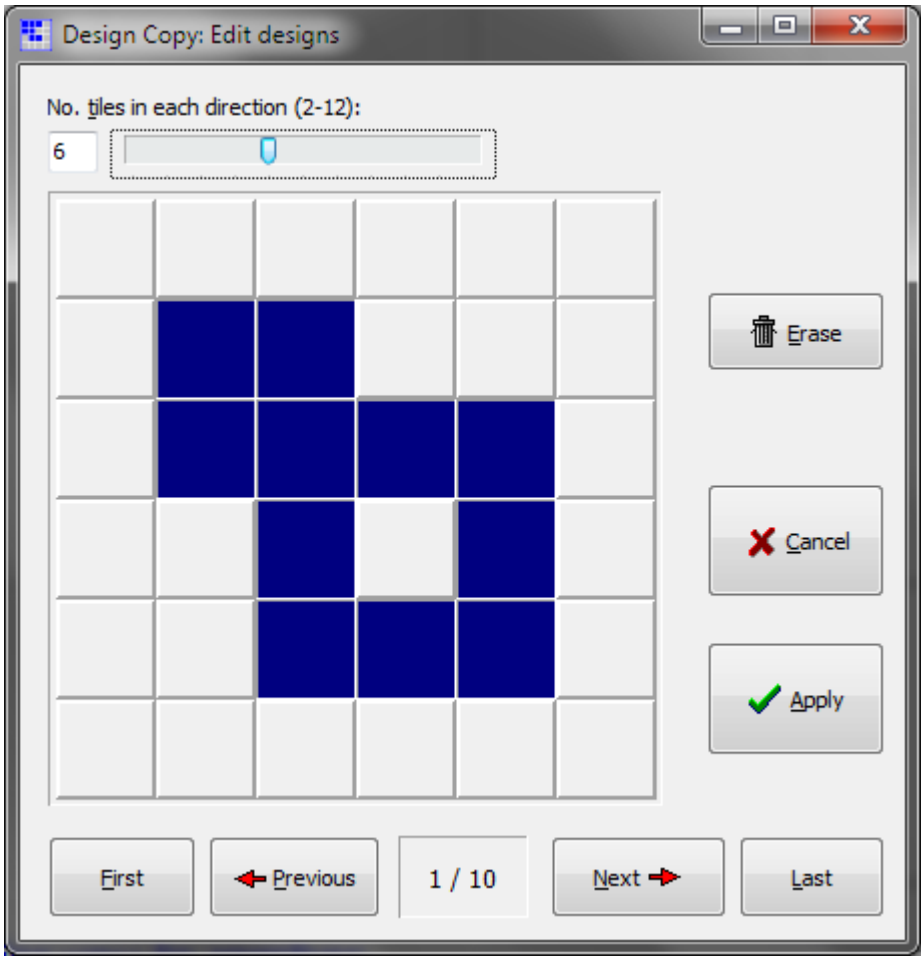


The program includes the following options in addition to the options that are common to all of the programs:

1. The *order* in which the designs are presented can be set up to be the same each time a problem set is initiated, or the designs can be set up to be presented in random order (selected from a total of 50 designs at each level of difficulty)
2. *Memory task* - the design is hidden before it can be 'drawn';
3. The *duration* of which the design is displayed - if memory task is chosen

Editing the designs

When the *Edit designs-button* is clicked, a new window is opened, and the designs can be edited here.



It is also here where one can choose the number of tiles for each direction. The designs can be 'drawn' by clicking on the tiles.

To save the design, click 'Apply' to close the window, then chose `Files | Save options...` from the main menu.

3.9 Go, no-go

Purpose

The purpose of this program is to train *divided attention* and *inhibition of impulses*, i.e. the ability to withhold habitual responses. This may be relevant for persons with *ADHD*, as well as persons with *prefrontal brain injuries*.

The user's task is to withhold his responses when the base number for a chosen multiplication table is displayed. The numbers from one and onwards will be displayed sequentially. A response is required for every number, except for the numbers of a chosen multiplication table. Thus, this task may also be relevant for persons with *acalculia* and *dyscalculia* (acquired or developmental difficulties with numbers and calculation).

The task

The idea for the task was derived from a simple game used in schools to teach the multiplication tables. This game can also be very useful for the training of divided attention and impulse inhibition. It is necessary to react quickly and to also to abstain from making a response.

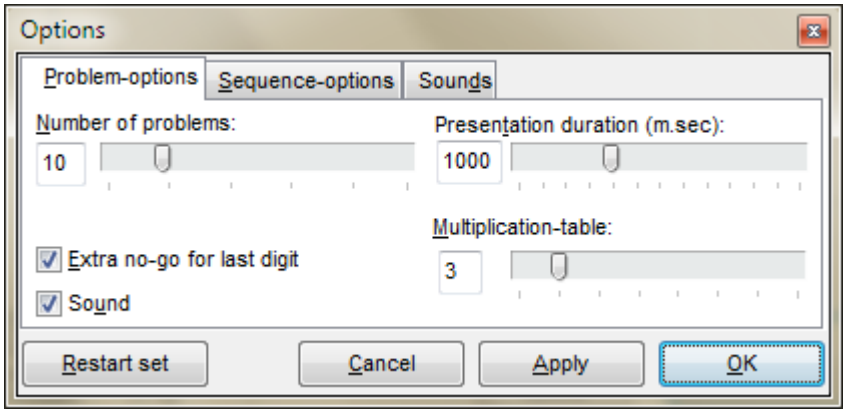
The user's task is to click on the 'Click here' button (or the space key), when the displayed number is not part of the chosen multiplication table. The duration of which each number is displayed can be adjusted, thereby leaving a shorter or longer time for responding, before the next number is displayed.

It is possible to introduce an extra complication to the problem set. The extra complication is that the user is not allowed to click on any of the numbers that include the base of the chosen multiplication table as the last digit e.g. for the multiplication table of 3, the numbers 13 and 23 may not be clicked. This is called *'extra no-go'*.

The program will count the number of omission errors, the number of 'commission errors' (missed responses to numbers not included in the multiplication table), and the number false responses to the numbers in the multiplication table.

Options

1. It is possible to work with *multiplication tables* ranging from 2 to 9;
2. *'Extra no-go'* for the base number of the multiplication table can be chosen;
3. The *duration* of which each number is shown can be adjusted (ranging from 10 to 3000 m.sec. 3000 m.sec. = 3 seconds).



3.10 Right-left

Purpose

The program is designed to train *executive control of attention*, that is, the ability to *inhibit* the most obvious response. This may be relevant for persons with *ADHD* and persons with *prefrontal brain injuries*.

This task is based on the *Stroop principle* (discovered in the 1930's). The principle is that there exists a conflict between a words meaning and its appearance, and that this will slow down a response. Colour names presented in different colours (coloured colour names) describes what was originally used. Indeed, coloured colour names are still used in neuropsychological tests today.

The words 'Right' and 'Left' are used in this task. Responses are made by clicking buttons to the right or left with arrows pointing to the right or left (or by using the 1 and 2 keys on the keyboard). The stimulus word may be shown either to the right or left. The side in which the word is displayed may conflict with the meaning of the word. The required response can refer to either the position or the meaning of the word.

The task can be set up to change the required response during a problem set. This requires *cognitive flexibility* (another executive function) in addition to *executive control of inhibition*.

The task

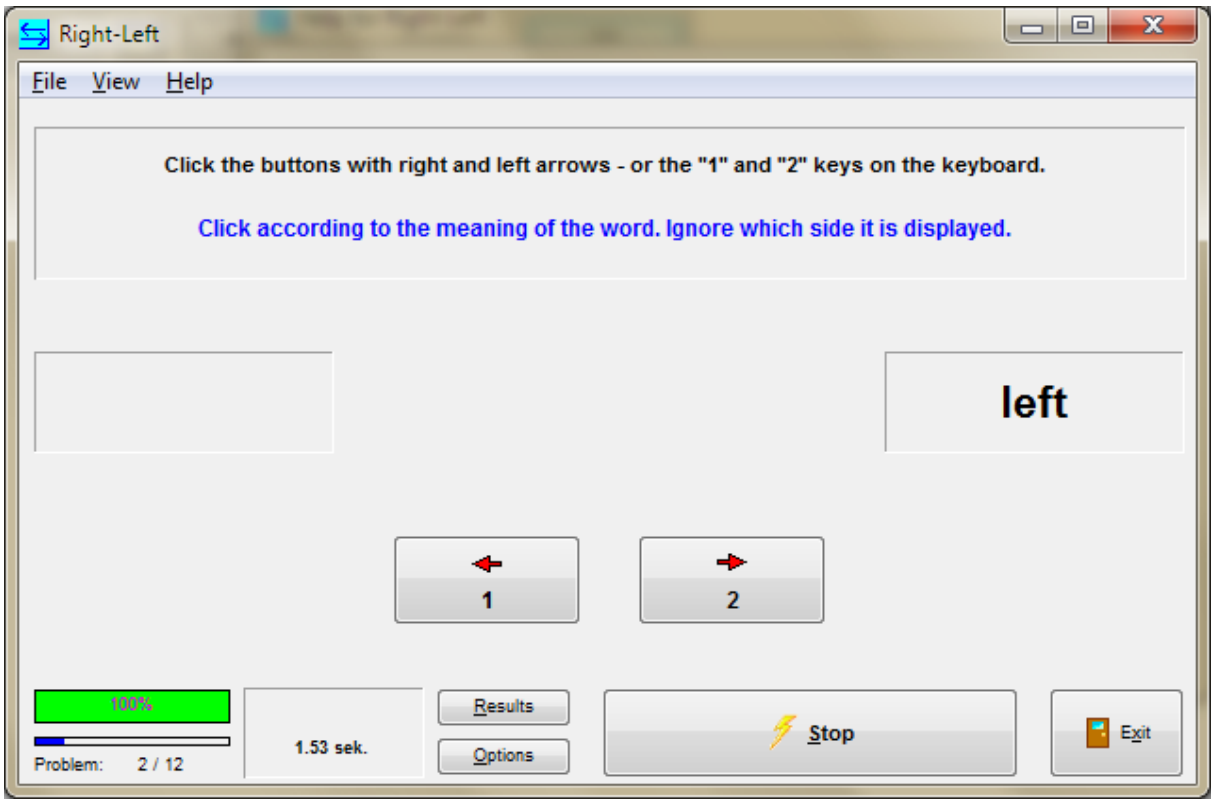
The user should react by clicking the *left* and *right arrow display buttons*, or better, by pressing the *1-* and *2-keys* on the keyboard. Instructions for how to respond are situated at the top of the display. There are three possibilities:

1) If the word is *displayed in the centre of the screen*, the user must react according to its meaning. If the word is 'Right' then the user should press the right arrow button (or the 2-key). This task will not challenge the executive control of attention, but it may be

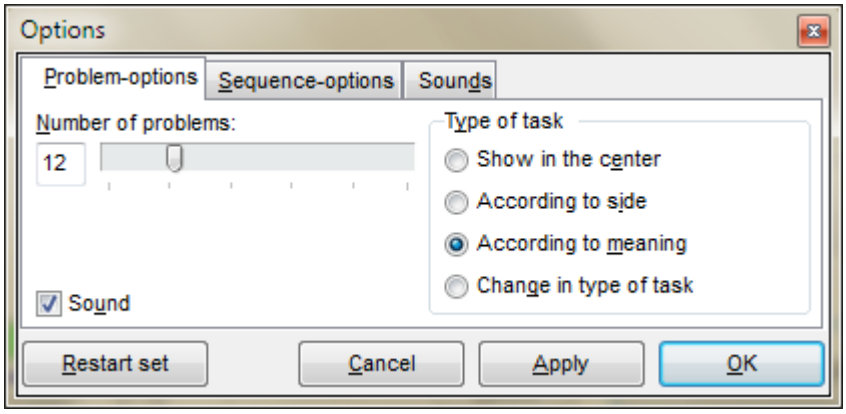
relevant for persons with right-left confusion.

2) If the words are *displayed on the sides of the screen*, one possibility is that the user should react according to the side on which the word is presented. In this case, the user should ignore the meaning of the word. On the other hand, the user's task may also be to react to the meaning of the word. If the word 'Right' is displayed on the left-hand side of the screen, the right arrow button (or the 2-key) should be selected.

3) Finally, this program includes a type of task that is *changing* in nature. Firstly, a word will be shown in the centre of the screen and the user should respond according to its meaning. After that, the words will be displayed on the right- and left- hand sides of the screen, and the user should respond according to the side on which the words are displayed. Finally, the user should respond according to the meaning of the word, ignoring the sides on which the words are displayed.



Options



In addition to the common options shared by all the programs in the suite, the only other option is *type of task*.

If 'Change in type of task' is chosen, the number of problems must be divisible by 3 so that an equal number of problems are acquired for each of the 3 conditions.

3.11 Hidden Code

Purpose

This task is designed to challenge *planning abilities*. The task requires the use of a good *strategy* and adherence to that strategy. Moreover, the information provided at each level should be checked carefully. High level *executive functions* can be trained in this way. The *participation of a therapist* (or 'tutor' or 'coach') is necessary in order to obtain an effect of the training. The therapist should encourage the use of verbalized strategies, and must also check the information collected at each level carefully.

For persons with severe planning difficulties, it is necessary that the therapist be the one to operate the computer. In this way, impulsive responses can be avoided. The user is asked to verbalize his strategy and then to give a reason as to why he thinks his guess was a good guess, taking into consideration all the information available.

A good strategy is needed so that the colours can be placed in a way that makes it easier to combine the information provided by each column. It will always be possible to solve the task, within the ten attempts allowed, if a good strategy is used.

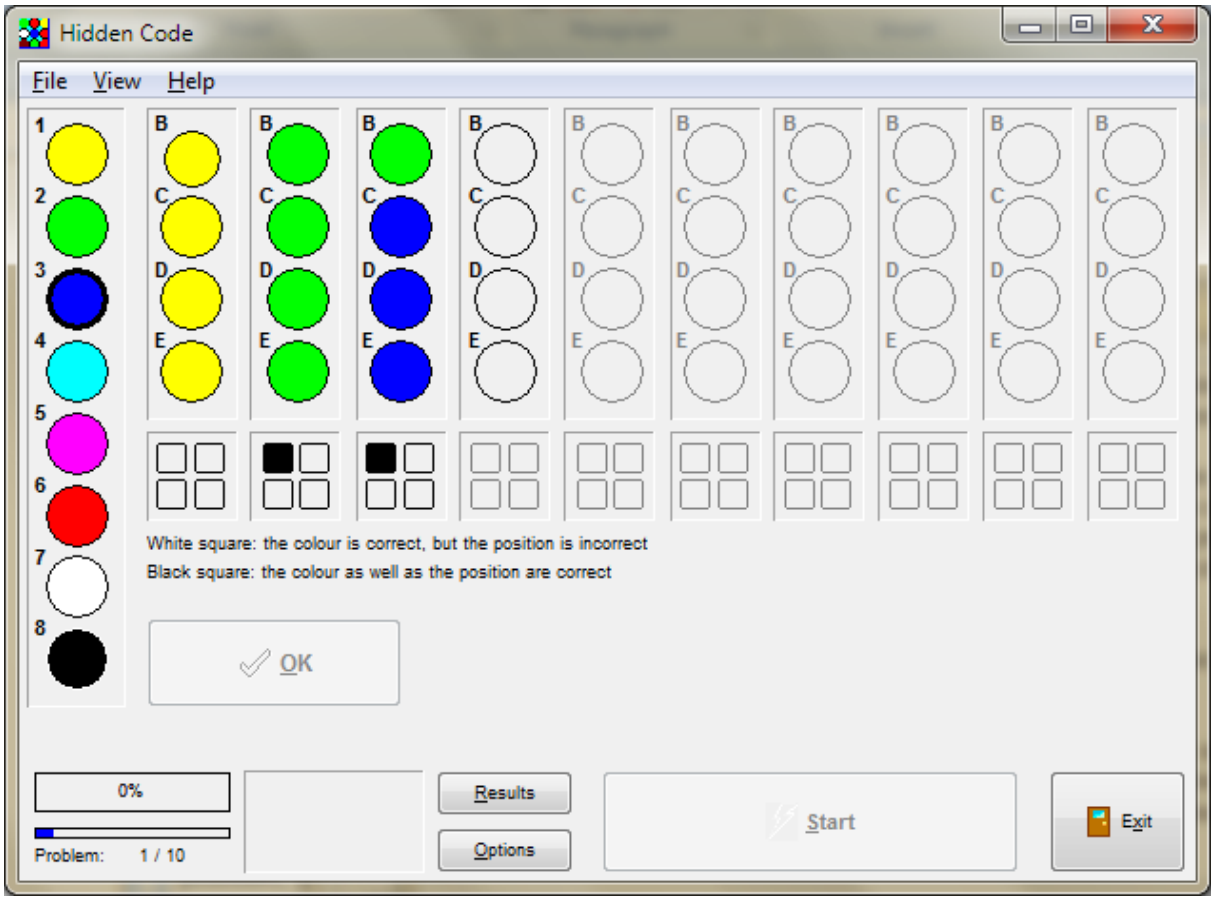
The task

The task here is to guess a hidden code. The code consists of a number of colours appearing in a certain order. The same colour may be present in more than one position.

The user should make a guess and then click OK. To make a guess, the user should first

choose a colour from the most left column. The guess should then be placed into the guessing column. A colour can be picked by using the mouse or by pressing the key with the corresponding number. The colour can then be placed into the desired position (in the guessing column) by pressing either a letter-key, or the mouse button.

When a guess is considered to be correct, or at least able to increase the user's knowledge about the hidden code, the OK button should be pressed.



A *black square* will appear underneath the column for each correct colour that has been placed in the correct position. A *white square* will appear underneath the column for each colour (probably correct) that has been placed in the incorrect position. This information should be used to improve the next guess. In the example picture above, the yellow colour in the first column is incorrect. In the second column, the colour is correct and in the correct position. In the third column, one of the colours is still in the correct position. Thus, it must be the top green colour that is correct. Furthermore, it is now also known that the blue colour is not part of the correct solution.

It is possible to change the number of colours to choose from (2-8), as well as the number of available positions to guess (2-4). Thus, the task can be made very easy to start with (e.g. 2 positions and 2 colours).

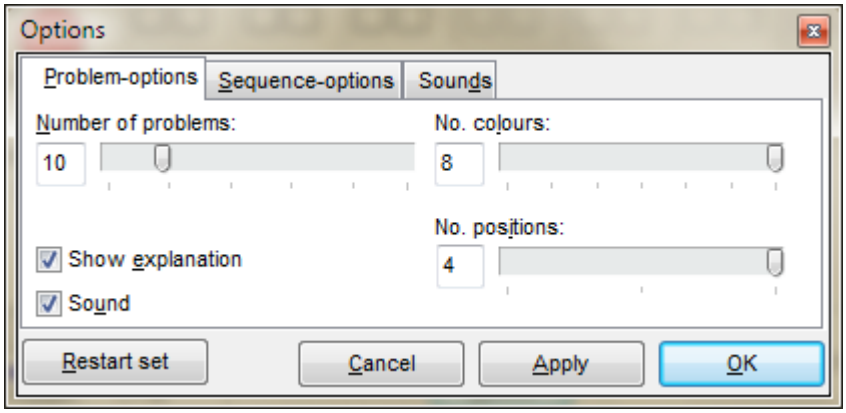
Options

It is possible to change:

1. The *number of colours* to choose from (2-8);

2. The *number of available positions* to guess (2-4);

3. Whether or not an *explanation* for the black and white feedback squares are shown.



3.12 Tower of Hanoi

Purpose

This program requires that *planning*, as well as *detours*, be used to reach the desired goal. It is designed to be used for persons with planning problems (caused by *prefrontal brain injury* or *ADHD*). It requires the user be able to inhibit the impulse to start, without planning anything. It can also challenge working memory when the plan has to be kept in mind.

The Tower of Hanoi has been used extensively in research. It has been used as an example of problem solving in artificial intelligence, and as an example of preserved procedural learning in amnesic patients (N. Cohen). Modified versions of this task (e.g. Tower of London and Tower of Toronto) have been used to test the planning abilities of patients with prefrontal lesions.

The advantages of the computer version, over the game that is made out of wood, are that:

1. The *number of moves* can be counted automatically

2. *Illegal moves* can be prevented (but attempts are counted)

3. The moves can be made very fast in order to *provoke impulsivity*.

It is usually not advantageous to let a prefrontal patient develop his own strategy.

Rather, *the therapist should inform the patient of the strategy.* In this way, the patient is only required to stick to the strategy. It is important that the therapist be well acquainted with the task. A strategy that is easy to verbalize and easy to understand should also be chosen. If a patient is very impulsive, it may be necessary that the therapist be the one to operate the computer. Thus, the patient can inform the therapist of his next move. The patient should be made to inform the therapist of his strategy, and also to explain why the next move is correct (there is only one correct way to solve the task for each number of storeys if the minimal possible number of moves is required).

The task

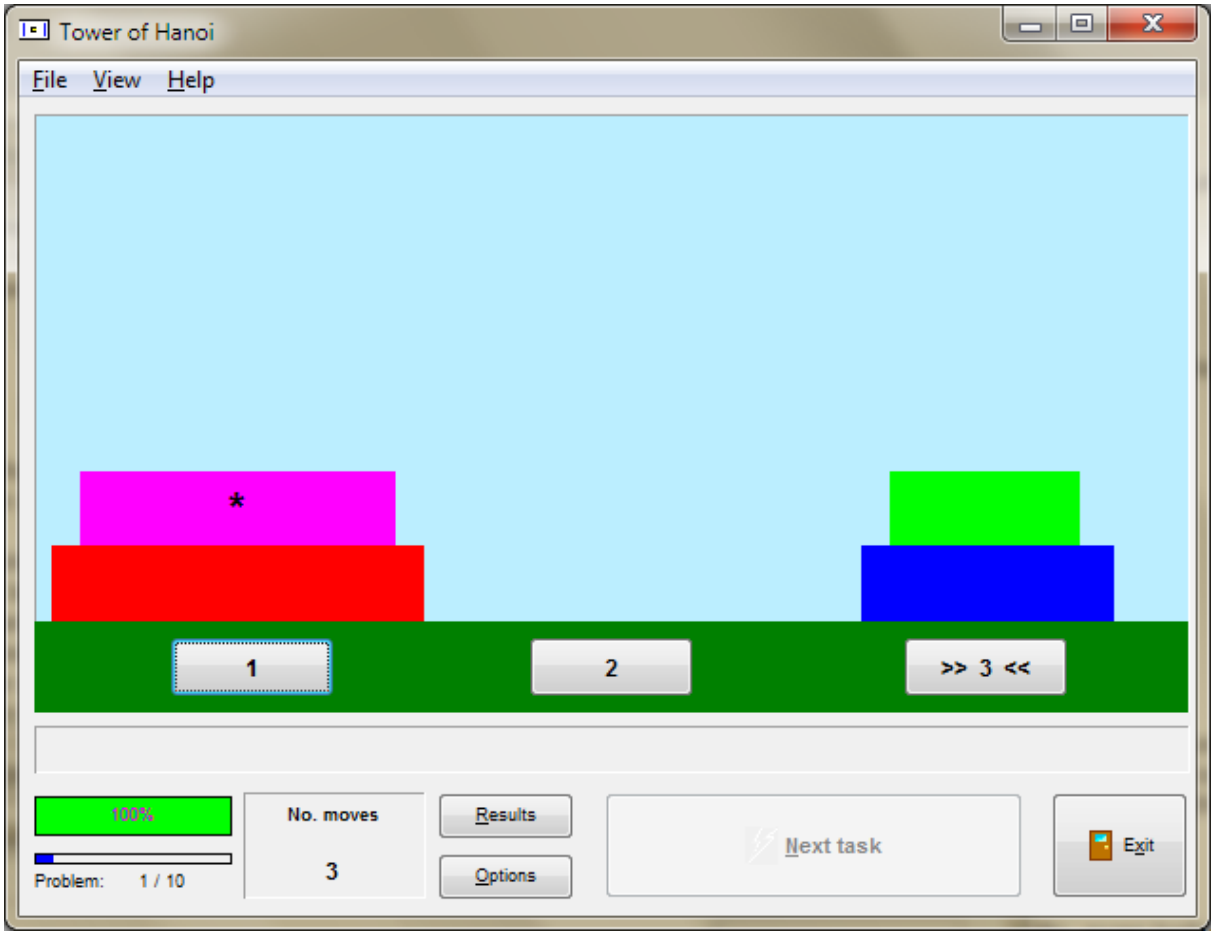
The user's task is to move the tower from building site 1 to building site 3. This is difficult because of the presence of two rules:

1. The user may only move one storey at a time;
2. The user is not allowed to place a larger storey upon a smaller one.

Apart from that, the user is allowed to place the stories in whatever way he likes. The stories can also be placed on building cite 2, in the centre.

The top storey of a tower can be selected by *clicking either the storey itself* or *the button, situated underneath the tower*, with the mouse. It is also possible to enter the storey number onto the corresponding number on the keyboard (tower 1 can be chosen with the 1-key etc.). The chosen storey will be indicated by an asterisk. The target site can then be selected by entering its number or by clicking the button underneath it. The user can remove the selection by clicking the selected storey or by clicking the button underneath the tower. The key displaying the appropriate number can also be used in this situation.

The goal is to move the entire tower with as few moves as possible. It is therefore necessary to plan carefully in advance, even before the first move. If the first move is incorrect, you will end up with too many moves.



It is only when the user really tries to plan, that the task is actually able to train planning ability. The user should adopt a strategy that involves thinking about the task 'backwards'. The user should ask the question: what storey has to be placed at the bottom of building site 3? This site has to be empty before the storey can be placed there, and at the same time, there cannot be any stories situated above the storey on site 1. Thus, in order to reach this sub-goal, the other stories have to make a tower on site 2. To make a tower on site 2, the user has to think about how the storey, situated on the bottom of site 2, can get there.

The red-green gauge, situated in the lower left-hand corner, will show the number of problems that were completed by using the least number of moves. The optimal solutions for the different number of stories are:

2 stories: 2 moves

3 stories: 7 moves

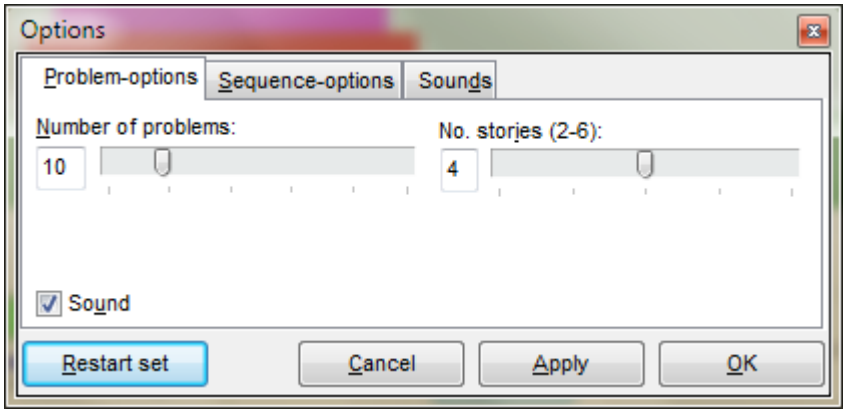
4 stories: 15 moves

5 stories: 31 moves

6 stories: 63 moves

The results windows will display the number of problems solved with the *optimal number of moves*, the *number of superfluous moves*, as well as the *number of illegal moves attempted* (e.g. placing a larger storey on top of a smaller one).

Options



The only unique option featured in this program is the *number of stories* that can be selected.

4 Training to go

Training to go (Homework) is an add-on program of COGNIsoft-I. It enables the therapist to transfer one of the COGNIsoft-I suite programs onto a USB memory stick, and then to send it home with the patient. The patient can thereby train at home, on his own computer, without having to buy a license for COGNIsoft-I. One or several of the problem sets (from the program suite) can be transferred onto the same USB stick.

The user has to install a small bootstrap program on his home computer. A shortcut icon will appear on the computer's desktop. The user has to click on the icon in order to access the program from the USB stick. Installation can be made easier by transferring the setup file (for the bootstrap program) onto the USB stick

This add-on requires a separate license. It can be used for an unlimited number of patients or clients, as long as they are treated at, or associated with, the therapist's hospital, clinic or school. The therapist may prepare several USB sticks, if it is required that the patient train with several programs at the same time.