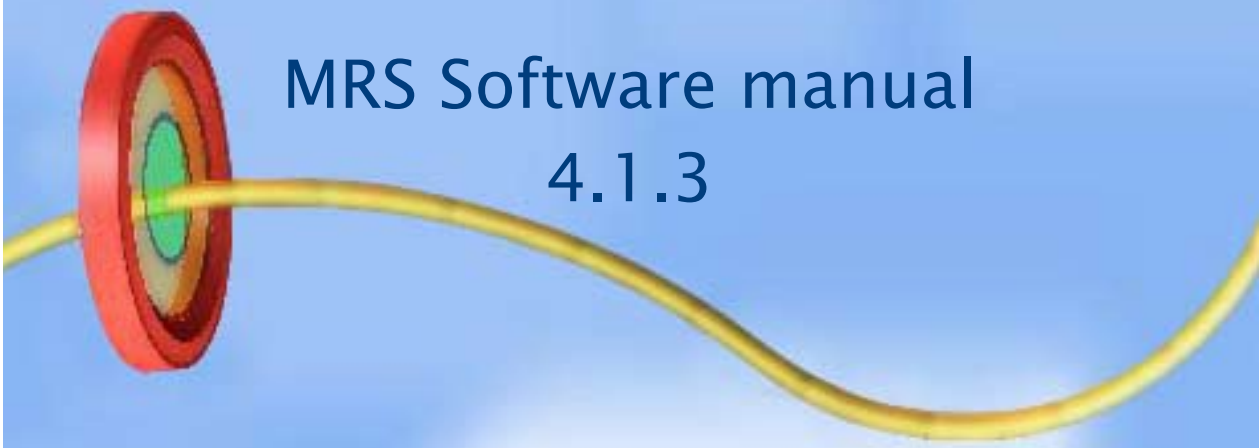
Product of:

MONITORED REHAB SYSTEMS



MRS Software manual 4.1.3

MRS-E1003

Table of contents

1. Introduction

What is power without control?

Treatment protocols are showing more interest upon coordination and proprioceptive elements in their approval.
Specific functional demands can be challenged with the unique designed software. Re-programming and accelerated restoration of motor-skills are easily performed and obtained.
Dual tasks with elements of math and recognition are unique.

The Monitored Rehab Systems Software is providing all elements to re-activate and restore function and motor-skills of the patient's impairments and disabilities.
The different software exercises are stimulating and challenging at every level and phase of the patients rehabilitations program.

Different testing methods will provide objective feedback and documentation of the patient's rehabilitation program.

We hope you all will experience value and pleasure of using the Monitored Rehab Systems Software as we love developing it!

Monitored Rehab Systems

2. MRS software installation

2.1 Introduction

In this chapter the installation of Monitored Rehab Systems software is described. The server and the client installation are clearly explained step by step. Keep this installation manual next to you during the installation.

A number of terms, which are used in the manual, are explained as following:

Server: The computer in the network where the database is stored, it is the most important computer. The client computers are connecting to this database. If there is no network your stand alone computer is "the server".

Client: A workstation. These make connection with the database, which is located on the server.

Firebird/interbase server: A program that enables the communication between MRS software and the database.

IP address: A kind of address from the computer, every computer in the network has his own IP address. (For example 192.168.0.1)

Database path: a routing to the location where the database is stored on the hard disk. Standard is this: “C:\Program Files\MRS Software\Database\MRS.gdb”.

2.2 Minimal requirements:

Processor: Pentium IV or compatible AMD processor
Operating system: Windows XP/Windows Vista
Memory: 2048 Mb
Hard disk: 2 Gb available
Screen resolution: 1024 x 768
Graphic adaptor: DirectX® 9-comp. Shader 2.0 with at least 128 MB VRAM

2.3 Permissions

You need administrator rights to install the MRS software.
Users of the software needs permissions (full control) on the following folders:

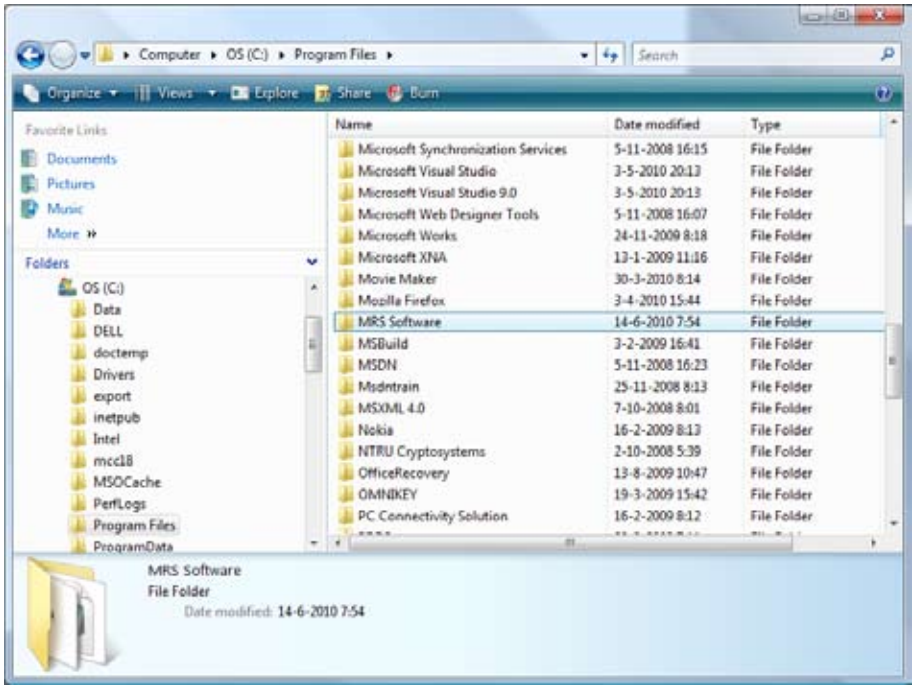
Windows XP:
- C:\Program Files\MRS Software
- C:\Program Files\Firebird
- C:\Documents and Settings\All users\Application data\MRS
- C:\Documents and Settings\[USER]\Application data\MRS

Windows Vista/Windows 7:
- C:\Program Files\MRS Software*
- C:\Program Files\Firebird*
- C:\ProgramData\MRS
- C:\Users\[USER]\AppData\Roaming\MRS

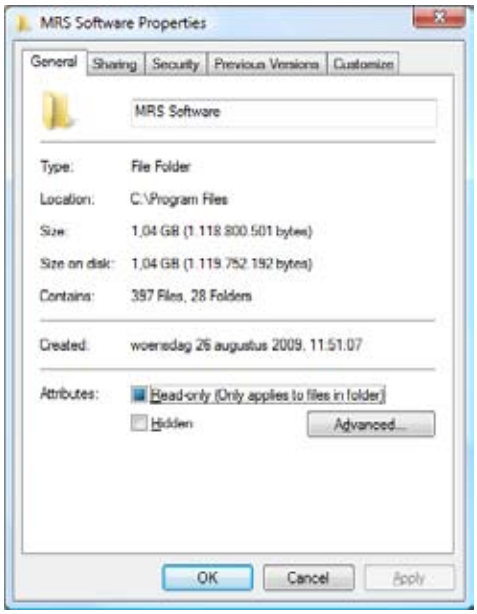
* If you are using a 64 bit version of windows the “Program Files” folder is named: “Program Files (x86)”.

Windows Vista: User Account Control (UAC) must be turned off.

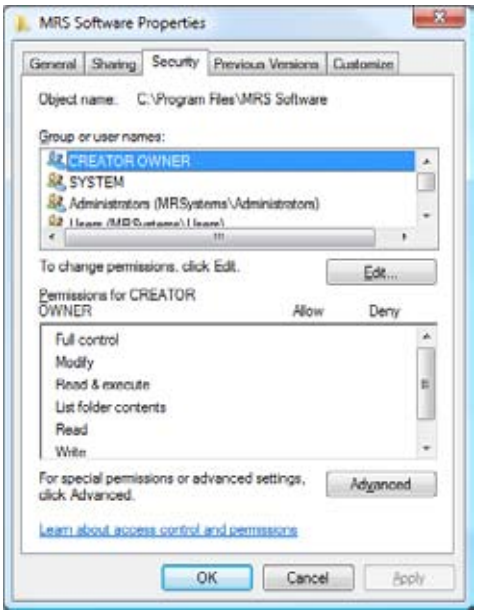
How to add permissions
To add permissions, browse to the “MRS Software” folder:



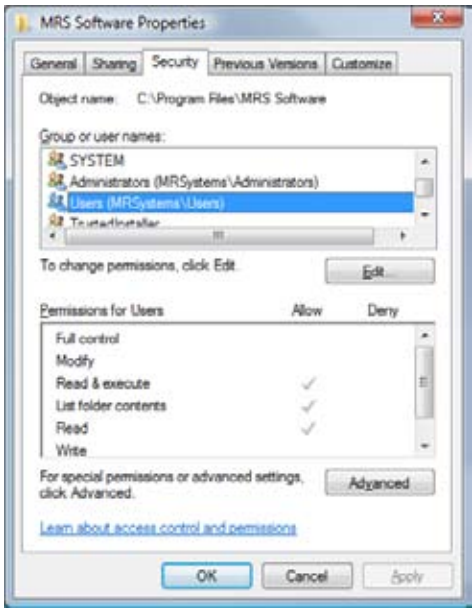
Right click the “MRS Software” folder and choose properties.



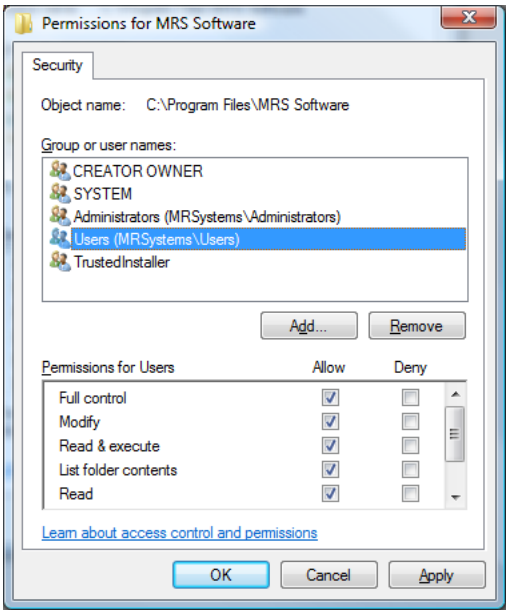
Select the tab “Security”.



Click “edit”.



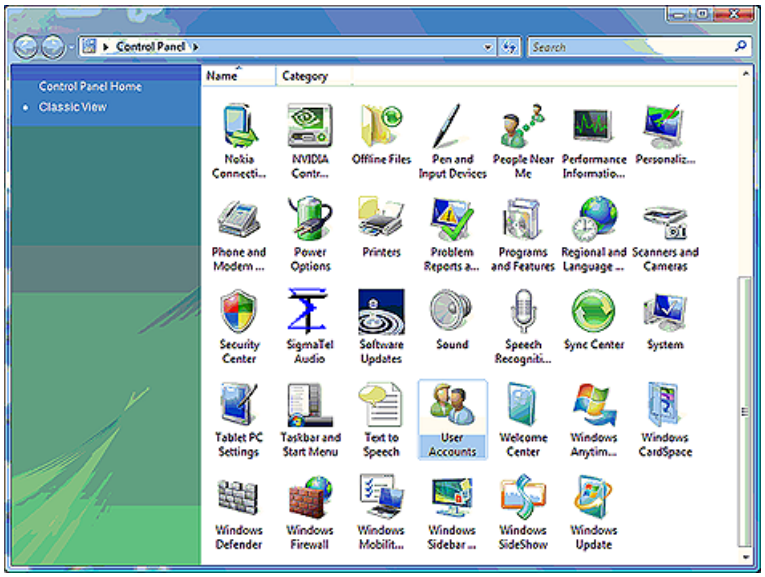
Select “Users”



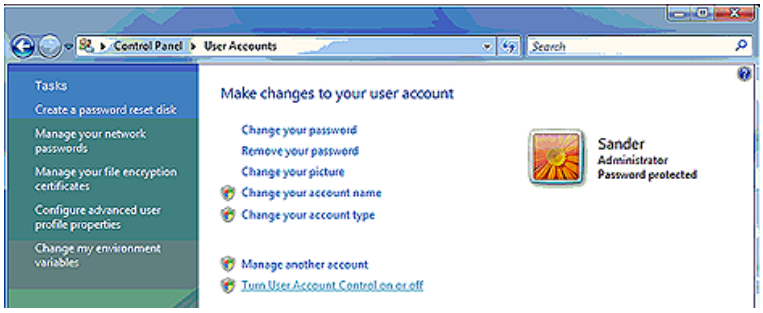
Select Full control and click “Apply”. All users have all permissions on the “MRS Software folder”.

How to turn off user account control

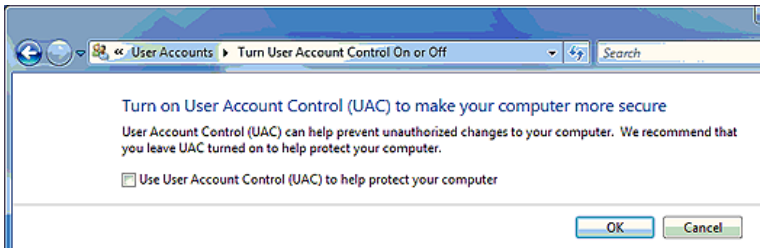
To turn off user account control, browse to Control Panel and select “User Accounts”.



Click “Turn User Account Control on or off”.



If Windows asks permission, choose Yes. The following screen will appear. The checkbox needs to be unchecked. If it is already unchecked, leave it this way. Otherwise, uncheck the checkbox and press OK. The computer will ask to restart. Choose Yes.



2.4 Firewall

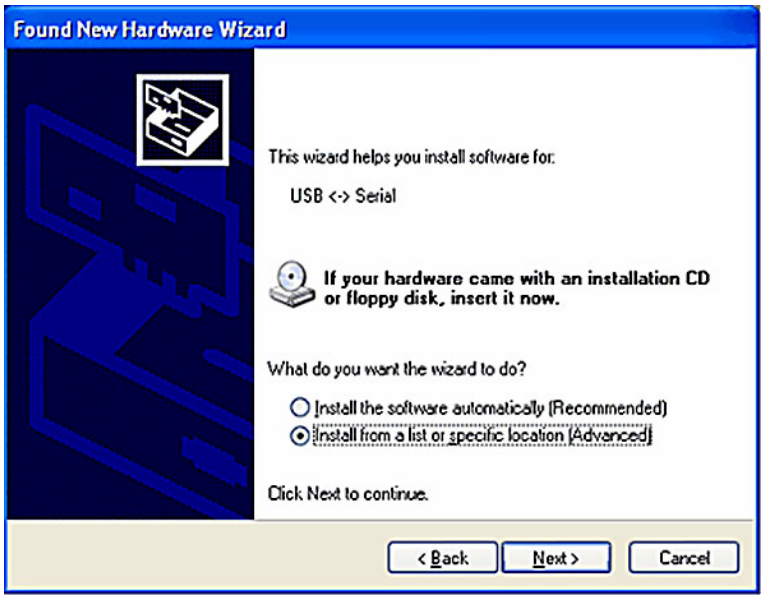
If there is a firewall installed on the server, you need to add TCP port 3050. This is used for connection from a client computer to the database server. If you do not know how to add this port, please contact your system administrator.

2.5 Install USB driver

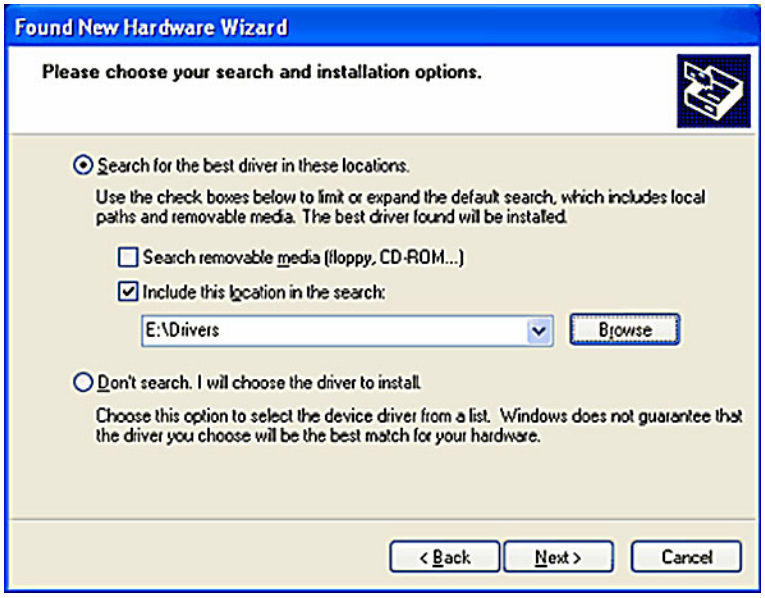
Put the installation CD in the CD-Rom player of the computer. Ignore the autorun screen. Connect the USB cable to the MRS Equipment and connect the other side of the cable to the computer. The following balloon appears in the screen:

After a few seconds the "Found new hardware wizard" appears:

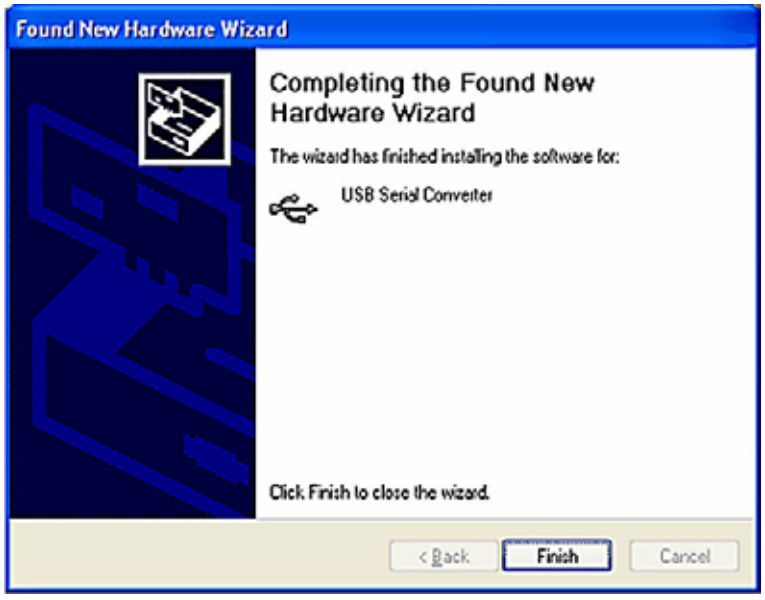
Choose "No, not this time" and press the <Next> button



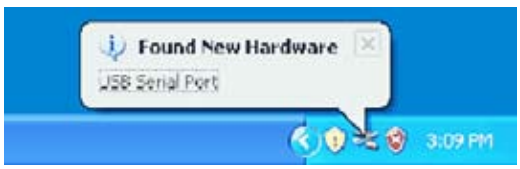
Choose "Install from a list or specific location (advanced) and press the <Next> button



Select the option "Search for the best drivers in the locations".
Uncheck "Search removable media".
Check "Include this location in the search".
Press the <Browse> button and browse to the "Drivers" folder on the MRS Software CD (in this example screen the driver is "E").
Press <Next> to continue. The installation is started...

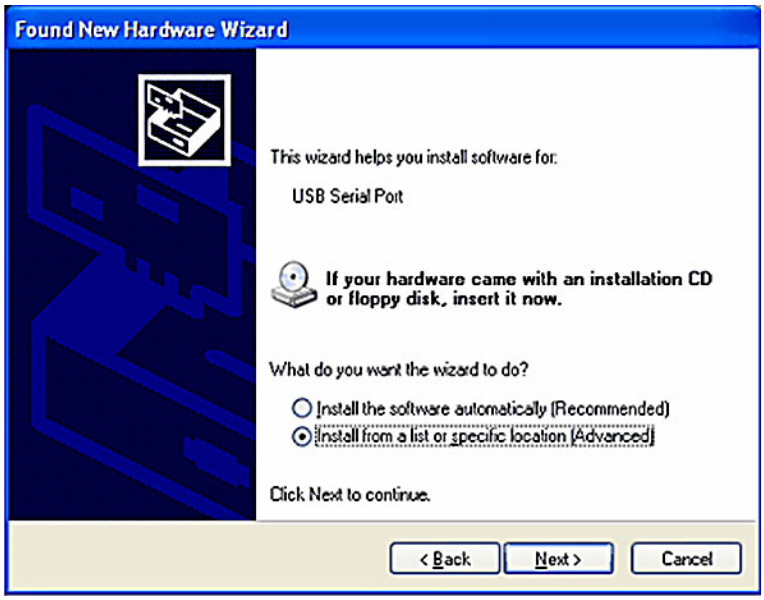


When done, press the <Finish> button to close the "Found new hardware wizard"
After a moment the following balloon appears:

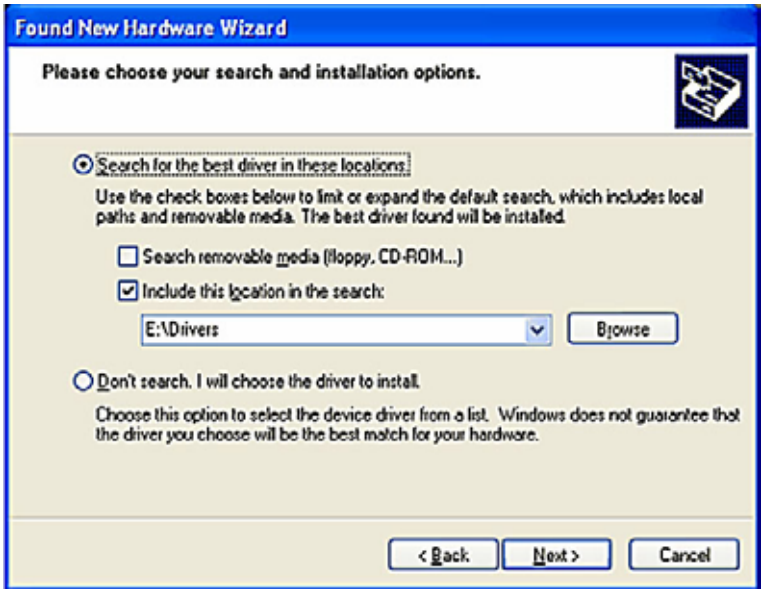


And after that the "Found new hardware wizard" appears:

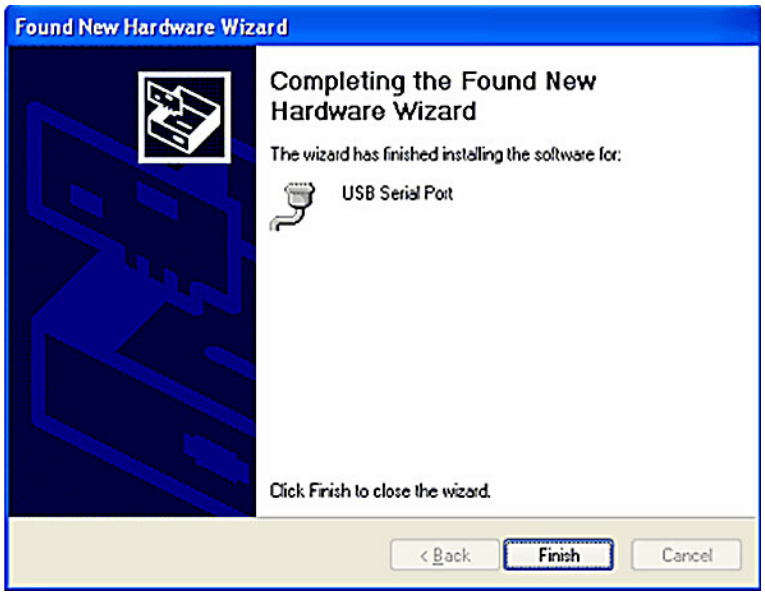
Choose "No, not this time" and press the <Next> button.



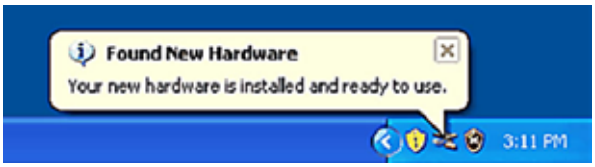
Select "Install from a list or specific location" and press the <Next> button



Select the option "Search for the best drivers in the locations".
Uncheck "Search removable media". Check "Include this location in the search".
Press the <Browse> button and browse to the "Drivers" folder on the MRS Software CD.
Press <Next> to continue. The installation is started...



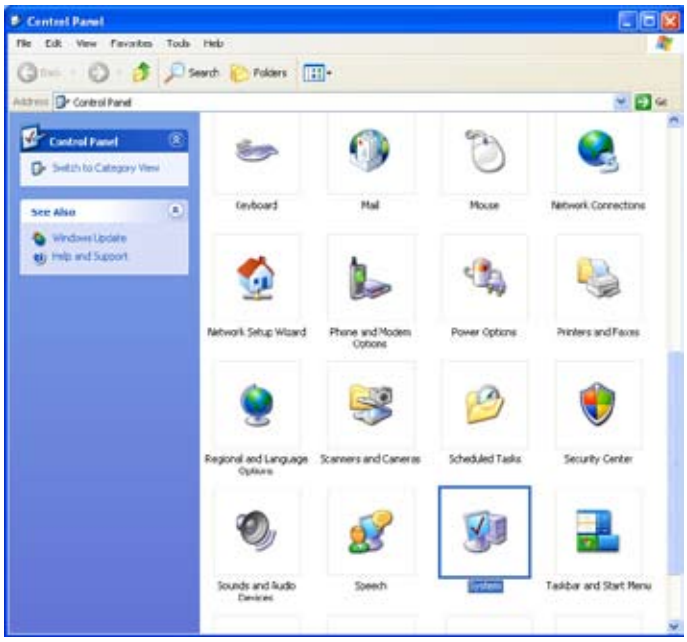
When done, press the <Finish> button to close the "Found new hardware wizard"
After a moment the following balloon appears:



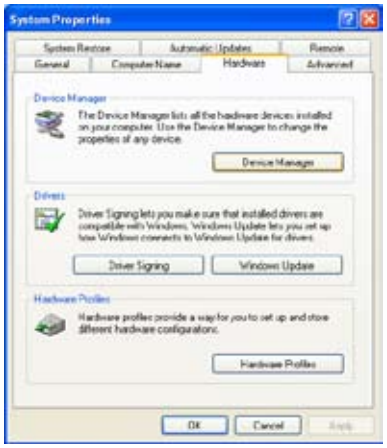
The MRS equipment driver installation is done.

2.6 Detect COM-port

Go to the control panel (Start -> Settings -> Control panel)



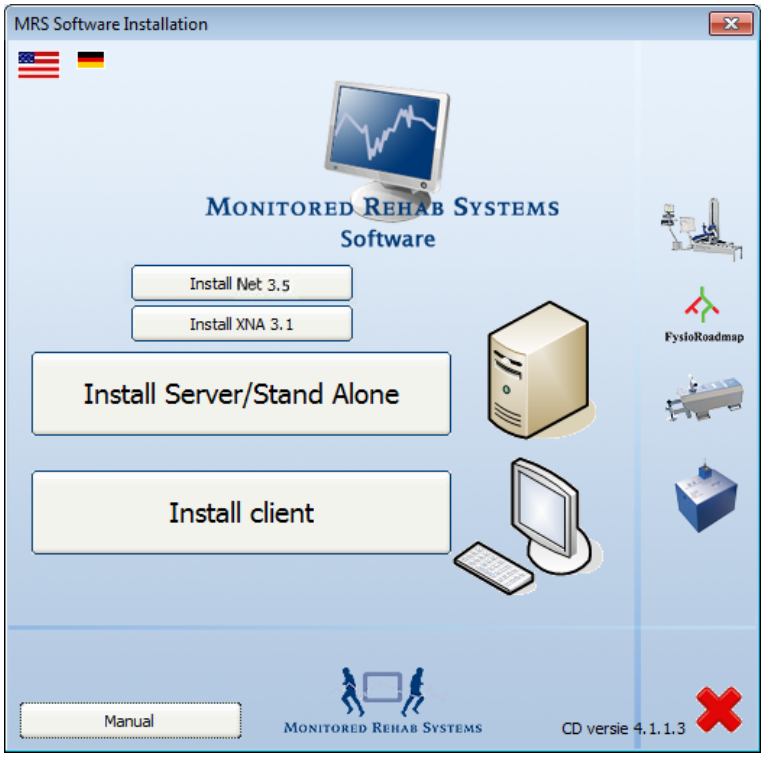
Double click on "System"
Go to the tab "Hardware" and then to "Device manager"



Double click on "Ports"
Now you can see on which port the "USB Serial port" is connected. In the example it is COM3. You will need this information after the installation. See chapter "Settings" page 24.

2.7 Autorun

Put the installation CD in the CD-Rom player of the computer. If “Autorun” is switched on, the following screen appears:

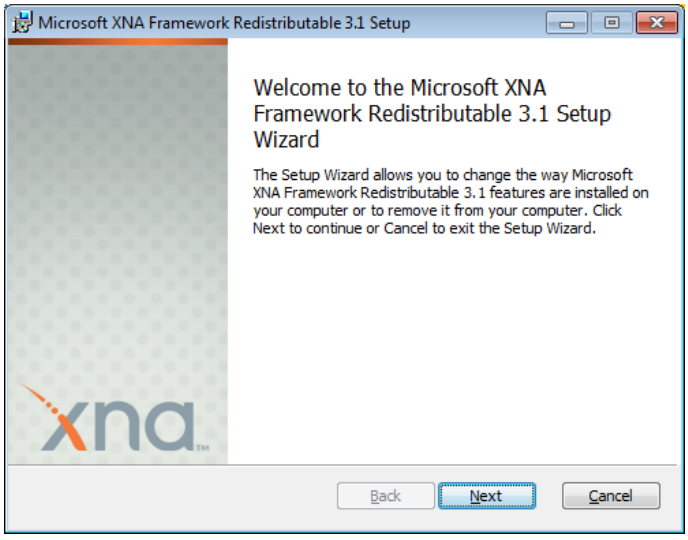


If the screen doesn’t appear, double-click on the icon “my computer” on your desktop. Select the CD-Rom player (generally the D-disk) and click on your right mouse button. Choose “Open” in the menu that appears. Now double-click on the icon “Autorun.exe”.

The following software is required:
- .NET Framework 3.5
- XNA Framework 3.1

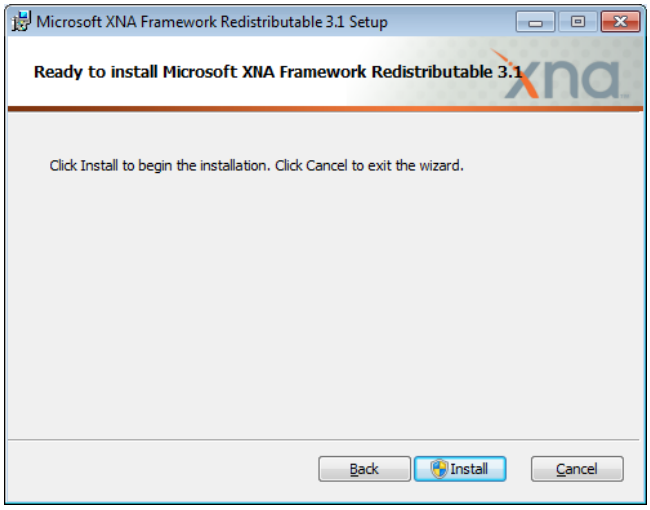
If they are already installed, you won't see these buttons.

If the button Install XNA version 3.1 or Net 3.5 appear(s), this means you don't have this software or correct version and you have to click this button.
The following screen will appear:

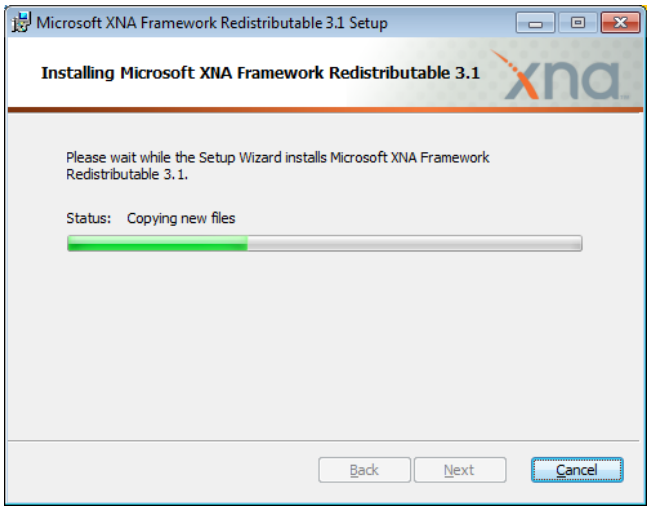


Press "Next" to continue.

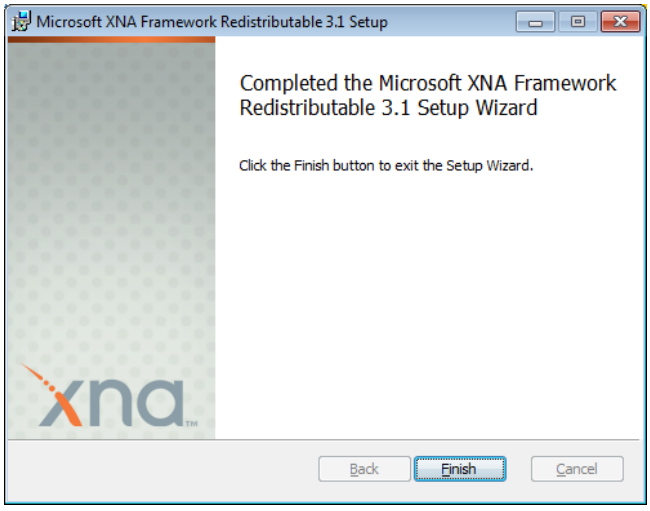
Check "I accept the terms in the License Agreement".
Press "Next" to continue.



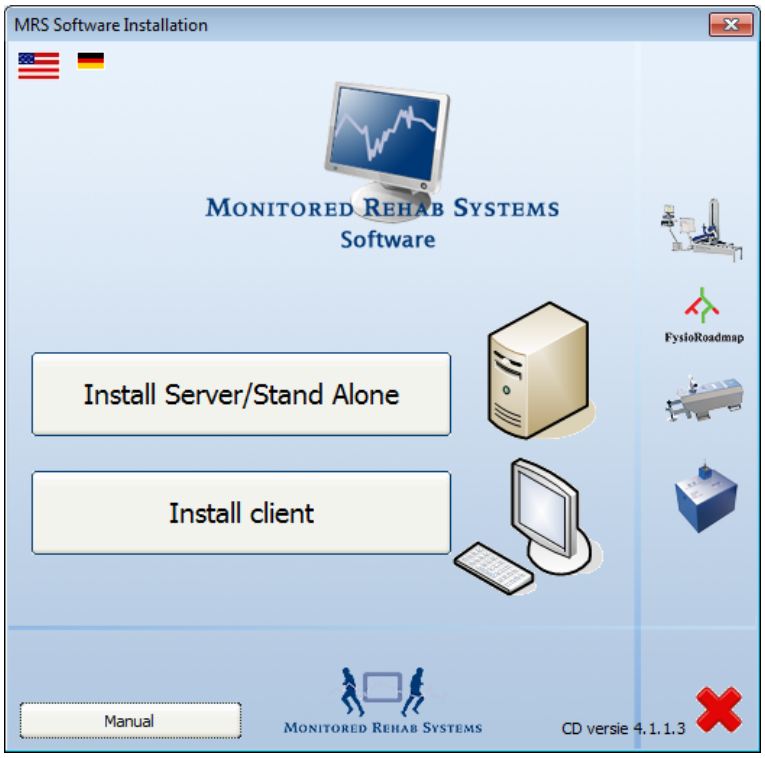
Press "Install". This installation take several minutes.



The following screen will appear when the installation has been successful:



Press "Finish" to continue.
The button in the start up screen will disappear.



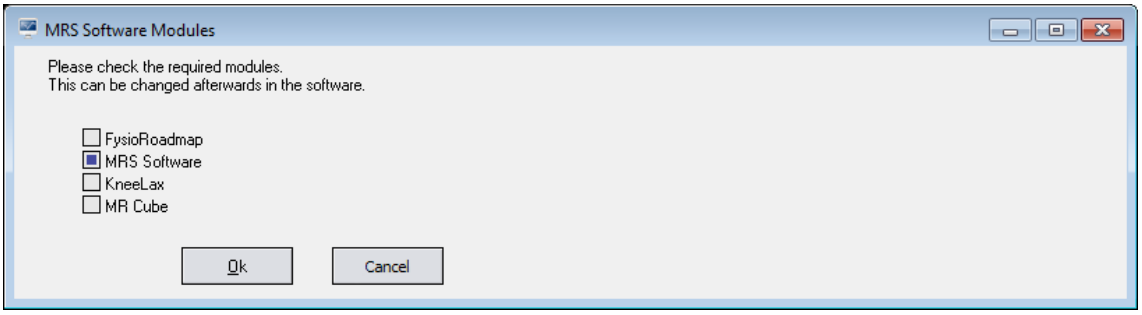
In the menu can be chosen between the server and the client. Always start with installing the server. Click therefore on the button “Install Server/Stand Alone”.

Attention!
With a new installation or update, the server must be installed always first. After this, install the clients.

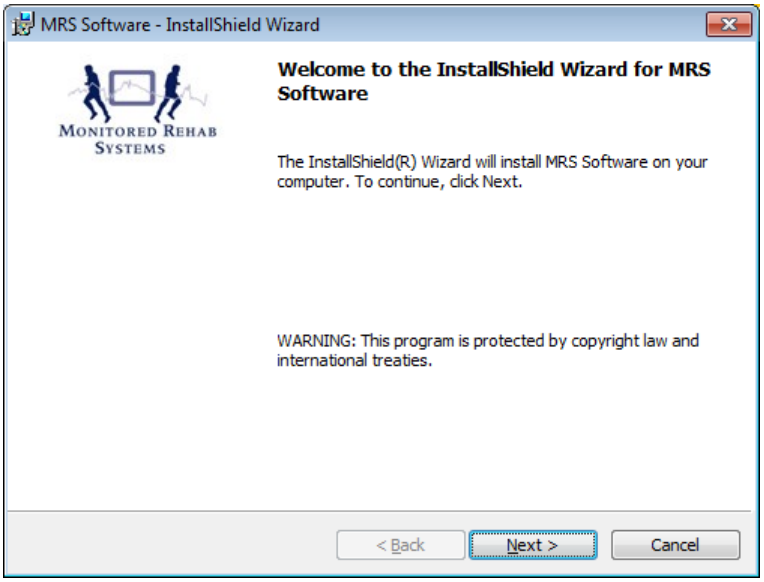
2.8 Server Installation

The software detects if there is an Firebird installation available. If there is an old version installed, a message appears. Please stop the Firebird server (Control panel – Firebird service manager – Stop). Press OK to continue the installation, a newer version of Firebird will be installed.

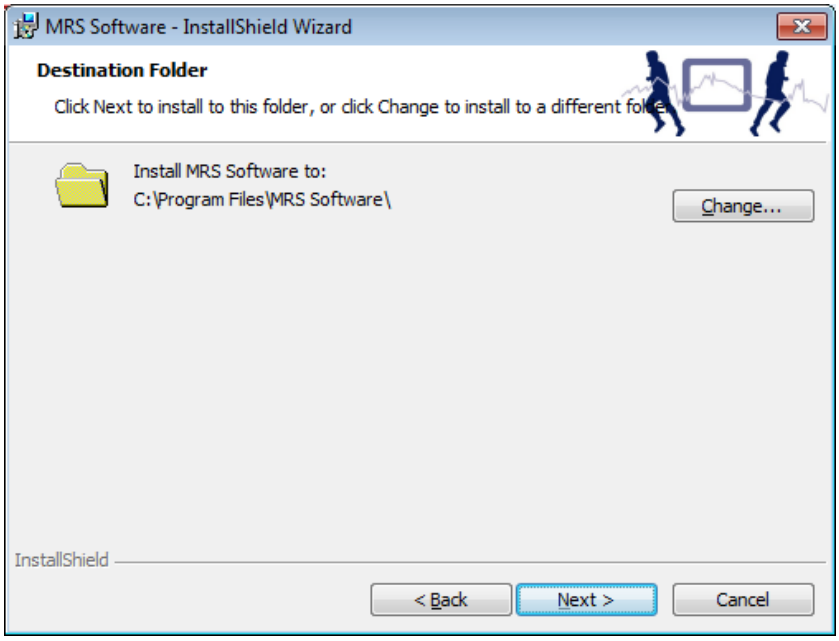
If “Install Server” is chosen in the autorun menu, the preparation of the installation starts:



Please make sure the “MRS Software” box is checked.



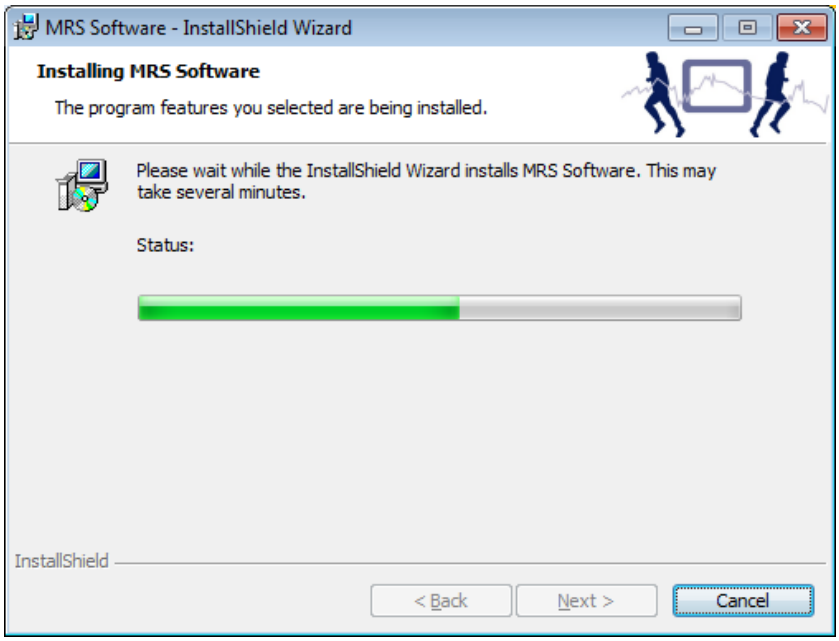
Choose “Next” to select the folder where the Monitored Rehab Systems software must be installed in.

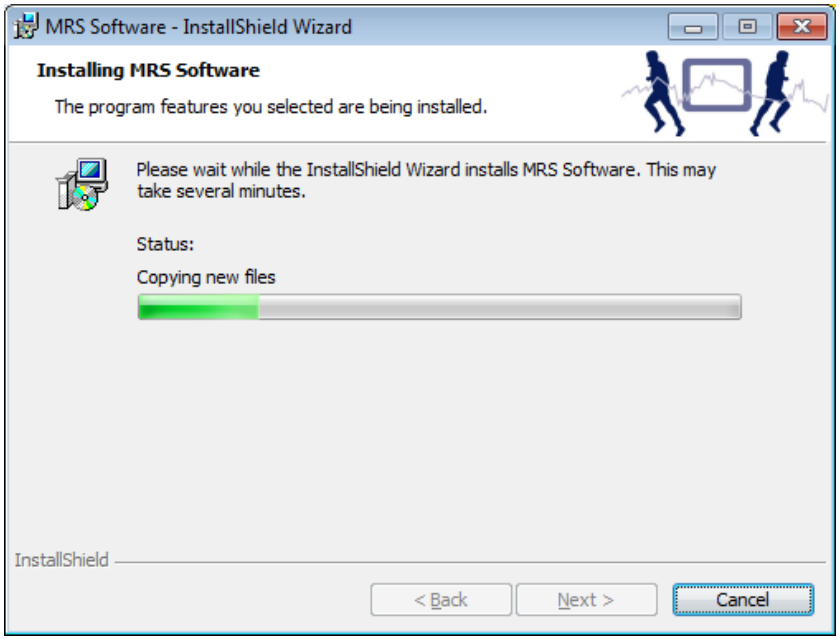


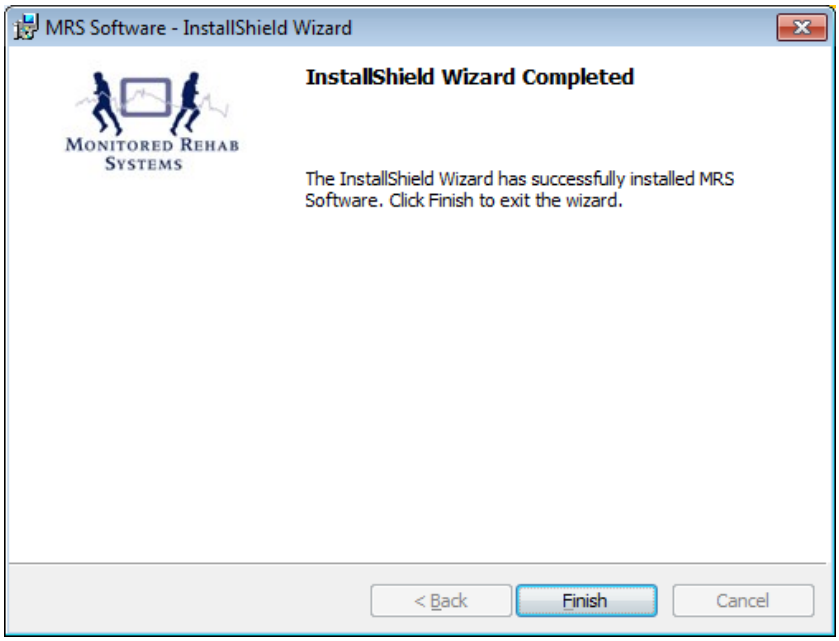
With the button “Change” the location can be changed. It is advised to install the software in the standard folder. If this is chosen for this software it will be installed in the folder:

C:\Program Files\MRS software

Here after press the button “Next”.





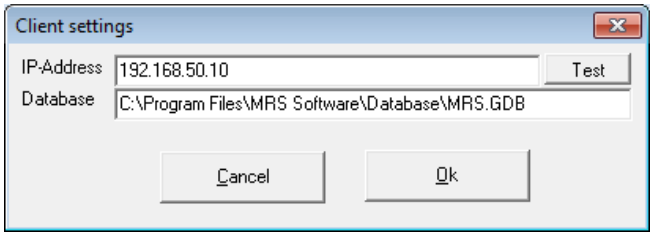


The installation is now almost ready, with the button “Finish” the installation is completed. There is a new icon on your desktop. Double-click to open the MRS Software.

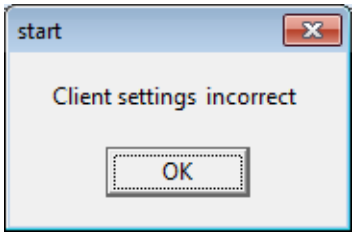
Possible client installation(s) can be started now.

2.9 Client Installation

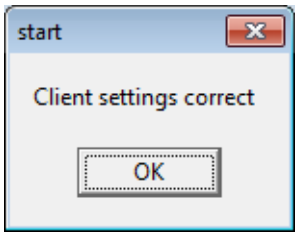
If “Install Client” is chosen in the autorun menu, the preparation of the installation starts:



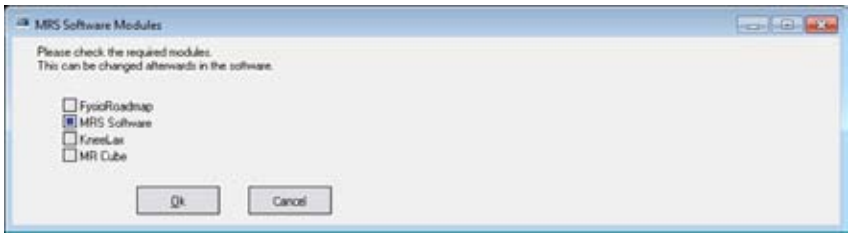
A client settings screen appears. Please enter the IP Address and Database path from the server computer. Please use the direct path which is used on the server (you can’t use a network shared drive). You can test the connection with the <Test> button.



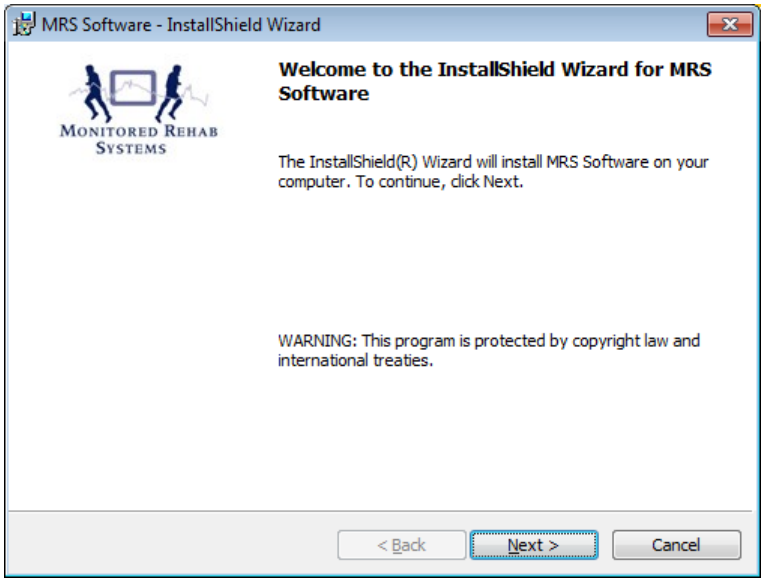
When client settings are incorrect, please check the following items:
- Permissions (page 4)
- IP Address (from server computer)
- Database path (direct path on server computer)
- Firewall port 3050 (page 7)



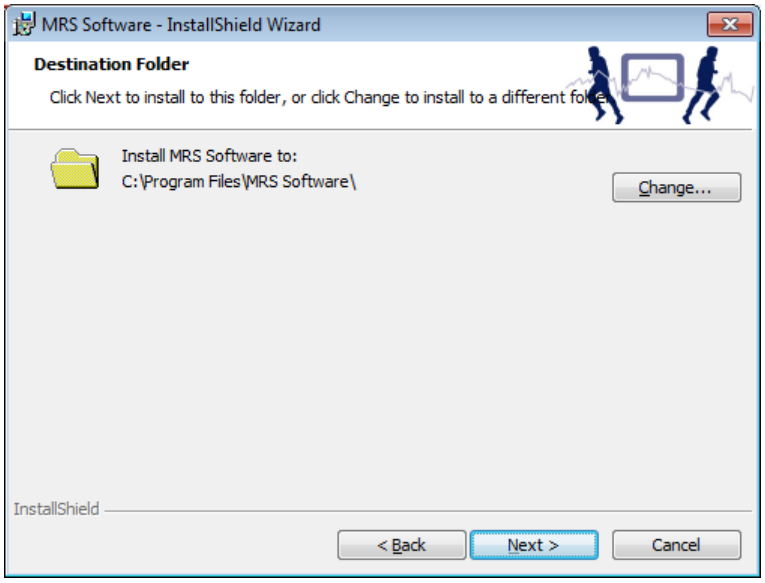
The <OK> button is enabled when the server can be reached.



Make sure the “MRS Software” box is checked.
Hereafter the welcome screen opens:



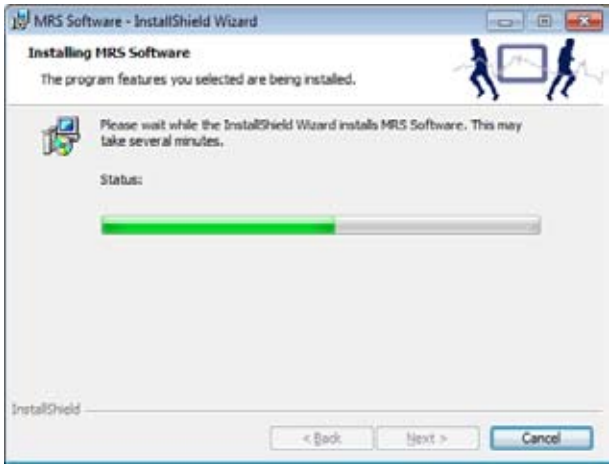
Choose “Next” to select the folder where the Monitored Rehab Systems software must be installed in.

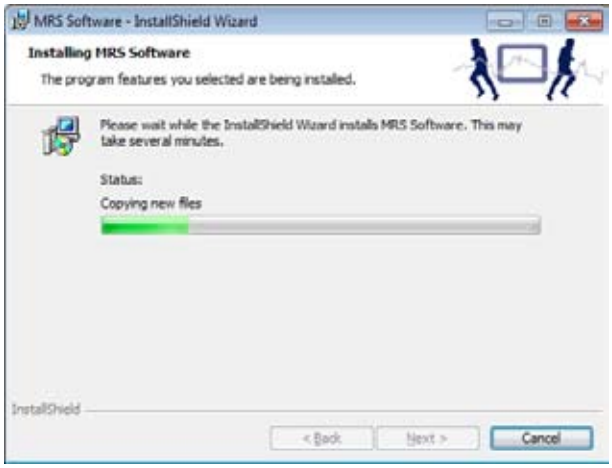


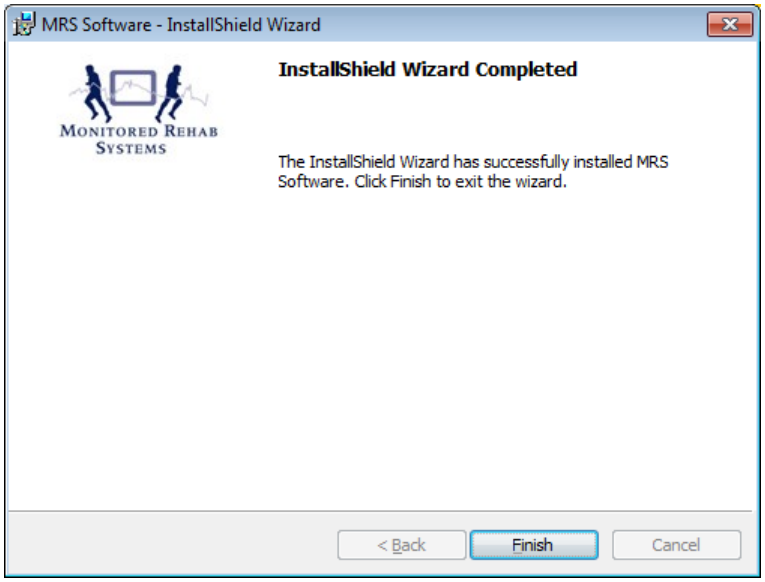
With the button “Change” the location can be changed. It is advised to install the software in the standard folder. If this is chosen for this software it will be installed in the folder:

C:\Program Files\MRS software

Here after press the button “Next”.







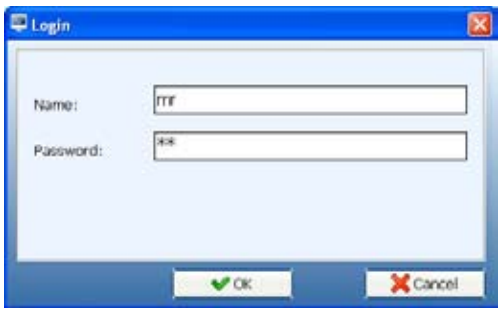
The installation is now almost ready, with the button “Finish” the installation is completed.

There is a new icon on your desktop. Double-click to open the MRS Software.

3. MRS Software login

Double-click the icon on your desktop to start the MRS Software.

The following login screen will appear:



3.1 Password

There are 3 login levels:

	Name	Password
- Administrator	**mradmin**	**mradmin**
- Supervisor	**mrs**	**mrs**
- User	**mr**	**mr**

The difference between these log levels are the rights you have in the program. The user has the least rights and the administrator has all rights. In several institutes supervisor and user are automatically logged in at the correct institution.
Users can be created by the administrator in MRS Software by going to 'Settings' and then 'User Management'.
After the first login as administrator an institute selection screen will appear. Choose which institute you want to use.
After selection of the institute, the referring password must also be entered. Default password is: mr
This password can be changed by the Administrator.

3.2 Rights

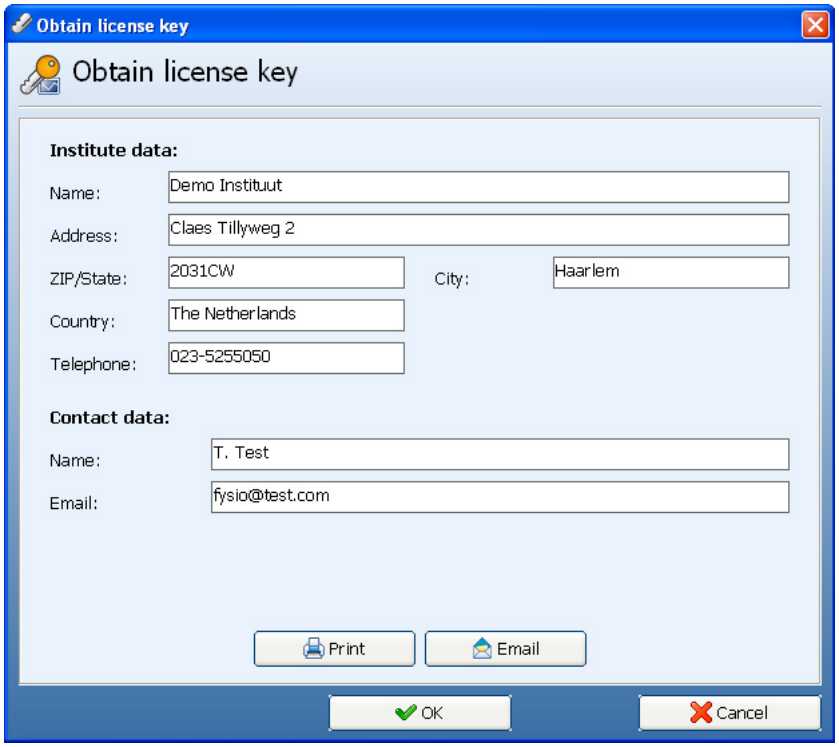
User (working Physiotherapist) can not adjust master files and settings.
Supervisor (or site manager, quality manager) can not adjust master files or administrator settings.
Administrator (General Manager, owner) has all rights to all functions in the program and can change the default passwords.

4. Registration

Before use, the Monitored Rehab Software needs to be registrated. This registration is valid for one year and will be renewed each calendar year. After installation, the software is in demo mode which is valid for 30 days. During startup, the software shows how many days you have left to register.

At the first start, the following message will appear:

Select "Continue" if you don't want to register at this time.
Select "Obtain License Key" if you do want to register. Enter your details:



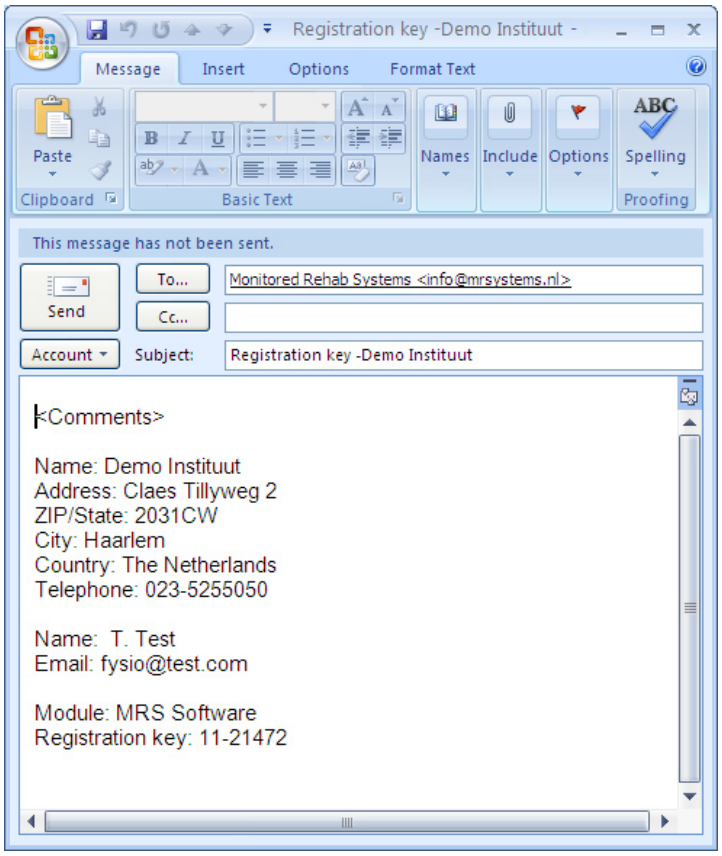
Select "Print" to print the registration form.
Select "Email" to e-mail the registration form, your local e-mail program **must** be opened for this action (webbased e-mail will not work).

Obtain license key

Send or fax this document to:
Monitored Rehab Systems
PO box 4959
2003 EZ Haarlem
+31 (0)23 750 54 44

Name:	Demo Instituut
Address:	Claes Tillyweg 2
ZIP/State:	2031CW
City:	Haarlem
Country:	The Netherlands
Telephone:	023-5255050
Name:	T. Test
Email:	fysio@test.com
Module:	MRS Software
Registration key:	11-21472

Print Preview. You can fax this to +31 (0) 23 750 5445 or save as PDF and email as an attachment to info@mrsystems.nl



Example of an automatically generated email.

After registration you will receive from Monitored Rehab Systems (within 3 days), by e-mail a license key.
To enter the received key, start the software and choose "Enter license key".

The code provided by Monitored Rehab Systems can you copy/paste in the text field under "License Key" (do not type, it gives error messages because the difference between I, l, L, l O, 0 o are not clear enough).

Then, select the green check mark. Your software is now registered.

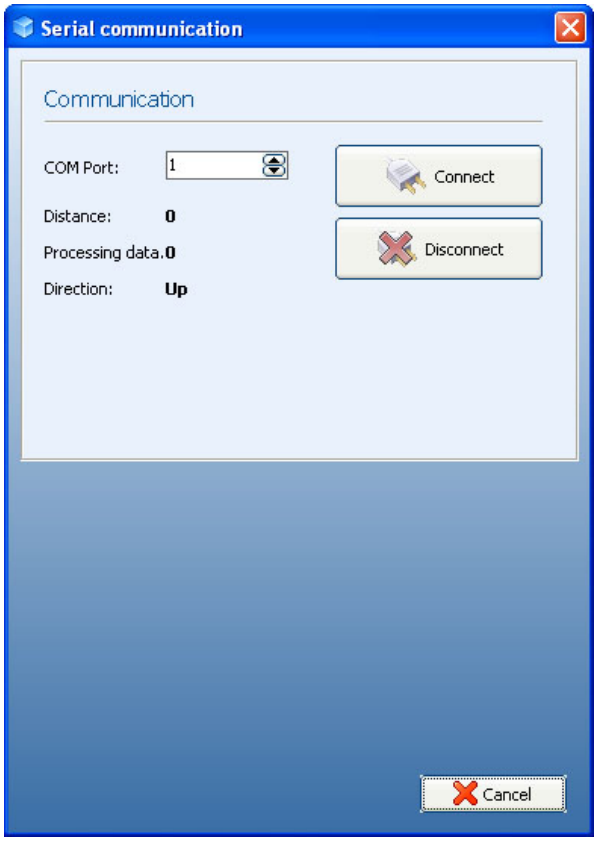
By the end of each calendar year you will receive (depending your agreement with your local dealer) an invoice for next year's license. After payment of the invoice you will automatically receive a new license key for the following year.

If you do not register, a message "License expired" will appear frequently.

5. Settings

The following settings can be found under the 'Settings' tab.

5.1 Show serial

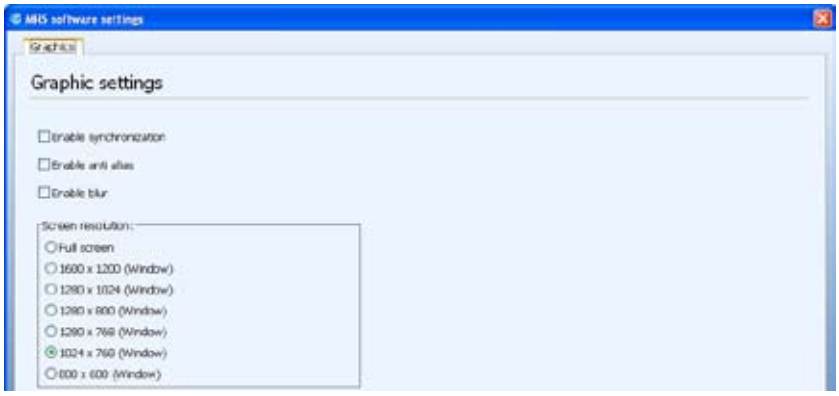


Com Port: select the comport where the electronics of the machine are connected to the computer. The number of your Com Port can be found with the instructions on page 12.
Force: value force should be moving if the machine is being used.
Distance: should be moving if the machine is being used.
Direction: the direction of the cable, "up" or "down".

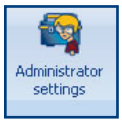
Press "Connect" to start communication with the electronics.
Press "Disconnect" to stop communication with the electronics.

5.2 Settings

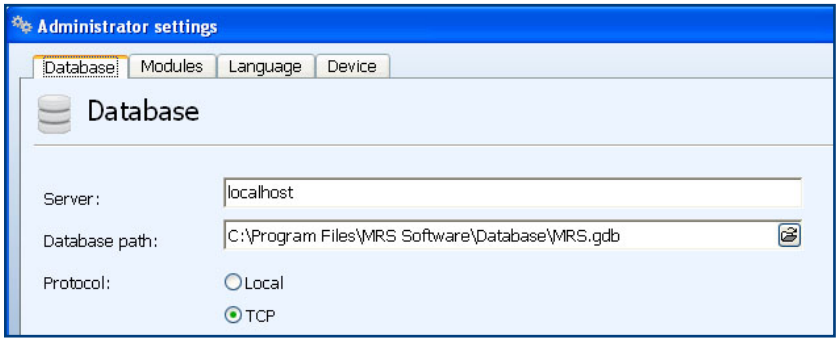
Enable Synchronization: This enables or disables synchronization between the monitor refresh rate and the drawing of the graphics. Enabling this will try to prevent screen tearing, but might decrease the frame rate.
Enable Anti Alias: When enabled this improves image quality at the cost of a minor hit in the frame rate.
Enable Blur: background with blur (not sharp).
Screen resolution: choose the resolution of your screen to optimize your view.



5.3 Administrator Settings

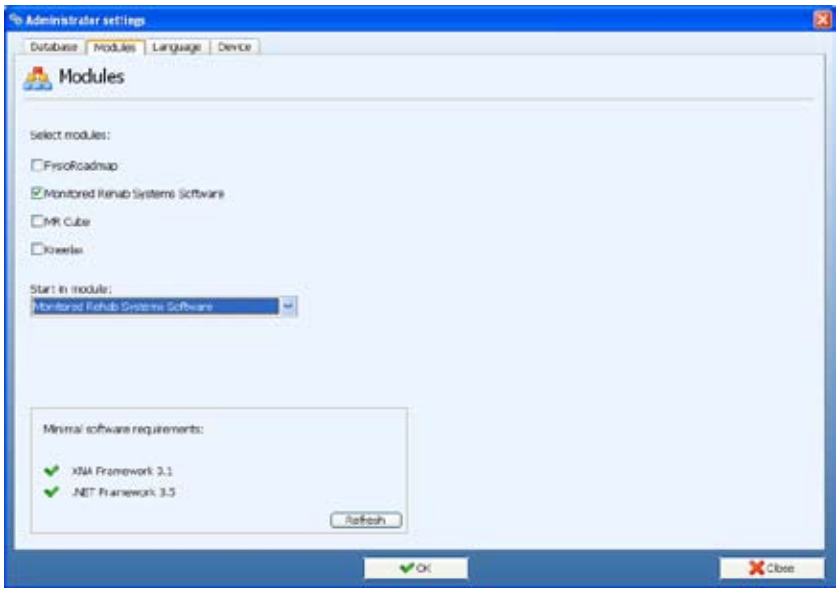


Database



Server: If you work with a central database on a server, the IP-address of the server should be entered in this field. If the computer is used as a server or stand alone, the setting is "localhost".
Database path: displays the path to the database. (Both local or on a server).
Protocol: TCP or local depending your network.

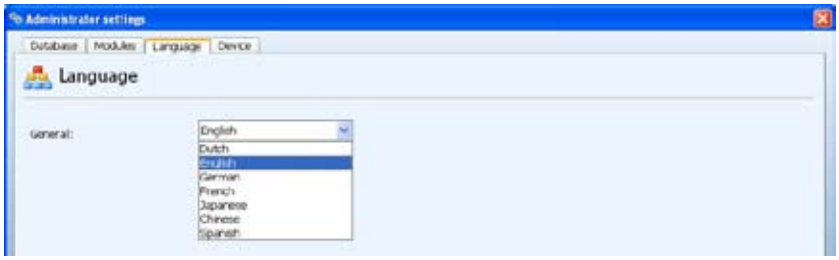
Modules



Select modules: If the software will be used also for other equipment or FysioRoadmap, select the module you need.
Start in module: select the module you want the program to start.
Minimal software requirements: For the proper functioning of the software, additional software is required. Here is an overview of the specifications and whether the software is installed on your computer. (Green checkmark = succesfully installed, red cross = the software is not installed yet)
Refresh: after installing extra software while MRS Software is still in use, use the refresh button to update the overview.

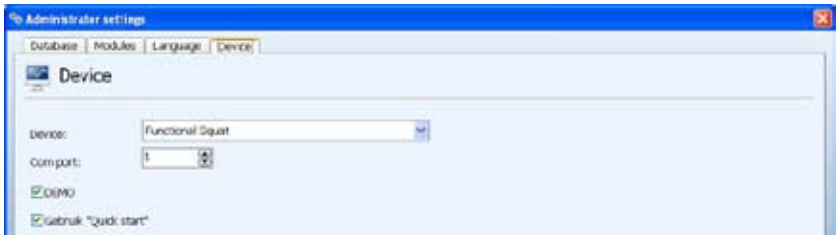
Languages

Select your language and restart the software.



Device

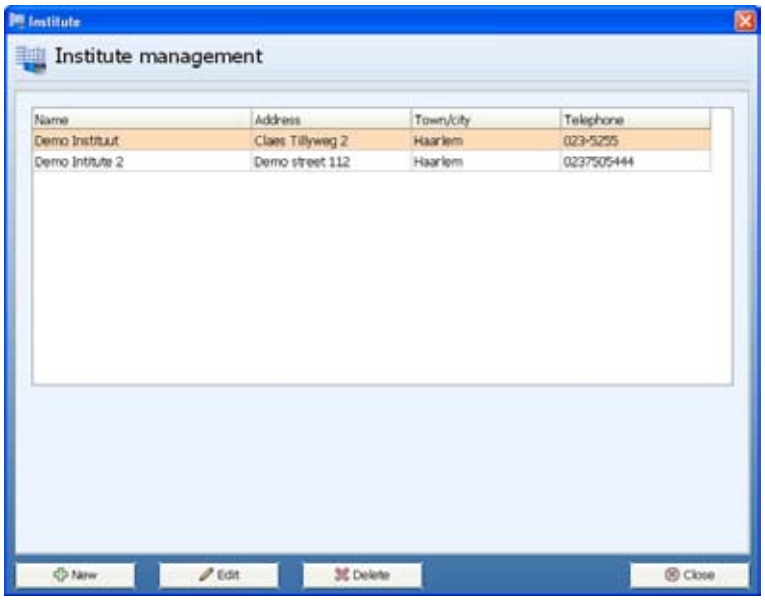
Select what kind of machine you are using.



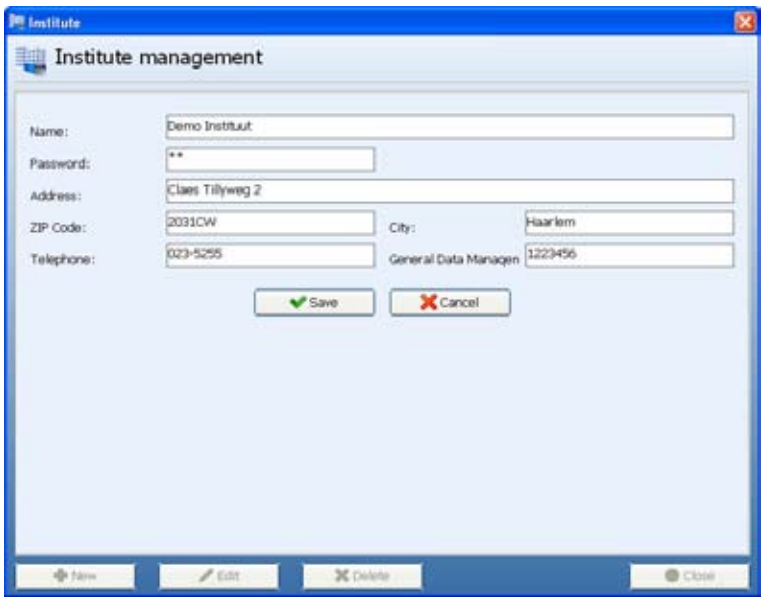
Com port: select the comport where the electronics of the machine are connected to the computer.
DEMO: If there is no connection to electronics, but you want to see a demonstration of the software

and use your mouse instead, use this option.
Use Quickstart: Select this option if you want to use the quickstart menu instead of the advanced menu.

5.4 Institute Management



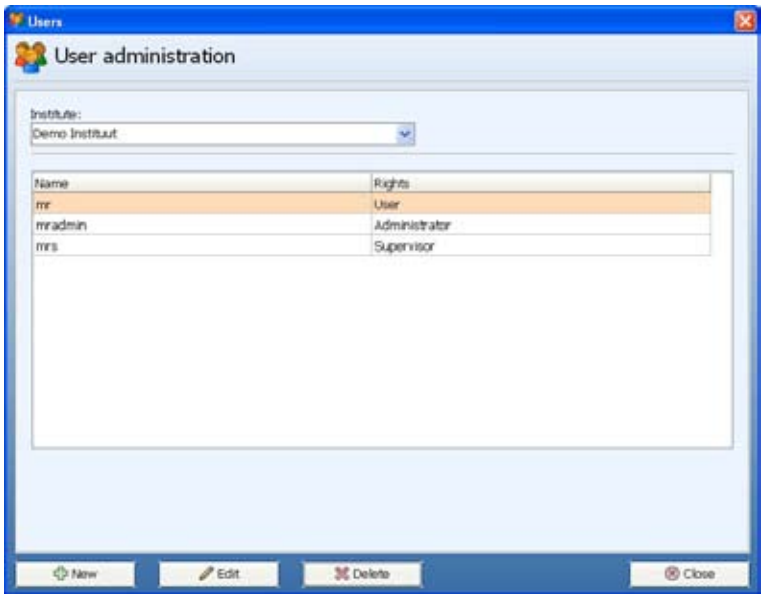
One institute stands for one administration in your software. Select the line <Wijzig Instituut> and choose 'Edit'. Fill in your details and Save. This information will appear automatically on your prints.



5.5 Choice of institute

This function is used to switch between multiple administrations. Choose the institute and confirm by password (Institute management).

5.6 User Administration



There are 3 login levels:

	Name	Password
- Administrator	**mradmin**	**mradmin**
- Supervisor	**mrs**	**mrs**
- User	**mr**	**mr**

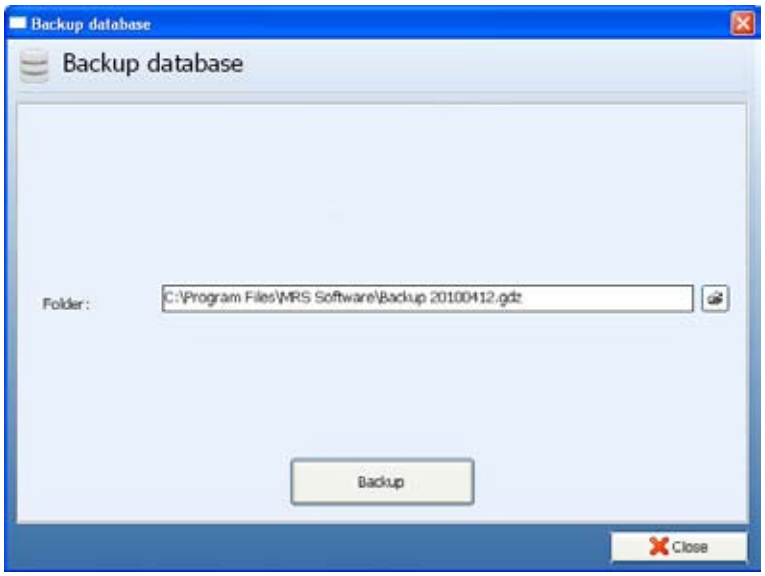
The difference between these login levels are the rights you have in the program. See page 23.

New user: First select the institute where you want to create the user in.
Choose 'New', the following screen appears:

Name: Enter the new username.
Password: Enter the password for this user.
Rights: Select the "Rights" of this user.
Then choose "Save". The new user appears in the list and is ready to login.

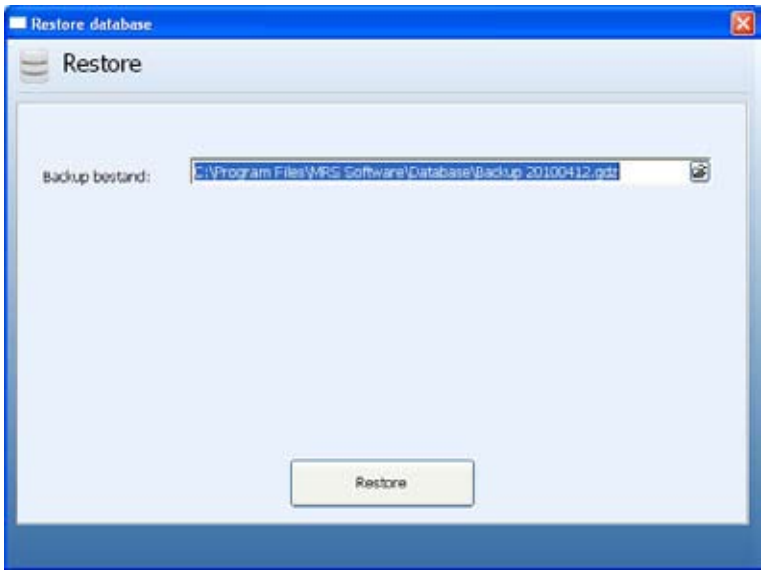
Delete: Click once on the user and select "Delete". The user is now removed.
Edit: Click once on the user and select 'Edit'. You can now change the information.

5.7 Back-up database



Select by "Backup path" the desired path to store the database. Click the button "Backup".
If the backup is complete, a green text "backup done" will be shown.

5.8 Restore database

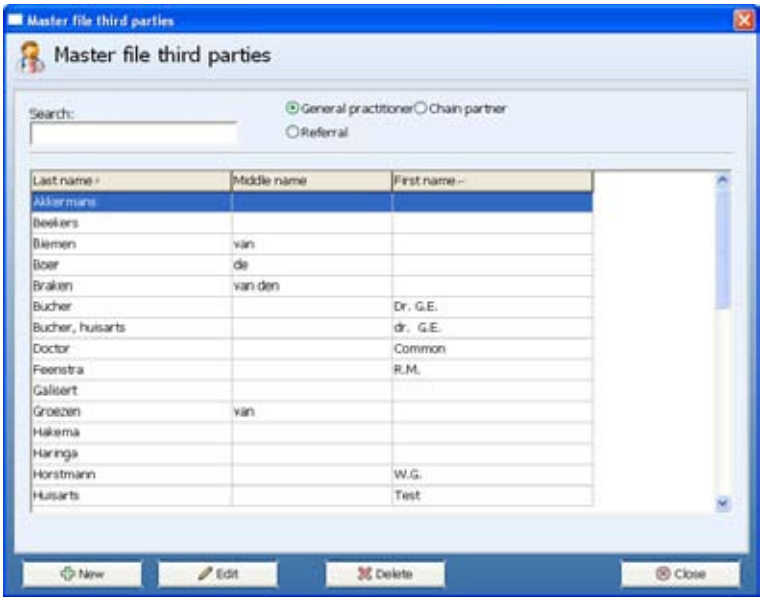


To restore the database choose the correct file and 'Restore'. Restart FysioRoadmap.
This operation will erase all data from FysioRoadmap and replaces it with data from the back up.

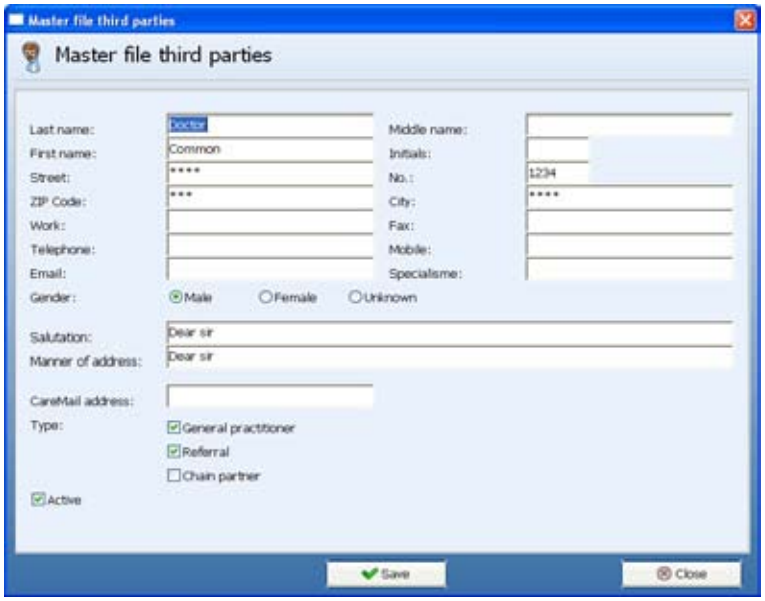
6. Master files

6.1 Third parties

The tab ‘Master files’ is used to add/edit the following third parties:
General practitioner - Clinician - Referral - Insurer
Editing is the same for all third parties and goes as follows:



Select 'General practitioner’. Choose "New" to insert a new general practitioner.

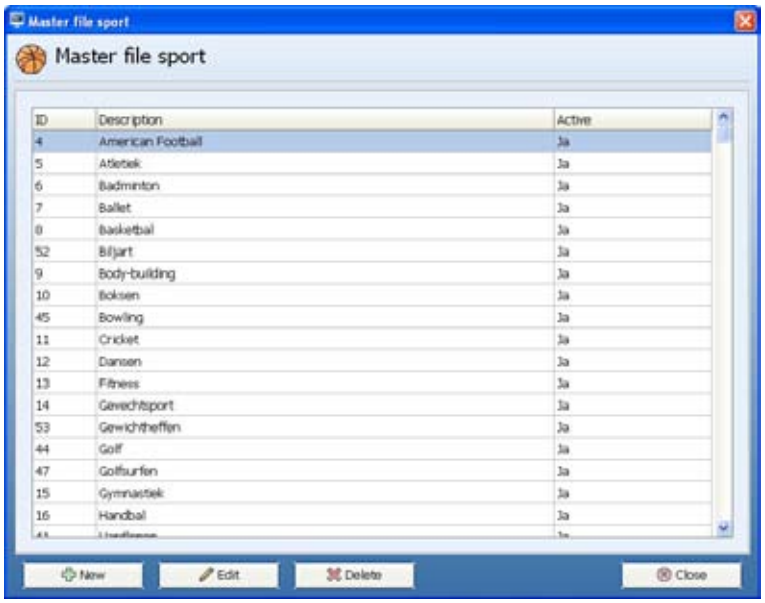


Fill in the all the fields. A number of fields is required and the screen will not save and close untill

this information is completed.
To edit someone of the third party, select the button and choose “Edit”. Via “Edit” you can uncheck “Active”. The contact person is not deleted but will not appear in the active list.

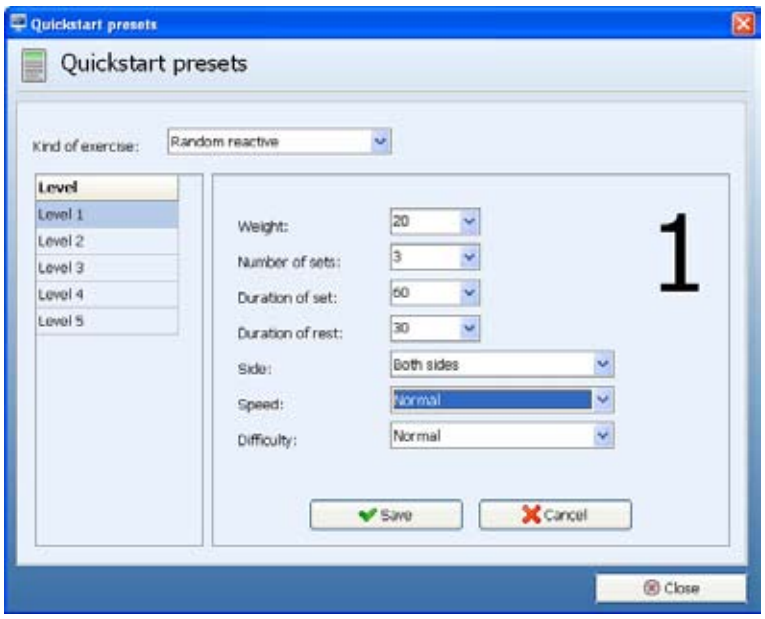
6.2 Sport/Profession/Employer

All sports are added via button “Sport”. Via “Edit” you can uncheck “Active”. The sport is not deleted but appears no longer in the active list. The sports which the patient practices can be specified in the indication of the relevant patient. Profession and Employer function exactly the same.



6.3 Quickstart presets

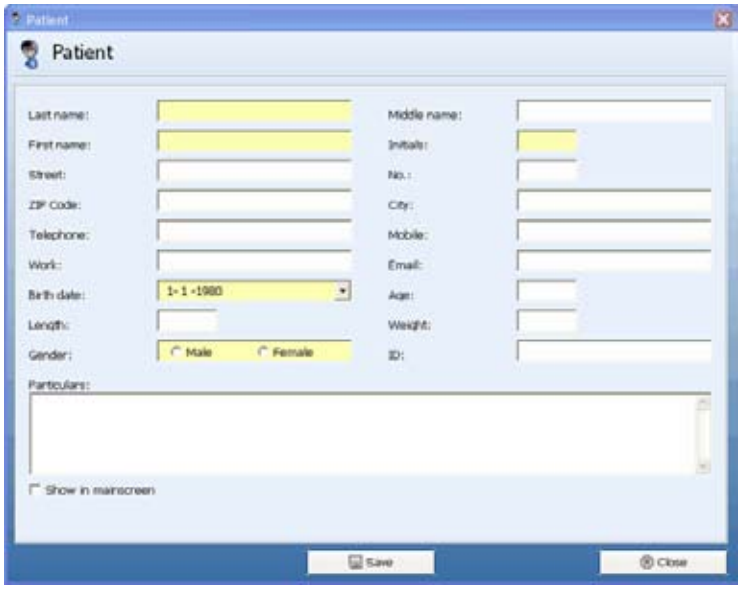
Choose this option to change preset levels of the quickstart. Select an exercise and level. Change settings into the preferred ones. Choose Save.



7. Patient

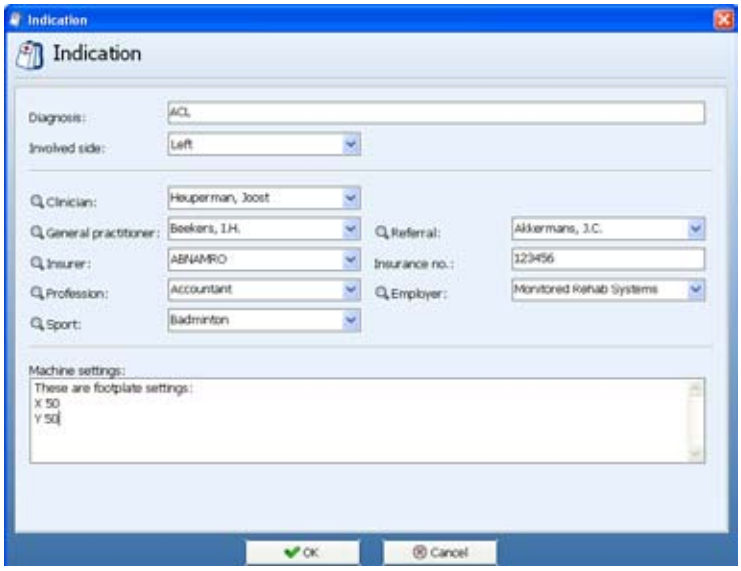
To insert a new patient select the option “New patient” in the menu.

Fill in the fields of the form with the patients data. The information in these fields will be linked with all performance results of the executed test- and training programs. The yellow fields are required.



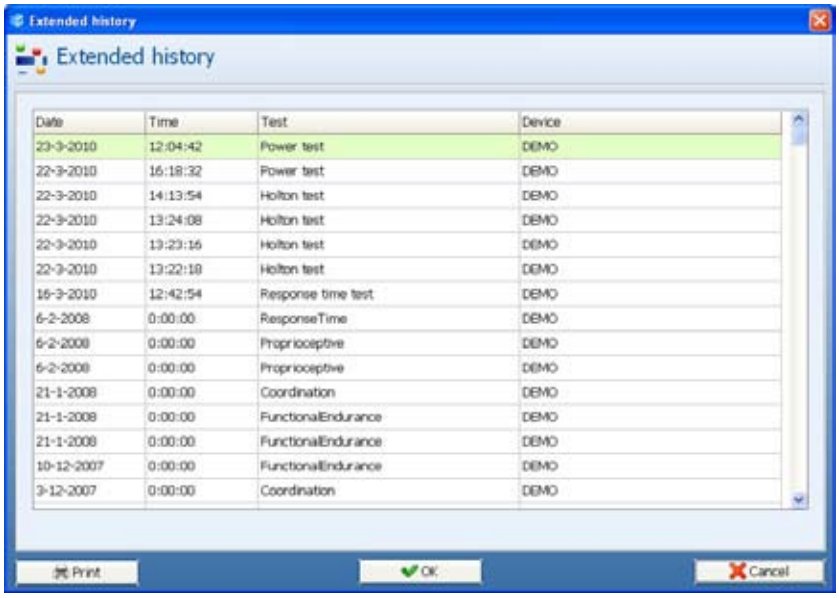
7.1 Indication

In the indication screen you can enter additional patient data like the diagnosis, involved side and more. This information is shown in the header on the printouts.

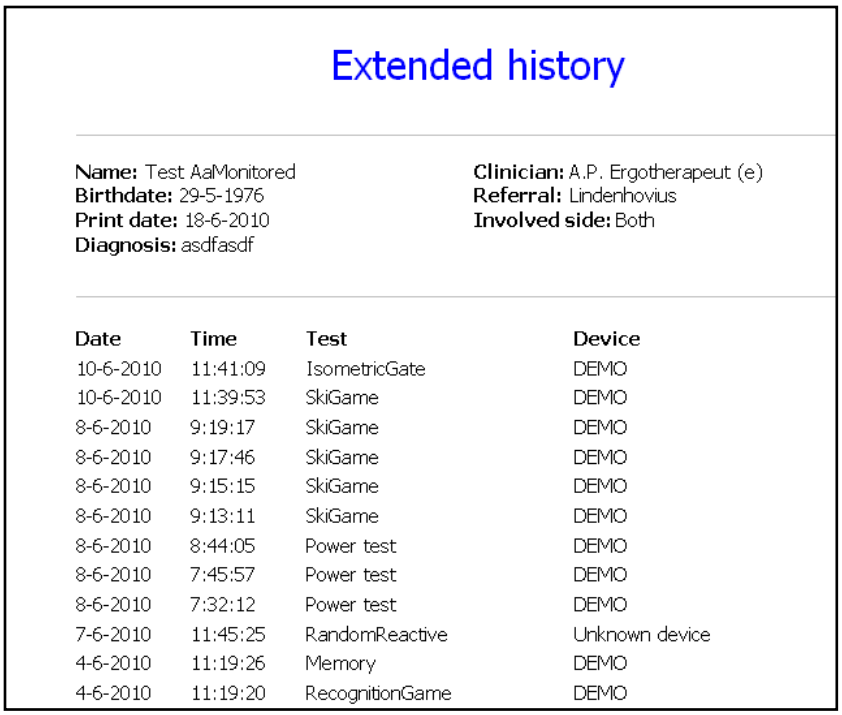


7.2 Extended history

Choose “Patient” - “Extended History”. Here you get an complete overview of all test-, rehab and training programs with belonging scores from the selected patient. Every overview can be printed out. To view the results of one specific test double-click on a test.



To print to paper use the “Print” button.



Extended history

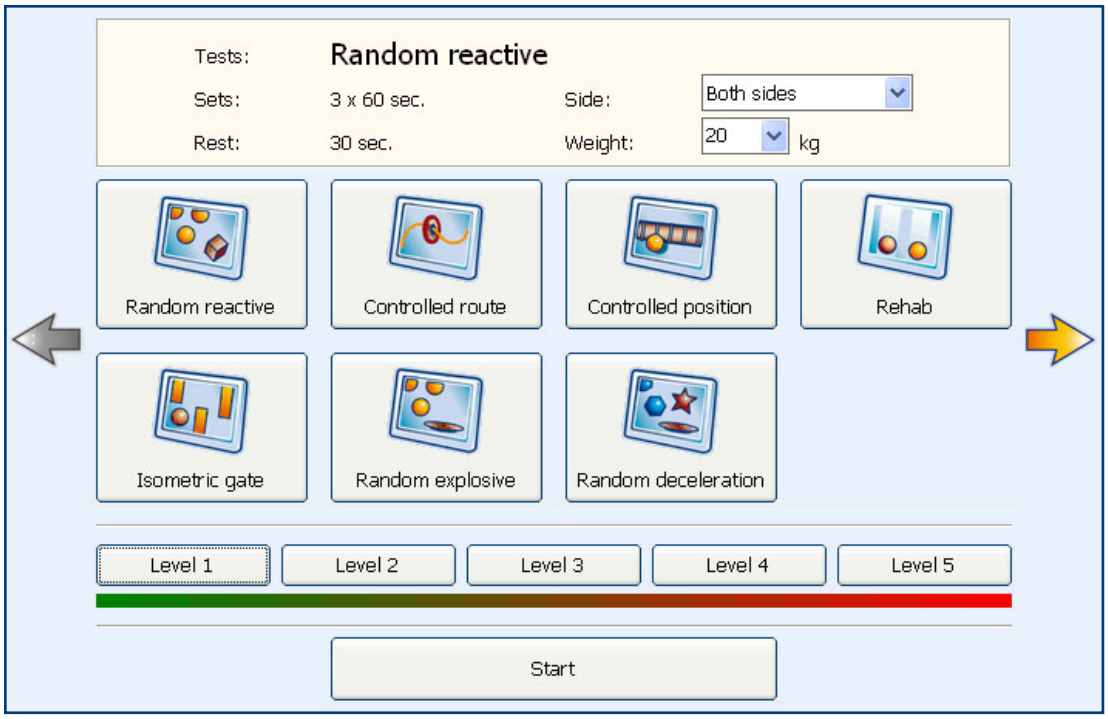
Name: Test AaMonitored
Birthdate: 29-5-1976
Print date: 18-6-2010
Diagnosis: asdfasdf

Clinician: A.P. Ergotherapeut (e)
Referral: Lindenhovius
Involved side: Both

Date	Time	Test	Device
10-6-2010	11:41:09	IsometricGate	DEMO
10-6-2010	11:39:53	SkiGame	DEMO
8-6-2010	9:19:17	SkiGame	DEMO
8-6-2010	9:17:46	SkiGame	DEMO
8-6-2010	9:15:15	SkiGame	DEMO
8-6-2010	9:13:11	SkiGame	DEMO
8-6-2010	8:44:05	Power test	DEMO
8-6-2010	7:45:57	Power test	DEMO
8-6-2010	7:32:12	Power test	DEMO
7-6-2010	11:45:25	RandomReactive	Unknown device
4-6-2010	11:19:26	Memory	DEMO
4-6-2010	11:19:20	RecognitionGame	DEMO

8. Quick Start menu

When the Quick start in the Settings is checked, the following screen will appear in the tab of the MRS software.



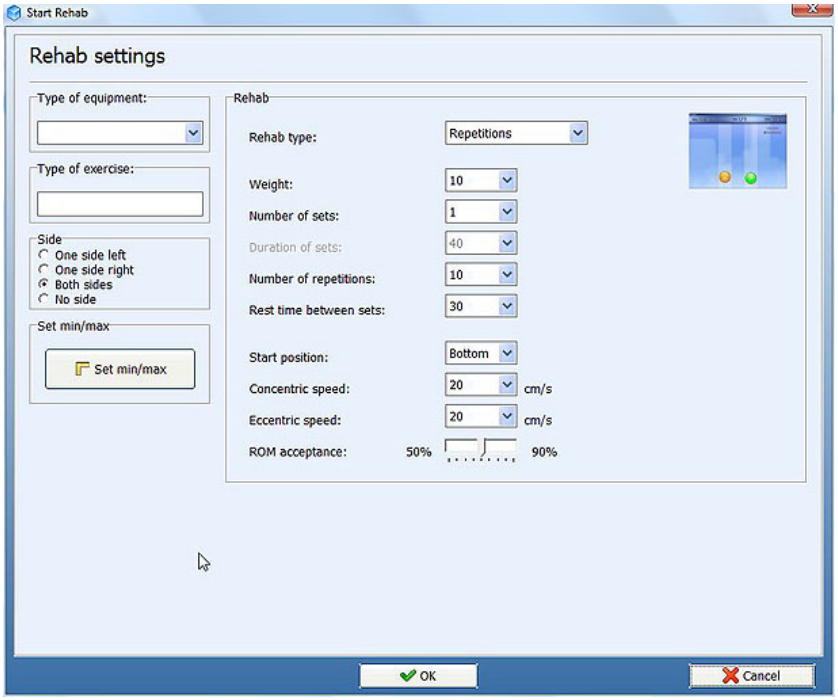
1) Choose exercise/challenging program/test bij clicking on the yellow arrow and select button;
2) Choose side;
3) Choose weight;
4) Choose level;
5) Press start.

The exercise will continue starting the same way as in the advanced mode. Explanation about these exercises is described in the following chapters.

9. Rehab F5

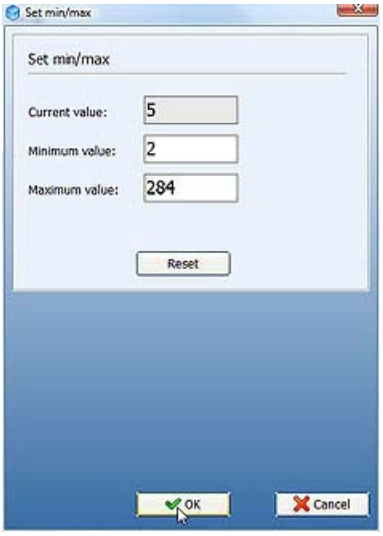
In the main menu “operations” the first option for training is Rehab (F5).

9.1 Rehab



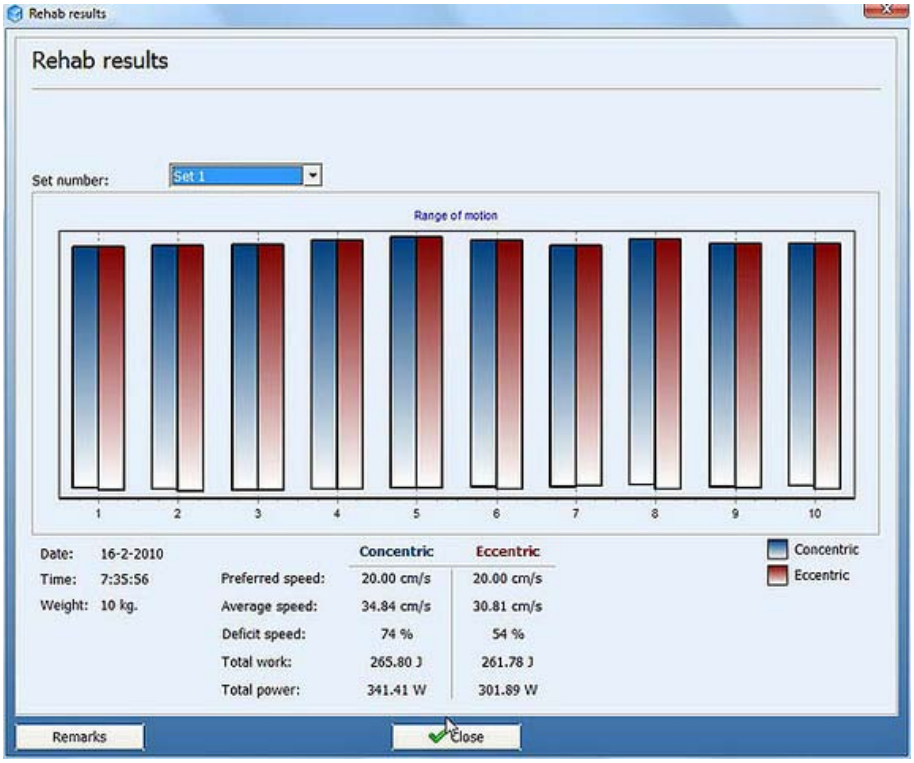
This training program ends after a number of repetitions or after a pre-set period of time.

How to set up a Rehab training step by step
1) Select “type of equipment” where the computer is connected to
2) Describe the type of exercise in “type of exercise”
3) Select One side left/right, Both sides or No side (no use of legs) training
4) Select rehab type (time or number of reps)
5) Select the exercise weight
6) Select number of exercise sets
7) Select the number of repetitions
8) Select the rest time between sets
9) Select start position. Bottom starts with concentric movement, top starts with eccentric movement
10) Select the concentric speed
11) Select the eccentric speed
12) Choose ROM acceptance. 50% means that 50% of the ROM should be done before this repetition is count as a repetition



13) Set Min/Max is needed to scale the range of motion. The test person should make one repetition. After this repetition press “OK”
14) This training program ends after a number of repetitions or after a pre-set period of time.
15) To start the training press “OK” and press “any key”

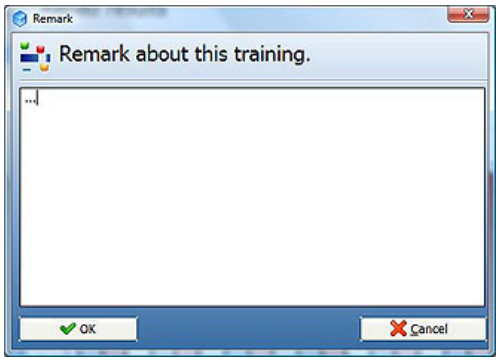
Displayed is the amount of repetitions (10) and the amount of sets (1).
The “Preferred” speed (orange) is set in the software for both concentric and eccentric.
The “Actual” speed (green) is the actual speed of the client/patient.
Task of the patient is to get the green ball (right side) moving with the same speed as the orange ball (left side).
If the training is finished the following screen will appear:



The graphics show the range of motion. Blue is the concentric part of the repetition, red is the eccentric part.

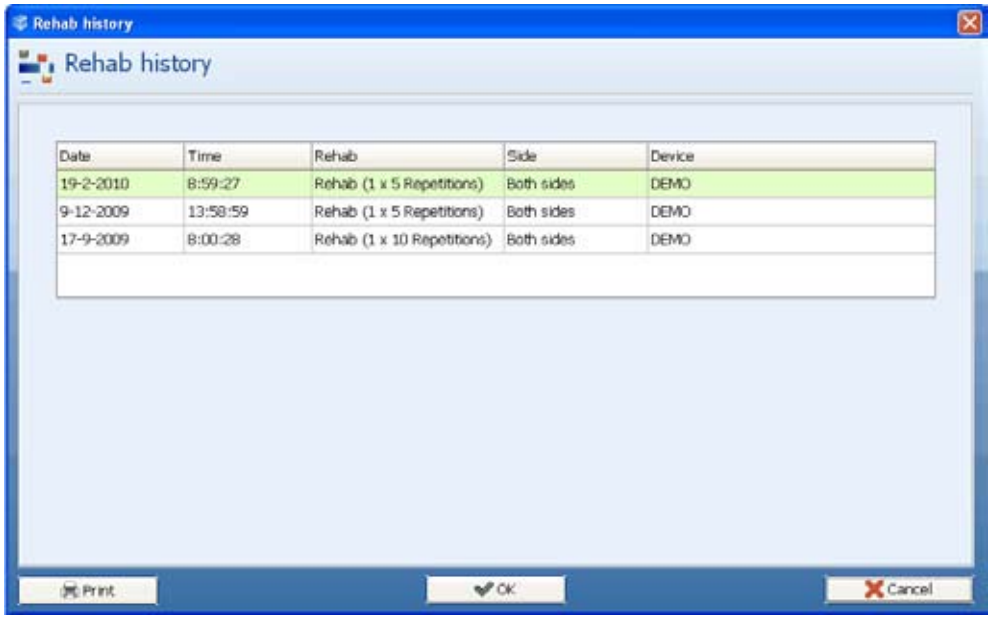
“Preferred speed” is the speed that has been set by the settings.
“Average speed” is the average speed of the exercise.
“Deficit speed” is the difference between preferred and average speed.
- : is too slow
+ : is too fast
0% : is perfect
“Total work” is the total work performed by the patient during the exercise in Joules.
“Total power” is the total work performed by the patient during the exercise in Watt.

To add remarks, press the button “Remark” and enter your text.

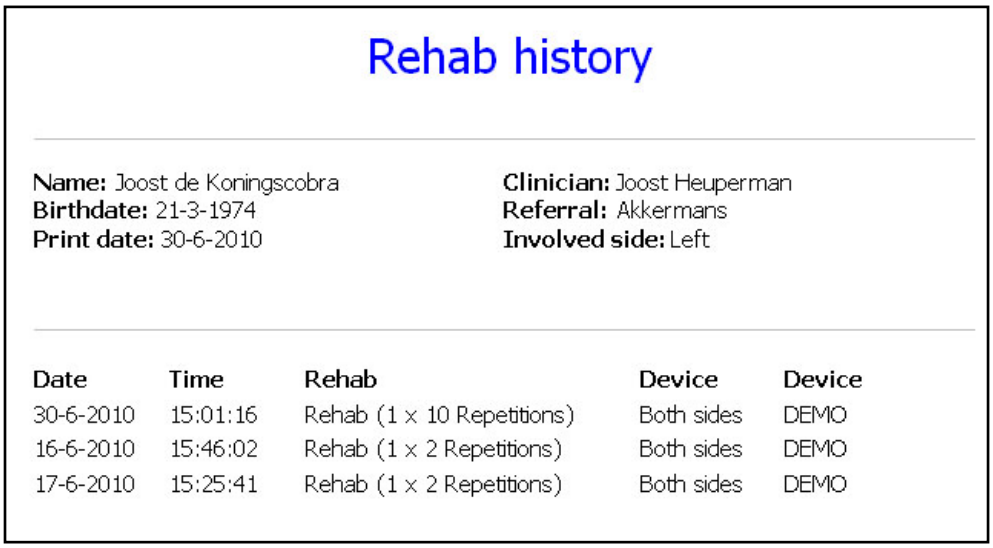


9.2 Rehab History

In this menu you can see all sets done in the Rehab training. Double click on the rehab to see the results.



To print to paper use the “Print” button.



Rehab history

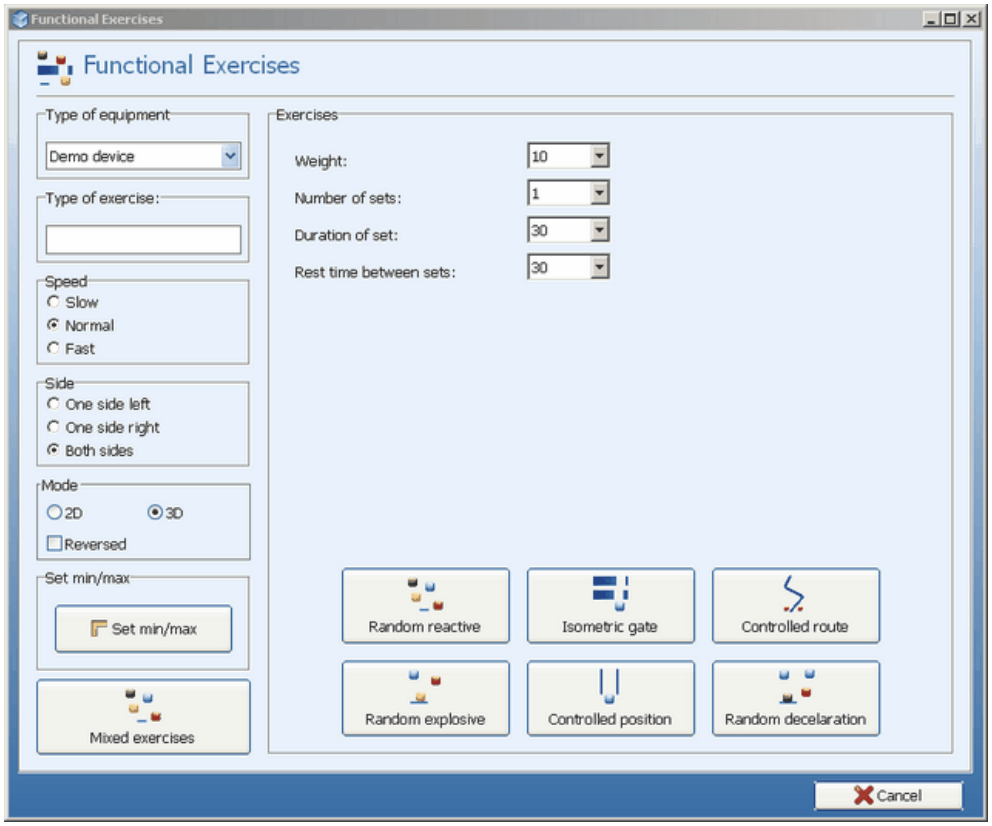
Name: Joost de Koningscobra
Birthdate: 21-3-1974
Print date: 30-6-2010

Clinician: Joost Heuperman
Referral: Akkermans
Involved side: Left

Date	Time	Rehab	Device	Device
30-6-2010	15:01:16	Rehab (1 x 10 Repetitions)	Both sides	DEMO
16-6-2010	15:46:02	Rehab (1 x 2 Repetitions)	Both sides	DEMO
17-6-2010	15:25:41	Rehab (1 x 2 Repetitions)	Both sides	DEMO

10. Exercises

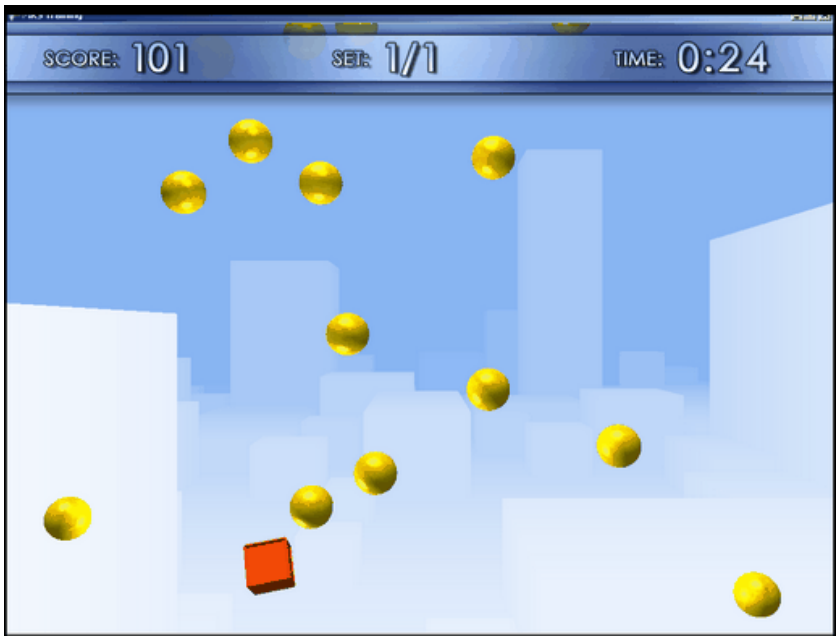
10.1 Functional exercises



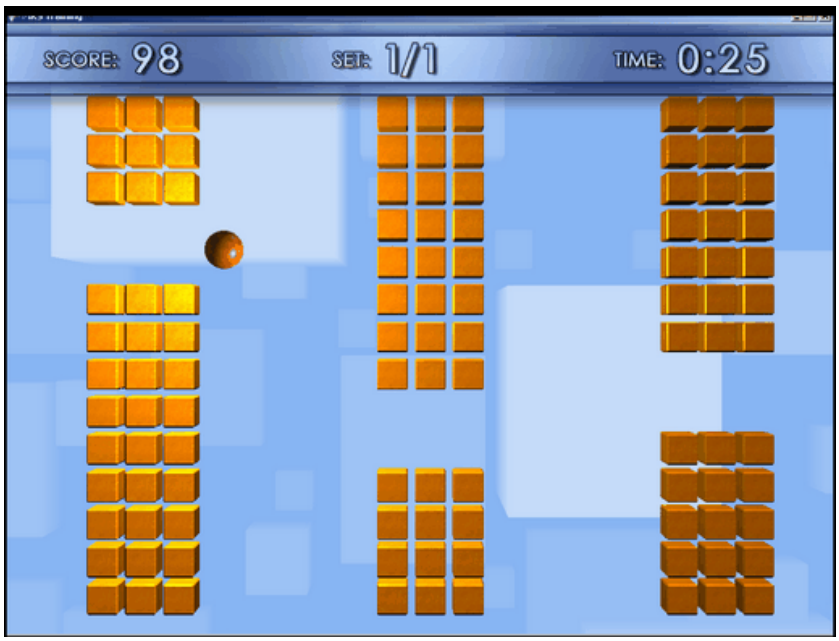
How to set up a Functional Exercise training step by step:

1) Select “type of equipment” where the equipment is connected to (optional)
2) Descripe the type of exercise in “type of exercise” (optional)
3) Select the speed of the exercise
4) Select one side left/right or both sides leg training
5) Select the type of feedback 2D or 3D (preferred) and start position (reversed starts with eccentric movement)
6) Select the exercise weight
7) Select number of sets
8) Select the rest time between sets
9) Set Min/Max is needed to scale the range of motion. The test person should make one repetition. After this repetition press “OK”

Random Reactive
In this exercise yellow balls will fall down from the screen “at random”. The red square symbolizes a catcher cube. Making concentric or eccentric movements will shift the red catcher to the right (concentric) or to the left (eccentric). The goal is to avoid the yellow balls.

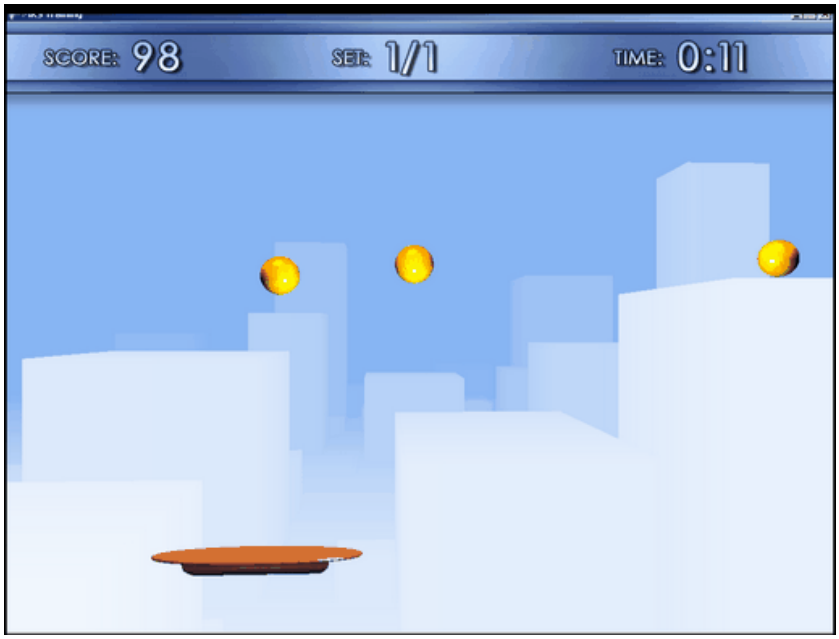


Isometric Gate
This exercise is a dynamic test form with a so-called isometric “hold” (= freeze moment). The coordinate abilities are stimulated by accelerating the power ability (hold). The red ball has to find its way by maneuvering it between the gaps in the bars. The spaces between the bars are random If the exercise is carried out well, the difficulty level will increase. The red ball will move higher, giving the patient less time to spot the gates. As with the other exercises the concentric and eccentric movements will shift the orange ball to the right (concentric) or to the left (eccentric).

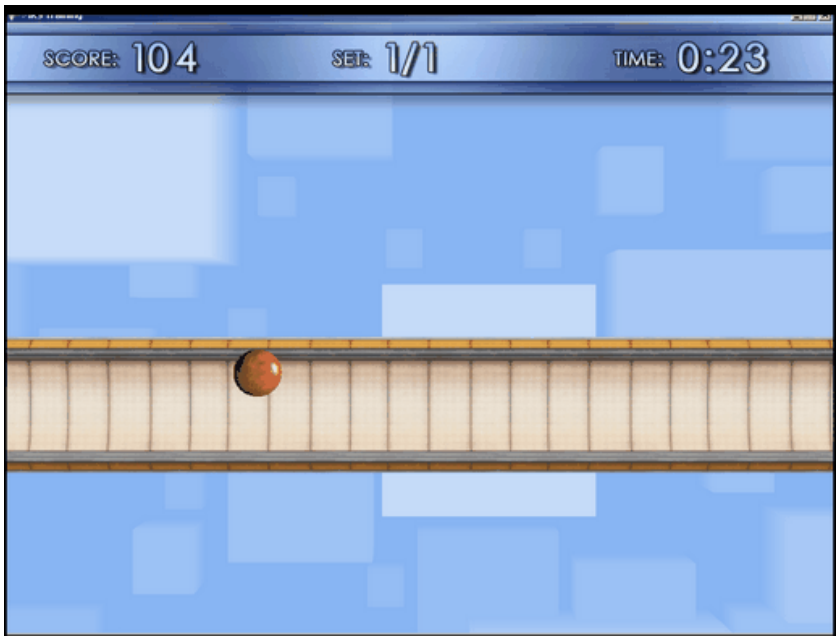


Controlled Route
In this exercise the red circle has to stay on the yellow line (path). The yellow line moves over the screen at random. Concentric/eccentric movements will shift the circle to the right or left. This exercise activates the eccentric/concentric muscle control and invigorates the coordinate abilities.

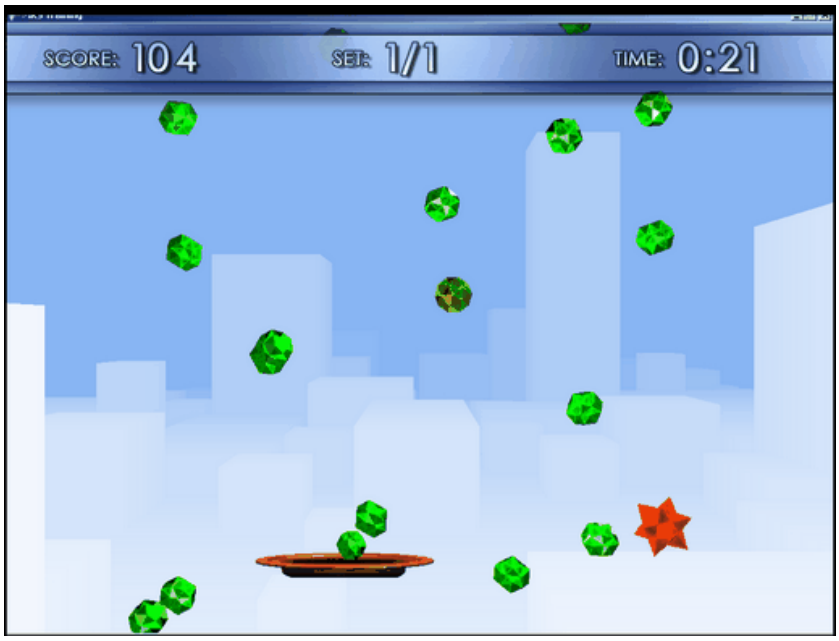
Random Explosive
In this exercise yellow balls will drop at random slow, normal or fast. These balls have to be caught and bounced back. Fast reaction (explosivity) is necessary to get good results. Concentric/eccentric movements will shift the red catcher bar to the left and to the right.



Controlled position
This exercise copies "simulation". Target is to keep the red ball on the vertical road. The "road" moves at random up and down with unexpected acceleration. Concentric/eccentric movements will shift the red ball to the left and to the right.



Random Deceleration
In this exercise little green stars with individual changing speeds will drop down the screen at random. The red circle symbolizes the catcher. Concentric/eccentric movements will shift the catcher to the left or to the right. The goal is to catch the green stars before they arrive at the bottom of the screen and avoid the unexpected red stars.



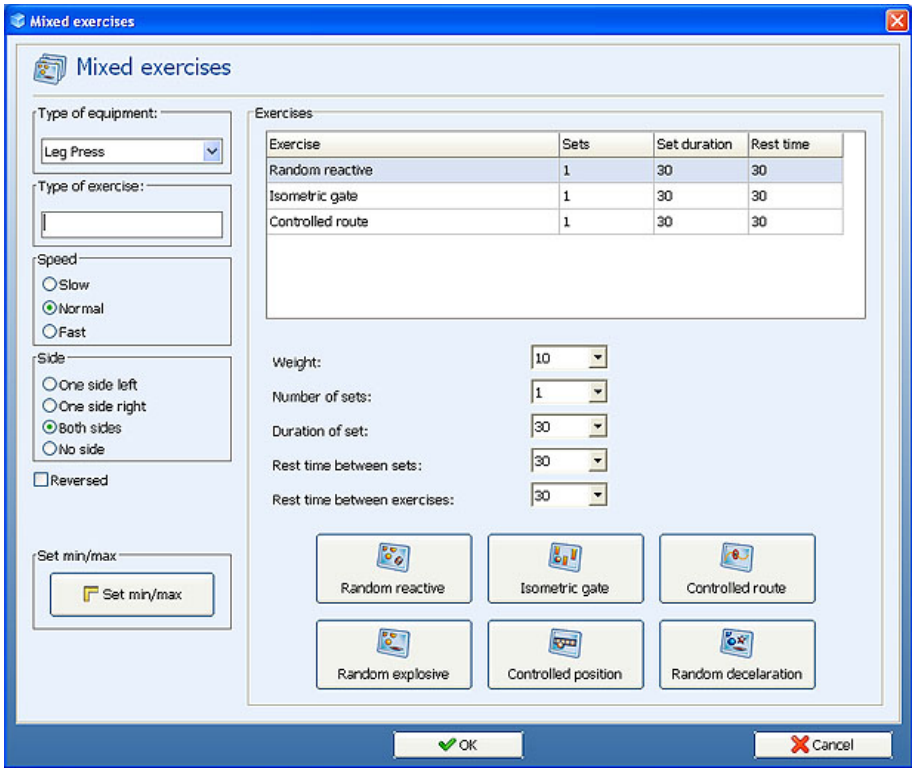
10.2 Functional exercises: the scores

The number of points at the start is based on the duration of the exercise.
The end score is calculated and influenced by:
- performance
- exercise weight
- speed level (slow, medium or high)
- if you perform a perfect exercise for 10 seconds, you get bonus points

The score is kept in the patient file and can be viewed in the exercise history.

10.3 Mixed Excercises

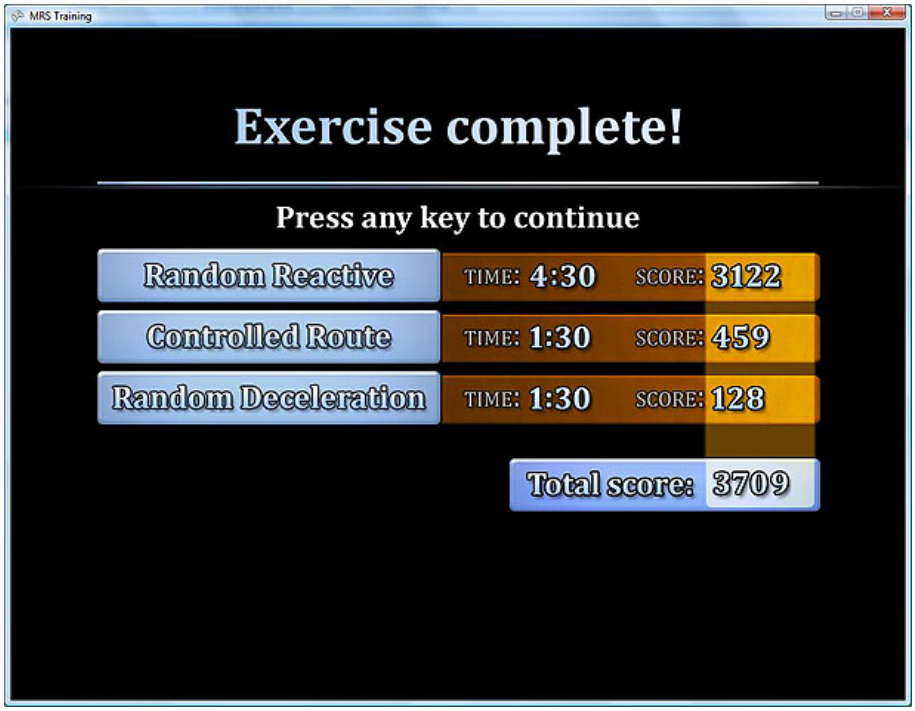
In this window you can create an individual combination of different exercises



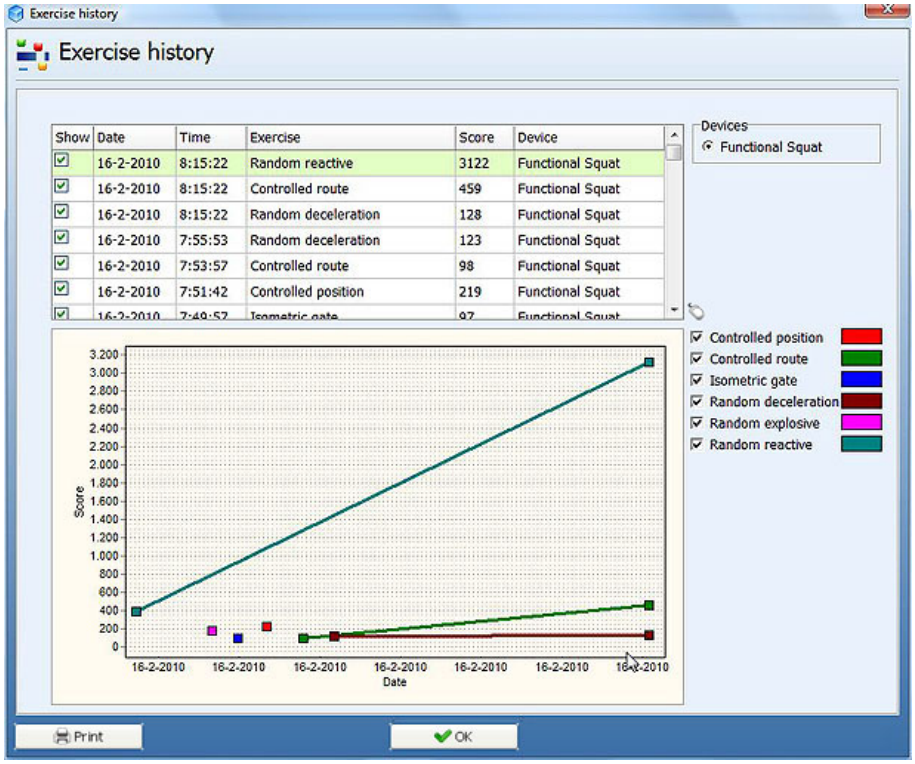
Option 1: how to create an individual mixed exercise training program

1) Select “type of equipment” where the MR Cube is connected to (optional)
2) Describe the type of exercise in “type of exercise” (optional)
3) Select the speed of the exercise
4) Select one side left/right or both sides leg training
5) Select the type of feedback 2D or 3D (preferred) and start position (reversed starts with eccentric movement)
6) Select the exercise weight
7) Select number of sets
8) Select the rest time between sets
9) Select the rest time between exercises
10) Set Min/Max is needed to scale the range of motion. The test person should make one repetition. After this repetition press “OK”

All exercises will start up automatically.
When the patient is finished, the following screen will appear:

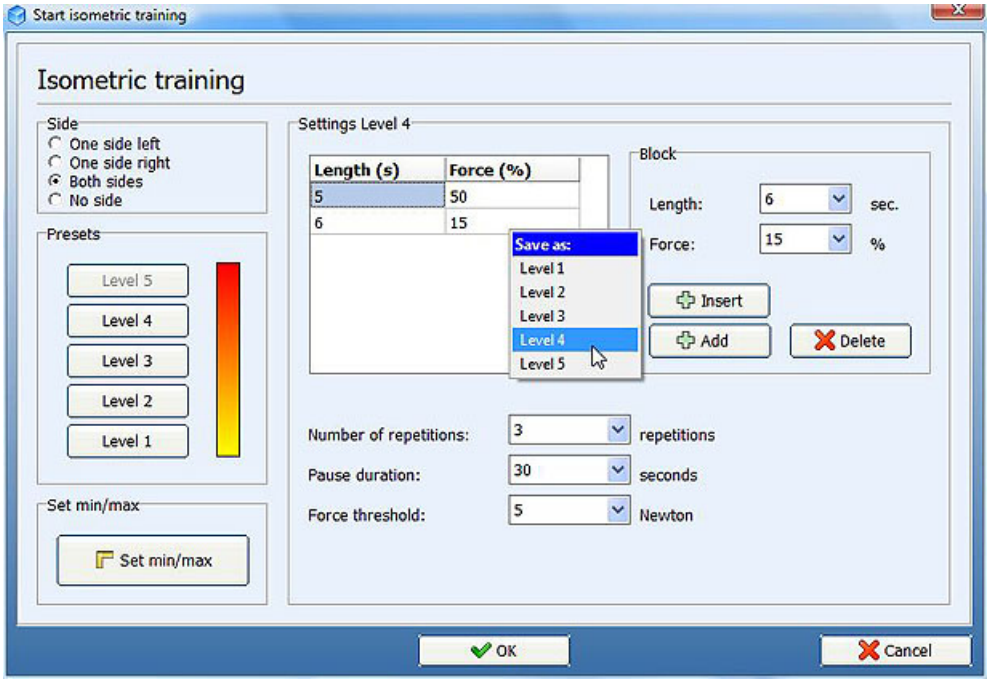


After pressing “Any key”, a concise list of all test- and training programs with belonging scores will be shown. Scores and dates are shown in graphics and can be (de)selected.



10.4 Isometric Training

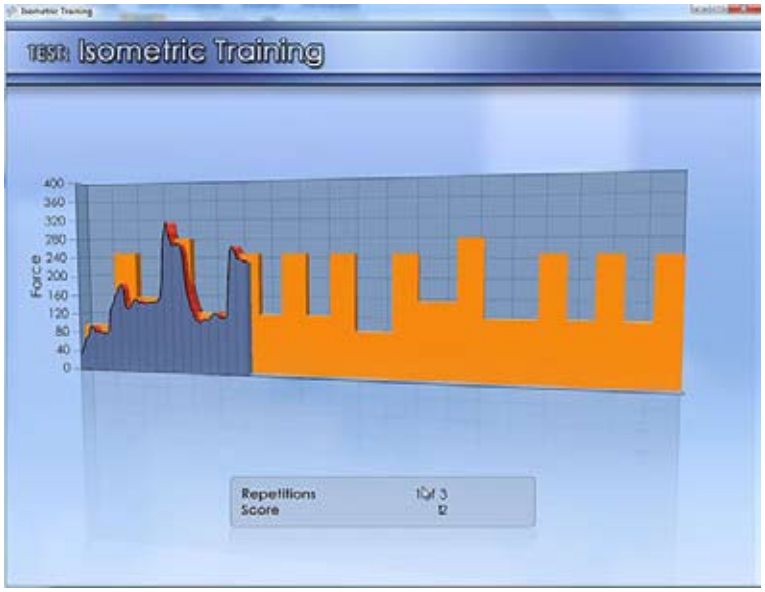
Choose Isometric Training or press F8.



How to set up an Isometric Training step by step:

1) fixate the weight stack, if your machine does not have this technical feature select the maximal weight
2) Select training level (preset 1 to 5)
3) Select if you want to train with one or two sides
4) Select the graphics for feedback
5) Select the range of Isometric Strength by using “set min/Max” or F12
6) Press “start”

The screen will display the following:

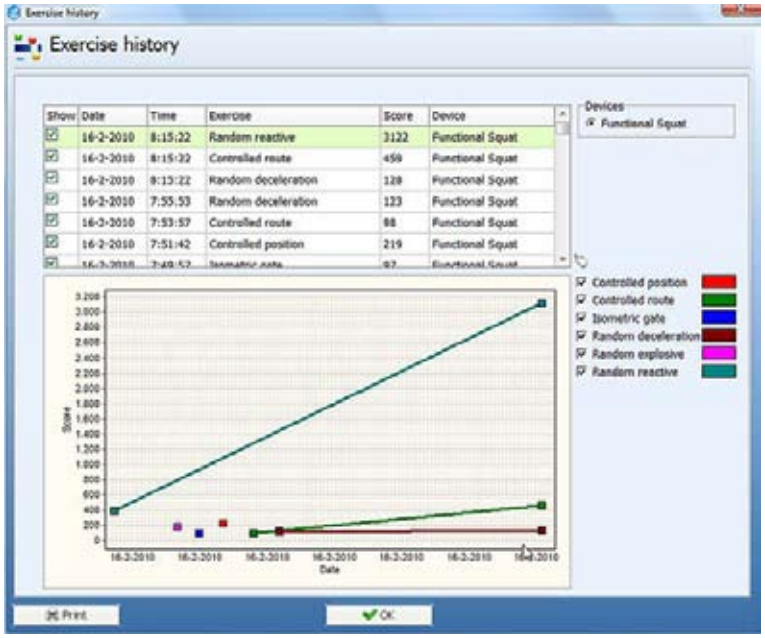


The task for the patient is to follow the orange blocks by giving more or less isometric power. The number of repetitions and the score of the exercise will be displayed.

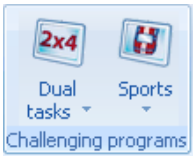
How to change the preset levels or create the default level:
Clear the preset level with the “Delete” button. By using “Add” or “Insert (with information of length and force) and add rest time (with information of rest time), you can create your own protocol. Select the right mouse button and the protocol you made will be stored under the preset level you just cleared.

10.5 Exercise history

When a patient is selected, a concise list of all exercise programs with belonging scores will be shown. Scores and dates are shown in graphics and can be (de)selected.

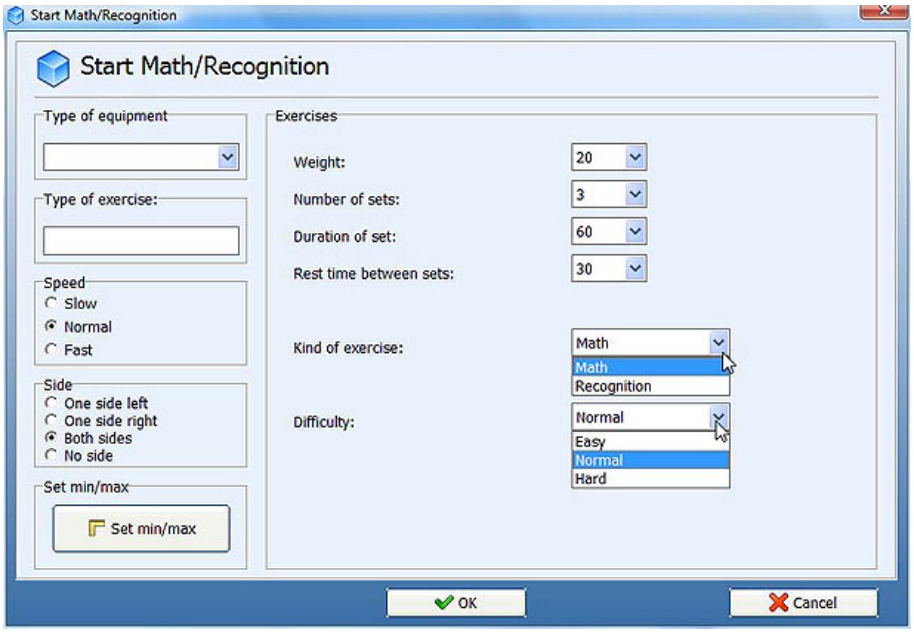


11. Challenging Programs



11.1 Dual Tasks

11.1.1 Mathematics



How to set up a Math exercise step by step:

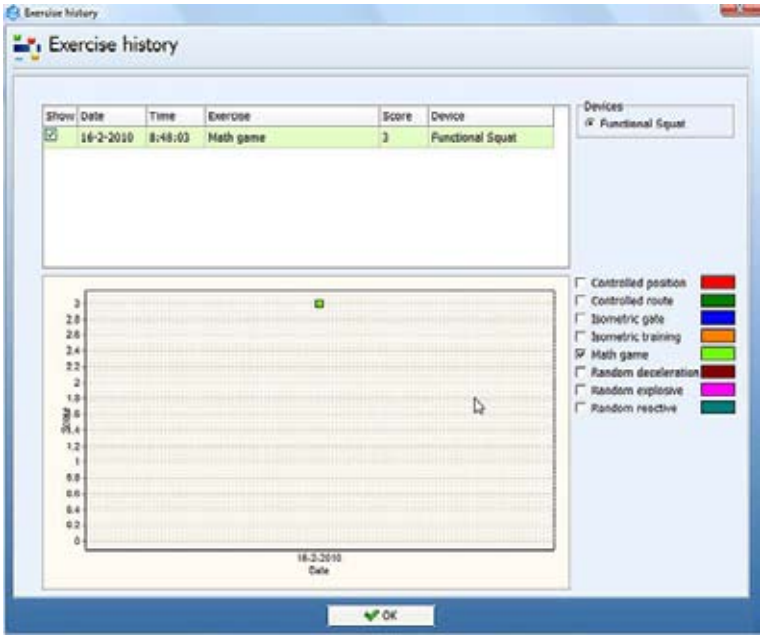
1) Select “type of equipment” where the equipment is connected to (optional)
2) Describe the type of exercise in “type of exercise” (optional)
3) Select the speed of the exercise
4) Select one side left/right, both sides or no side leg training
5) Select the exercise weight
6) Select number of sets
7) Select duration of set
8) Select the rest time between sets
9) Select your exercise: Math
10) Select difficulty
11) Set Min/Max is needed to scale the range of motion. The test person should make one repetition. After this repetition press “OK”

Choose the correct answer by moving the arrow.

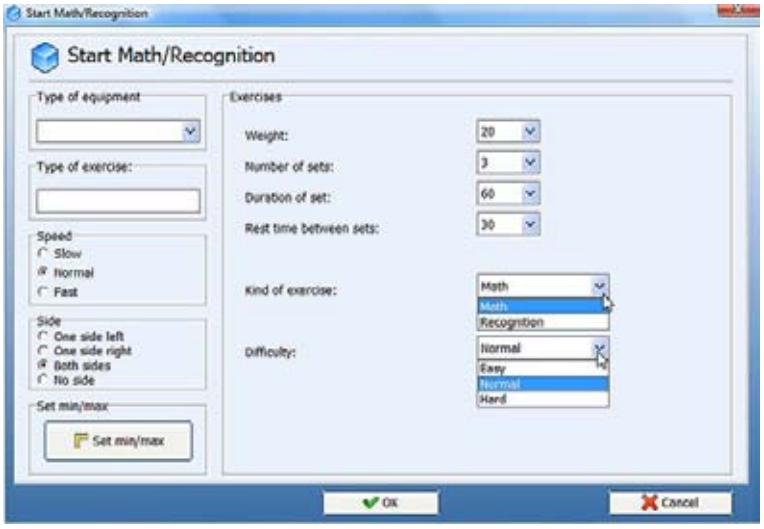
If a correct answer is chosen, a green check mark will appear. After this, the next equation will appear.

If a wrong answer is selected, a red cross will appear. After this, the next equation will appear. After finishing the exercise the results will be shown:

The preset settings are blue. The correct answers are green.
Press any key and the following results are shown:



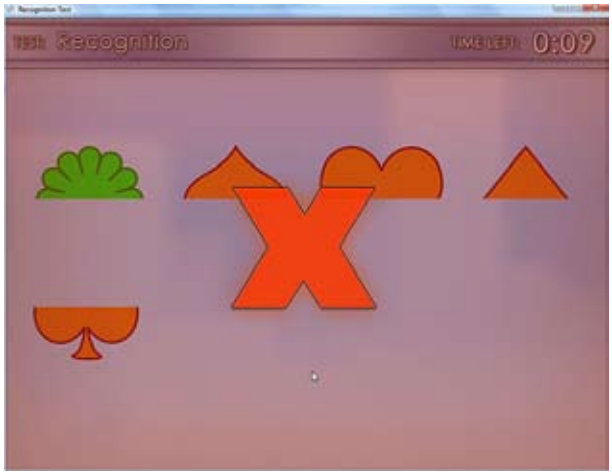
11.1.2 Recognition



How to set up a Recogition exercise step by step:

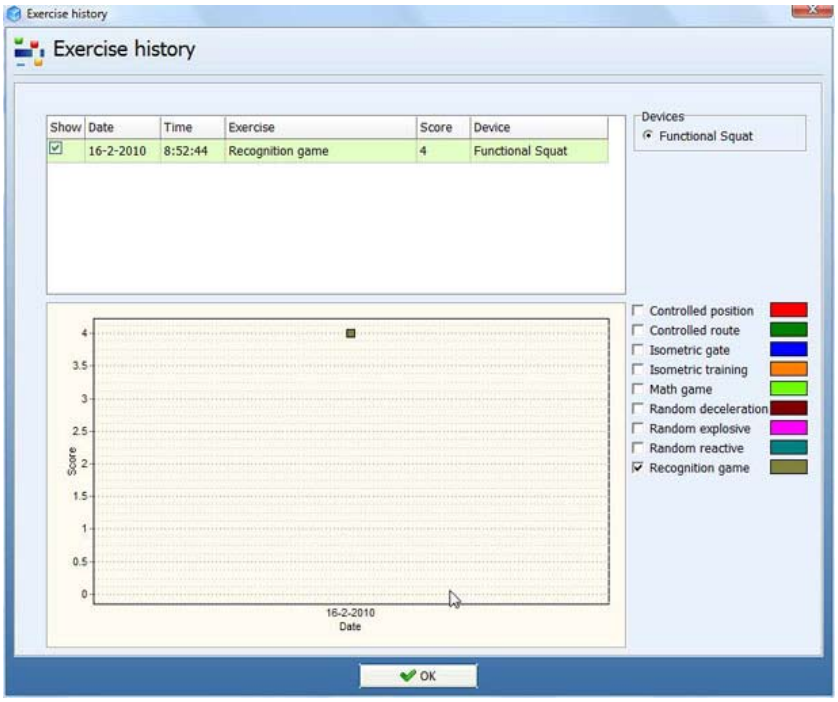
1) Select “type of equipment” where the equipment is connected to (optional)
2) Describe the type of exercise in “type of exercise” (optional)
3) Select the speed of the exercise
4) Select one side left/right, both sides or no side leg training
5) Select the exercise weight
6) Select number of sets
7) Select duration of set
8) Select the rest time between sets
9) Select your exercise: Recognition
10) Select difficulty
11) Set Min/Max is needed to scale the range of motion. The test person should make one repetition. After this repetition press “OK”

Choose the correct figure by moving the arrow.
If a correct figure is chosen, a green check mark will appear. After this, the next figure will appear.

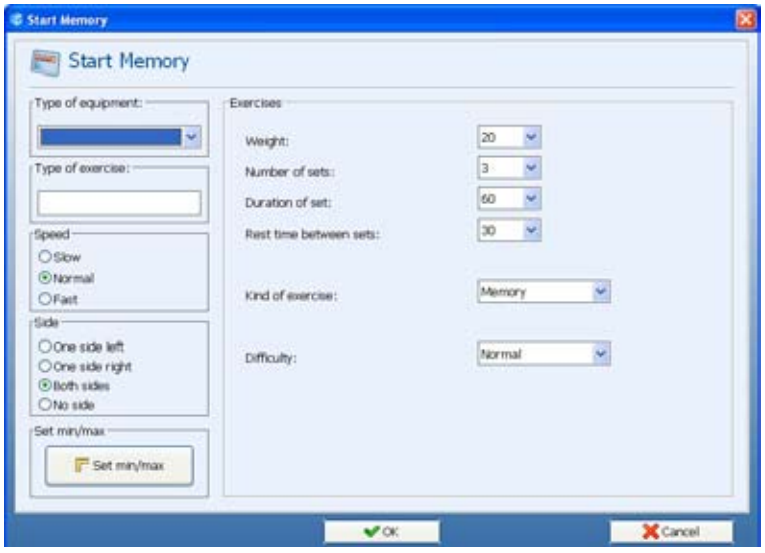


If a wrong answer is selected, a red cross will appear. After this, the next figure will appear.
After finishing the exercise the results will be shown:

The preset settings are blue. The correct matches are green.
Press any key and the following results are shown:



11.1.2 Memory



How to set up a Memory exercise step by step:

1) Select “type of equipment” where the equipment is connected to (optional)
2) Describe the type of exercise in “type of exercise” (optional)
3) Select the speed of the exercise
4) Select one side left/right, both sides or no side leg training
5) Select the exercise weight
6) Select number of sets

7) Select duration of set
8) Select the rest time between sets
9) Select your exercise: Memory
10) Select difficulty
11) Set Min/Max is needed to scale the range of motion. The test person should make one repetition. After this repetition press “OK”

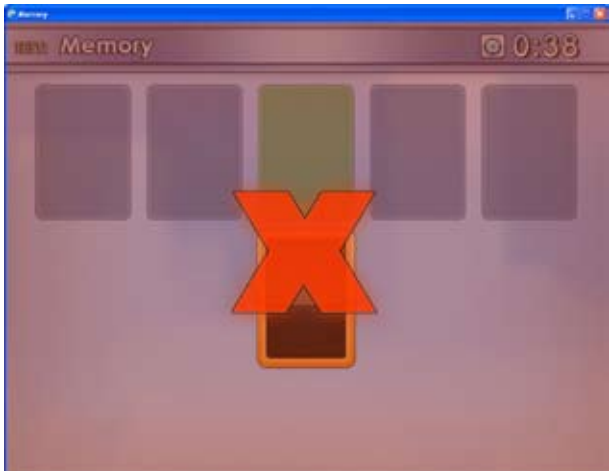
Cards (colors or numbers) are laid out face up, they turn black after a number of seconds. A new card will appear. Choose the matching card by moving the new card and place it under the correct card. If the two cards match, the player scores one point.

Level settings:	Easy	Normal	Hard
Time (in seconds) to show cards	5	4	3
Retry after wrong answer	3	2	1
Number of questions per set	4	3	3

Time of selection is depending on speed:

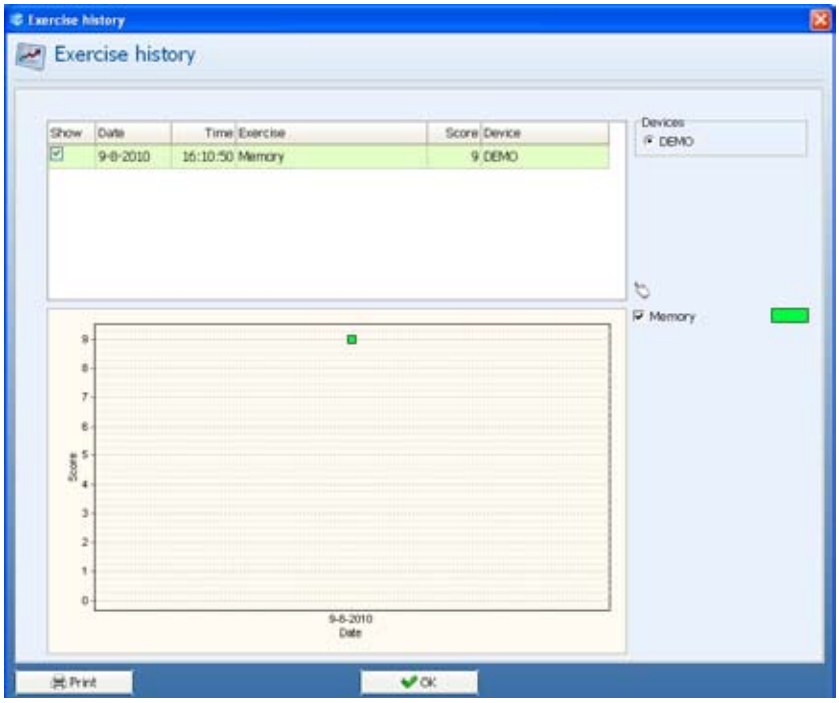
Slow	2 sec.
Normal	1 sec.
Fast	0.5 sec.

If a correct match is chosen, a green check mark will appear. After this, the next new card will appear. If a wrong answer is selected, a red cross will appear. After this, the next set of cards will appear.



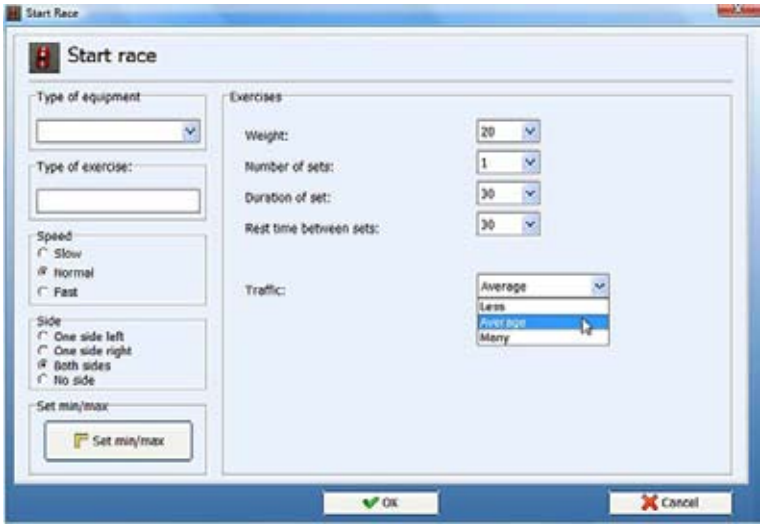
After finishing the exercise the results will be shown:

The preset settings are blue. The correct matches are green.
Press any key and the following results are shown:



11.2 Sports

11.2.1 Race Game



How to set up a race game step by step:

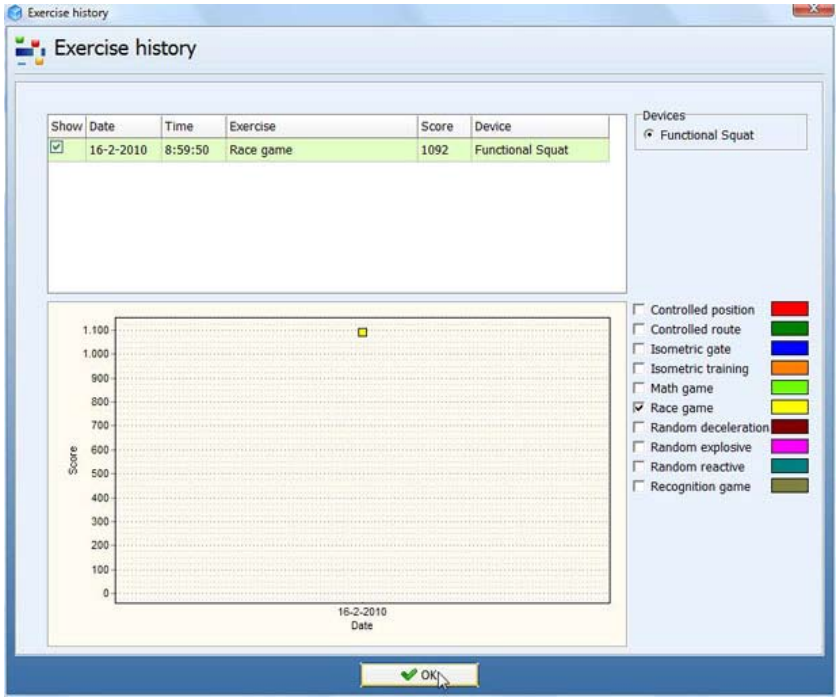
1) Select “type of equipment” where the equipment is connected to (optional)
2) Describe the type of exercise in “type of exercise” (optional)
3) Select the speed of the exercise
4) Select one side left/right, both sides or no side leg training
5) Select the exercise weight
6) Select number of sets
7) Select duration of set
8) Select the quantity of traffic
9) Set Min/Max is needed to scale the range of motion. The test person should make one repetition. After this repetition press “OK”

Start driving and avoid other vehicles. Collecting coins by driving through them.
A yellow coin gives you extra time, a red coin gives you a temporary speed boost.
Driving on the emergency lane will diminish the speed.

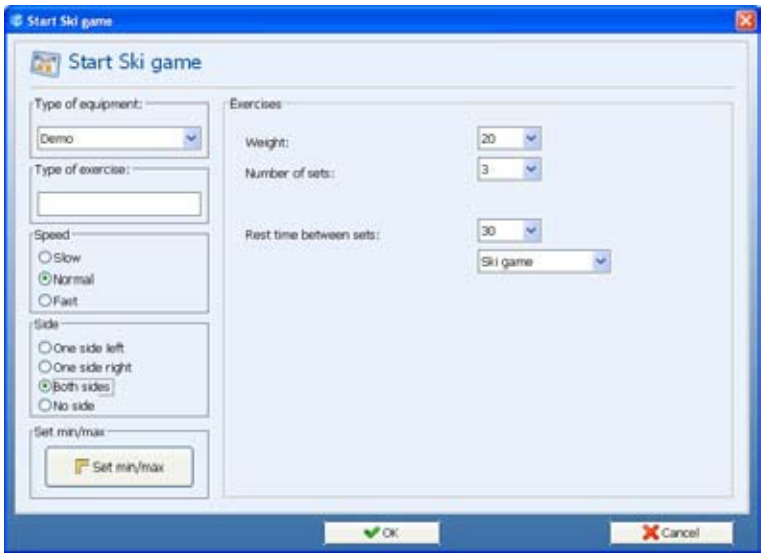
If you touch another vehicle you will crash and you have to restart driving.

After finishing the game, the score will be shown.

Press any key and the following results are shown:



11.2.2 Ski game



How to set up a ski game step by step:

1) Select “type of equipment” where the equipment is connected to (optional)
2) Describe the type of exercise in “type of exercise” (optional)
3) Select the speed of the exercise
4) Select one side left/right, both sides or no side leg training
5) Select the exercise weight
6) Select number of sets
7) Select rest time between sets
8) Set Min/Max is needed to scale the range of motion. The test person should make one repetition. After this repetition press “OK”

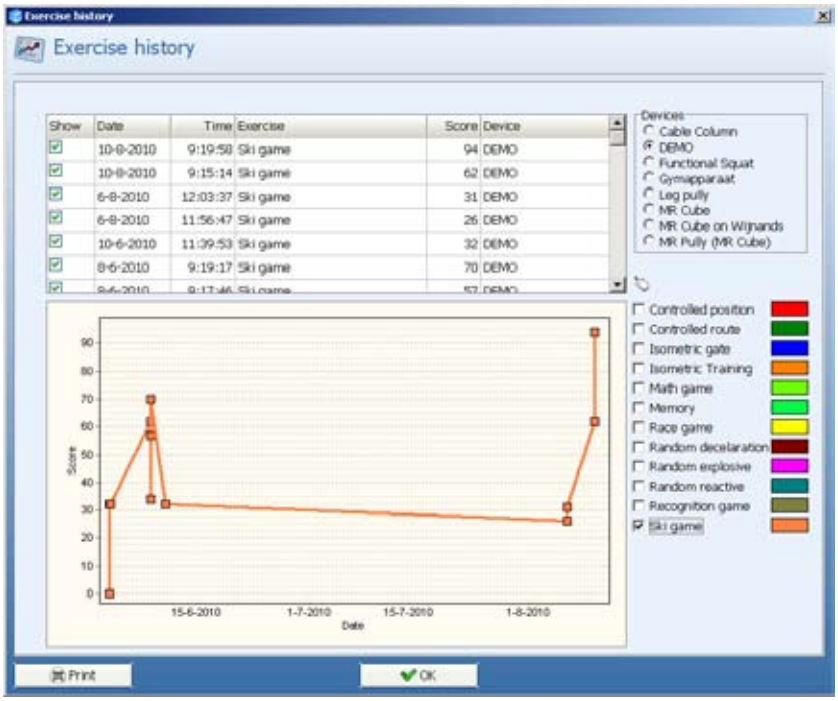
Start skiing and try to stay within the two flags.

If you do not ski between the flags, you get 10 seconds time added to your time.

After a crash you have to restart skiing.

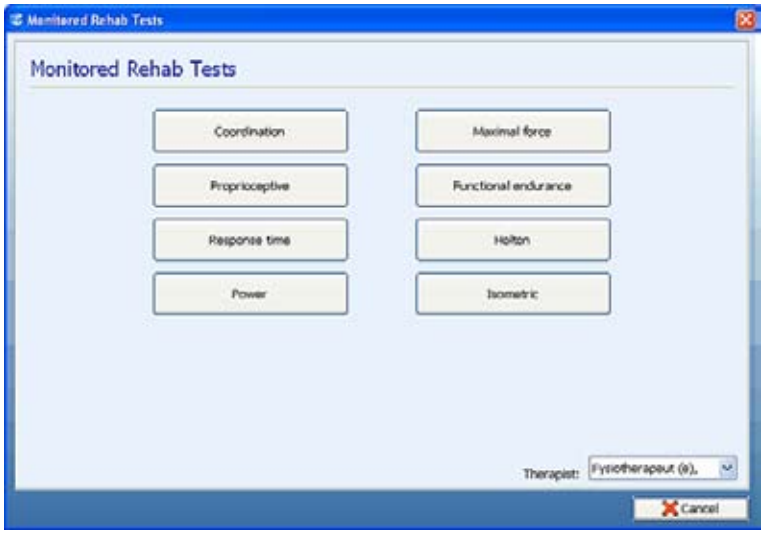
After finishing the game, the score will be shown.

Press any key and the following results are shown:



12. Tests Monitored Rehab Systems

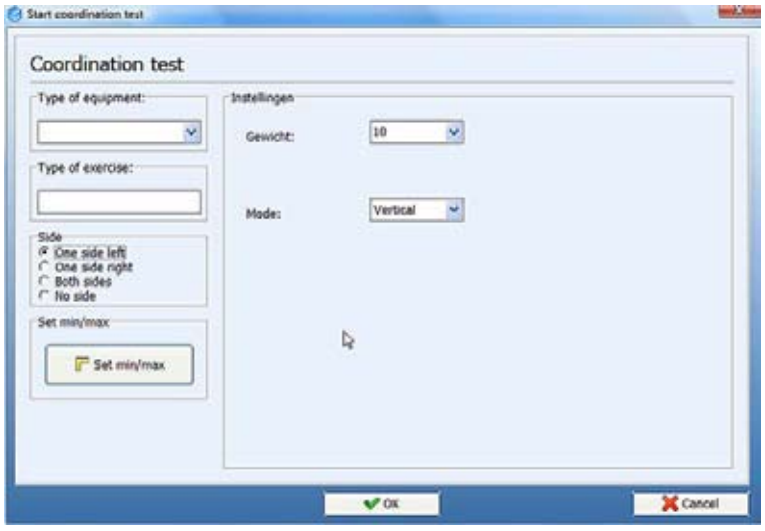
Choose 'Show tests'. The following screen will appear:



Choose which test you want to do.

12.1 Coordination Test

The coordination test can be done safely in early rehabilitation since it is not related to strength. With the coordination we want to look at the quality of movement, we can see both concentric and eccentric and absolute strength is not important. The first screen of the coordination test:



The amount of weight you select can be minimal. The test should always be easily achievable; you are not looking for strength but for coordination. 5 or 10 kg is enough weight in most of the tests you will do.

Mode: Choose “Vertical” or “Horizontal” moving of the yellow line.

Set min/max: Where in the previous max. force test and endurance strength test the range of motion was not so important, in the Coordination test it is extremely important to select the proper range of motion. Make sure the foot does not come off of the foot plate when setting the Min/Max.

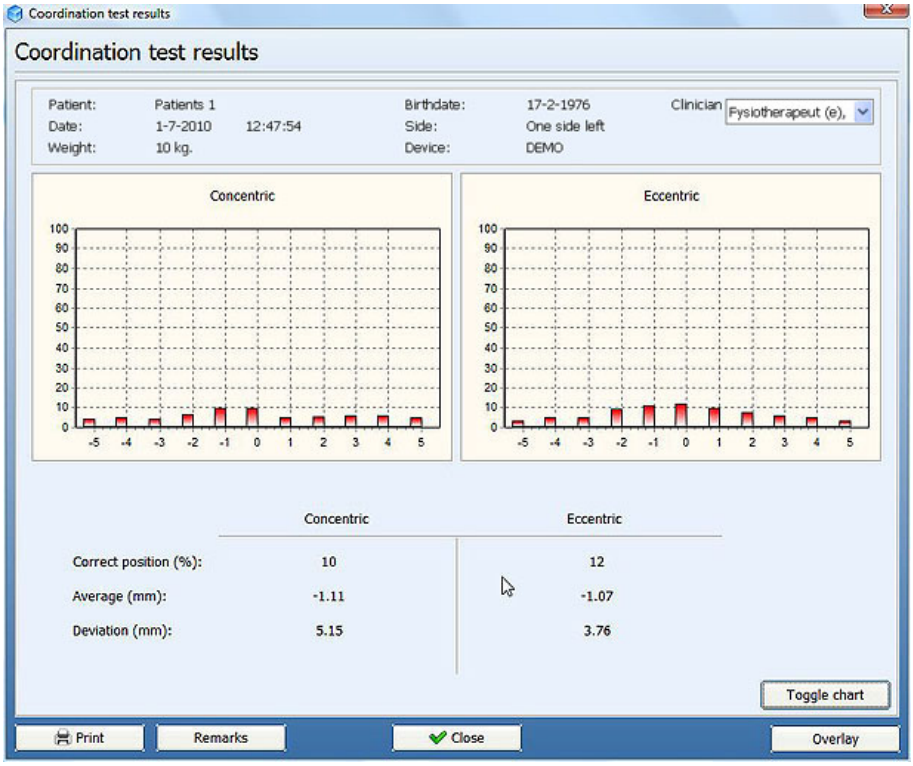
Set min/max is needed to scale the range of motion. The test person should make one repetition (with slow speed) after you press “Set min/max”.
Press “OK” and hit “Any key” to start the test.

The Min value should be around “0” the max value is the end of the range. If the “min” value is not “0” please reset the electronics (Reset button). Then make the repetition (to set min/max) again, ending in the “min” position.

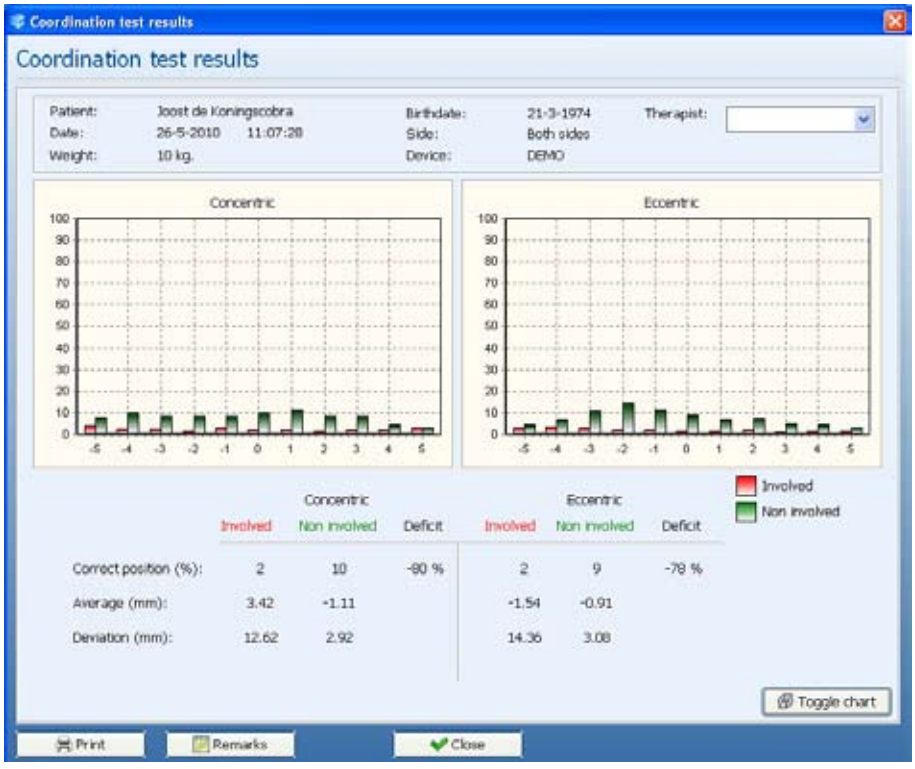
The test person will start the test in the “min” position.
Press “OK”.
Press “Any key” to begin the test.

Test instructions: keep the red crosshair on the yellow line as exact as possible. We start with the Non-Involved side and afterwards the Involved side.

After the test (one side) the following results will appear:

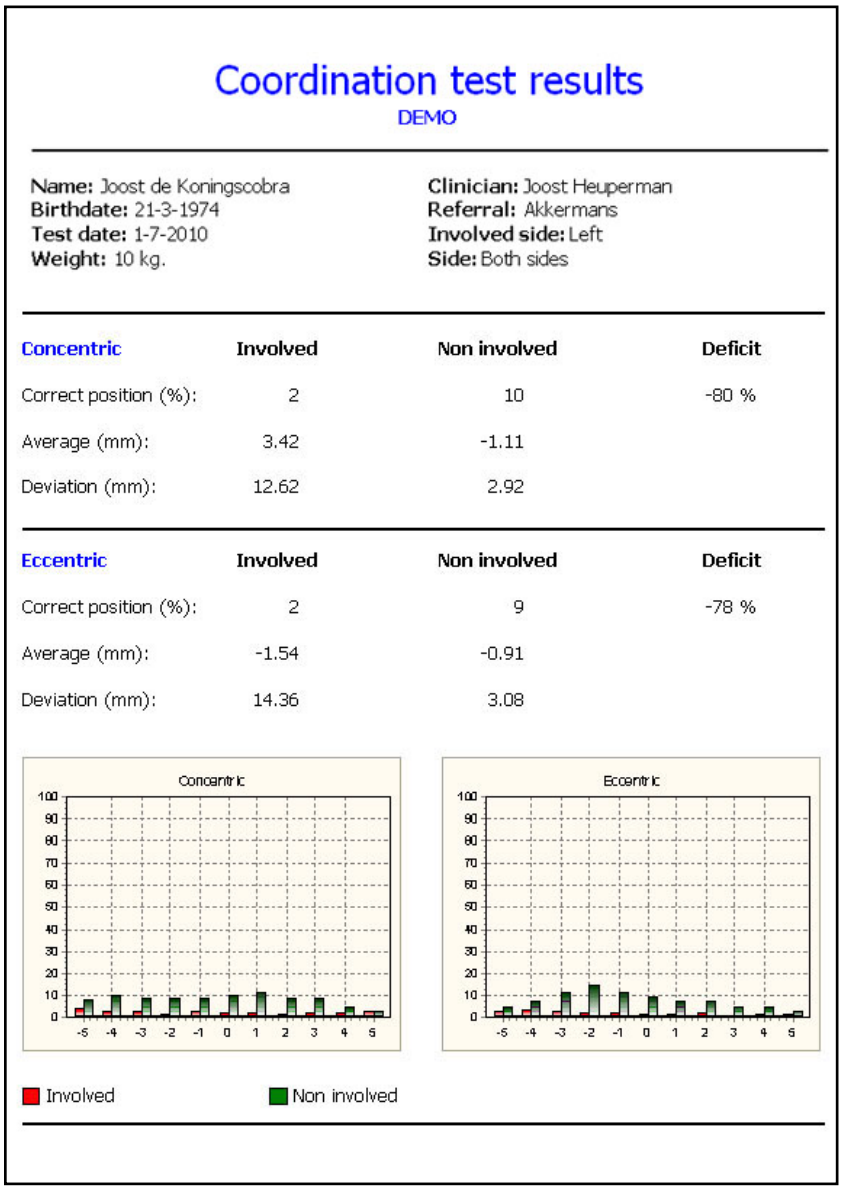


After the test (both sides) the following results will appear:



To print to paper use the “Print” button. If you want a print preview on the screen use the command; “ctrl-p”. To add a note use “Remarks”.

To view a line chart, use “Toggle chart”.
To compare results use “Overlay”. Choose the test results you want to compare with and press “OK”.
The result will be displayed.



Coordination test results

DEMO

Name: Joost de Koningscobra
Birthdate: 21-3-1974
Test date: 1-7-2010
Weight: 10 kg.

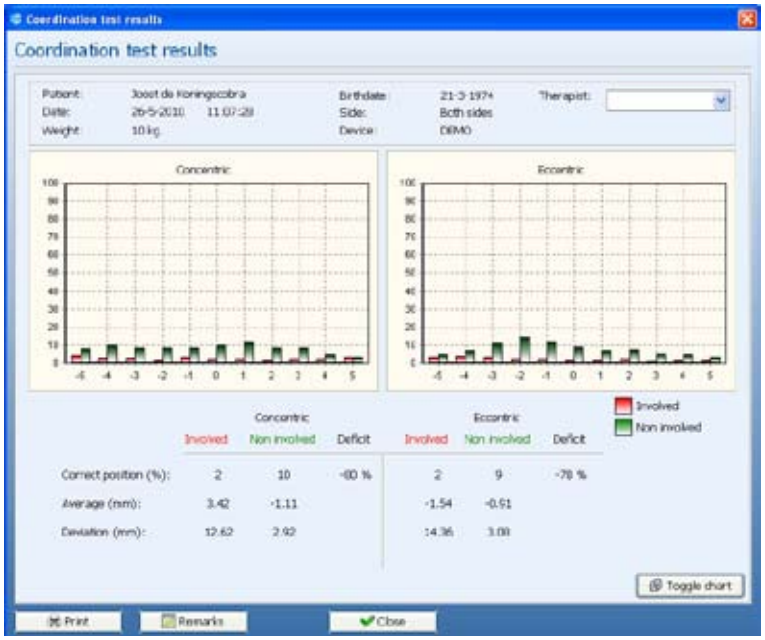
Clinician: Joost Heuperman
Referral: Akkermans
Involved side: Left
Side: Both sides

Concentric	Involved	Non involved	Deficit
Correct position (%):	2	10	-80 %
Average (mm):	3.42	-1.11	
Deviation (mm):	12.62	2.92	

Eccentric	Involved	Non involved	Deficit
Correct position (%):	2	9	-78 %
Average (mm):	-1.54	-0.91	
Deviation (mm):	14.36	3.08	

12.2 Interpretation Coordination Test

Directly after the test we check the shape of the graphics;



First we look at the bar graphs. What we want to see in both Concentric and Eccentric is that the highest bar is around zero.
In the graphic the “o” point means that during the test the crosshair was exactly on the blue line. In the graph left from zero (minus region) means at during the test crosshair was at the left side of the blue line. In the graph right from zero (plus region) means that during the test the crosshair was at the right side of the blue line. The height of the bars in the graphs represents the amount of time the red crosshair was in that specific position during the total test time (% exercise time).

What we expect to see, in an ideal test, is one bar at the zero position, with a score of 100% of the test time. This ideal test result is not likely.

The above (involved) test is an example of a test result which would indicate poor coordination:
- a low bar on the “0” position means the test person was not able to keep the red crosshair at the yellow line for a longer time
- many small bars spread left and right from the zero position means the test person was not even able to keep the red crosshair on the yellow line but was moving around the yellow line. The more bars we see at a bigger distance from the “0” point (left and/or right) the more moving around the yellow line was registered and therefore less control was demonstrated.

The numbers we see on screen for both concentric and eccentric:
Weight: The weight selected for this test
Duration: The time in seconds selected for this test

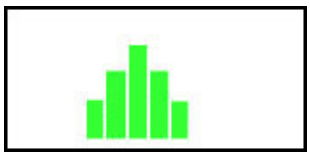
For a reproducible test it is important to have the same weight and duration in the next test of the same person.

Average: We get a separate value for Average Concentric and Eccentric for both Involved and Non-Involved

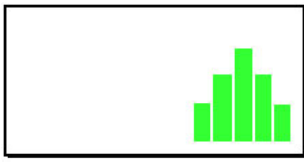
The blue line is the zero point. The average is calculated by adding all the deviations and dividing

them by the number of measurements (25 Hz). If the average is “0”, or nearby, this normally means (if also the deviation is low) the patient demonstrated good coordination.

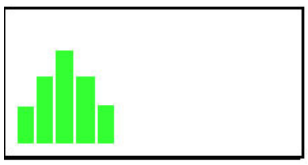
Some examples :



In this test the average will be around “0”



In this test the average will be above “0” i.e. 5 cm



In this test the average will be minus “0” i.e. -5 cm

Deviation: The deviation is a value for the variation in the measurements. A higher value means there is a greater spread in the positions during the measurement. The test person with a high deviation has been moving far above or under the yellow line a lot and did not stay close enough (or on) to the yellow line.

Low Deviation

High Deviation

If you have an average around “0” you could think this is a good test but when the Deviation is high, this “good” average is a lucky shot and the test person did not perform well.

Some examples:

	Small Average	**Big Average**
Low Deviation	Very good	Steady, but not at track
High Deviation	Can not stay stable on track	Unstable and can not stay on track

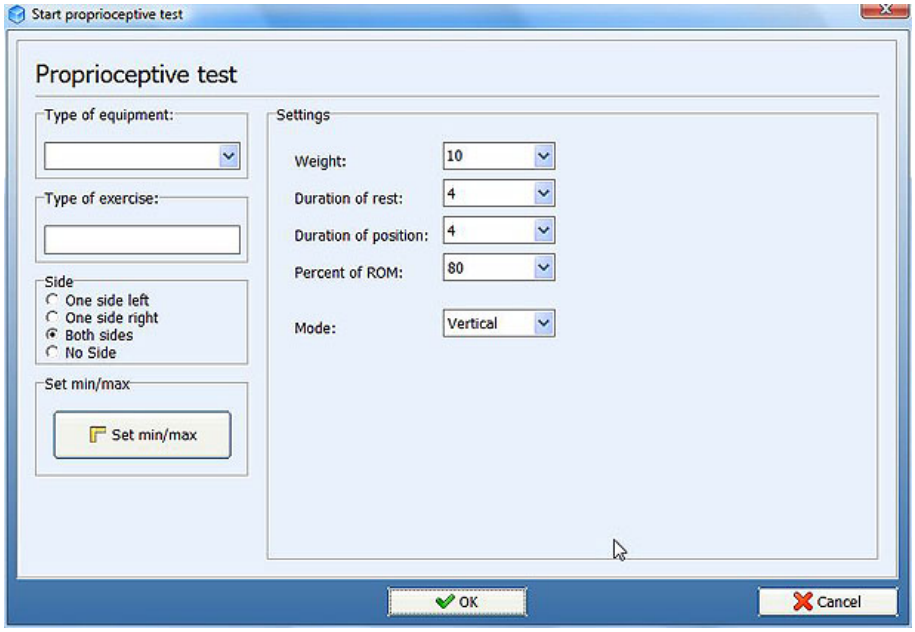
In the perfect test we see that both the Average and the Deviation are close to “0”

The Correct position: is the amount of time the crosshair is on the yellow line expressed as an percentage of the overall test time. The larger this percentage, the better the test person performed.

12.3 Proprioceptive Test

The Proprioceptive Test can be done safely in early rehabilitation since it is not related to strength. With the Proprioceptive Test we want to look at the quality of reproducing a certain joint position.

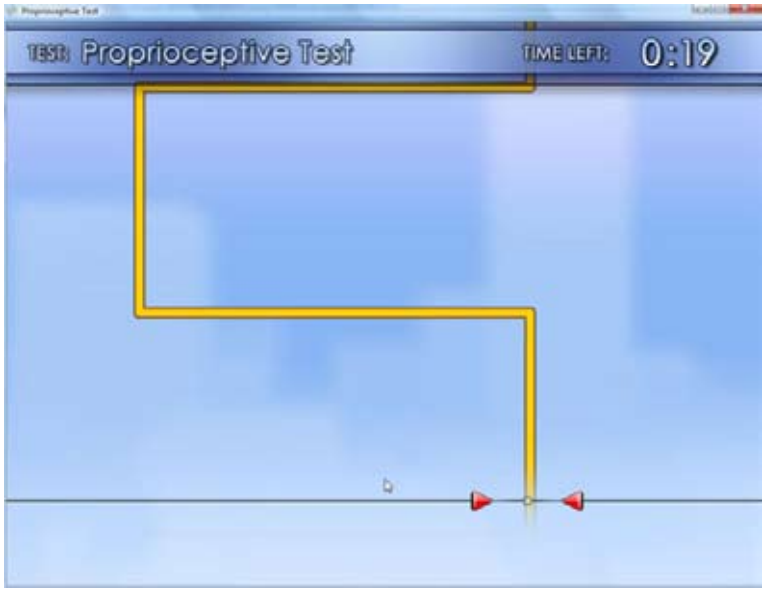
The first screen of the Proprioceptive Test:



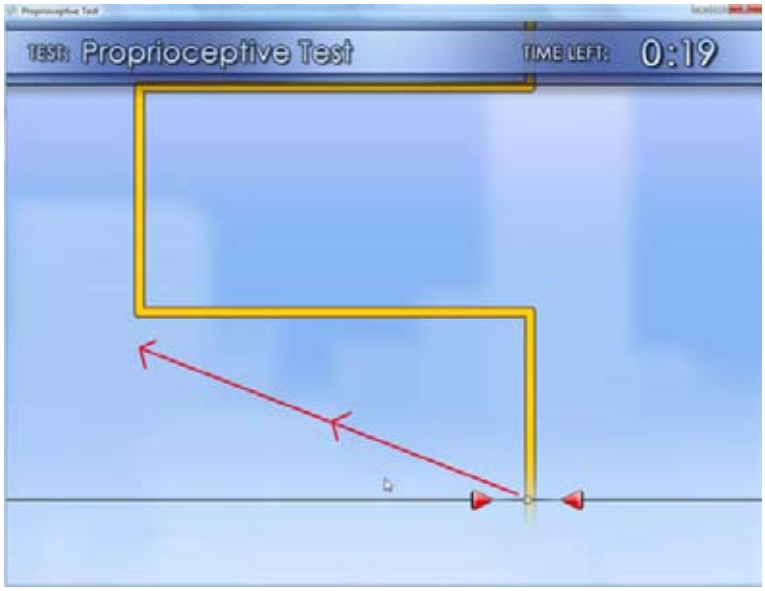
1) Select Side: One side left/right, Both sides leg or No side (no use of legs) training.
2) The amount of weight you select can be minimal. The test should always be easily achievable; you are not looking for strength but for proprioception. 5 or 10 kg is enough weight in most of the tests you will do.
3) Duration rest: the amount of time the test person has to be in the rest position. The longer this time the more difficult to re-acquire the “correct position”
4) Duration position: the amount of time the test person has to be in the “correct” position.
5) Percent of ROM: The joint position where we test proprioception, expressed in terms of the % of the Range of Motion. We suggest a position between 30 % and 70%
6) Set min/max: Where in the previous Maximal Force Test and Endurance Strength Test the range of motion was not so important, in the Proprioceptive Test it is extremely important to define the range of motion.
7) Set min/max is needed to scale the range of motion. The test person should make one repetition (with slow speed) after you press “Set min/max”.
   The Min value should be around “0” the max value is the end of the range. If the “min” value is not “0” please reset the electronics (Reset button). Then make the repetition (to set min/max) again, ending in the “min” position.
   The test person will start the test in the “min” position..

Press “OK”.
Press “Start” and hit “any key” to begin the test.

Test instructions:
- The test person is asked to replicate joint position (fixed % of the ROM) four times.
- The first and second repetition are with feedback
- The third and last repetition without feedback on the screen. We ask the test person to close their eyes in order to prevent the use of extra visual feedback (e.g. height of weight stack, joint angles) to replicate the joint position. The tester should give verbal cues when the test person should move from rest position to the desired joint position and back again.

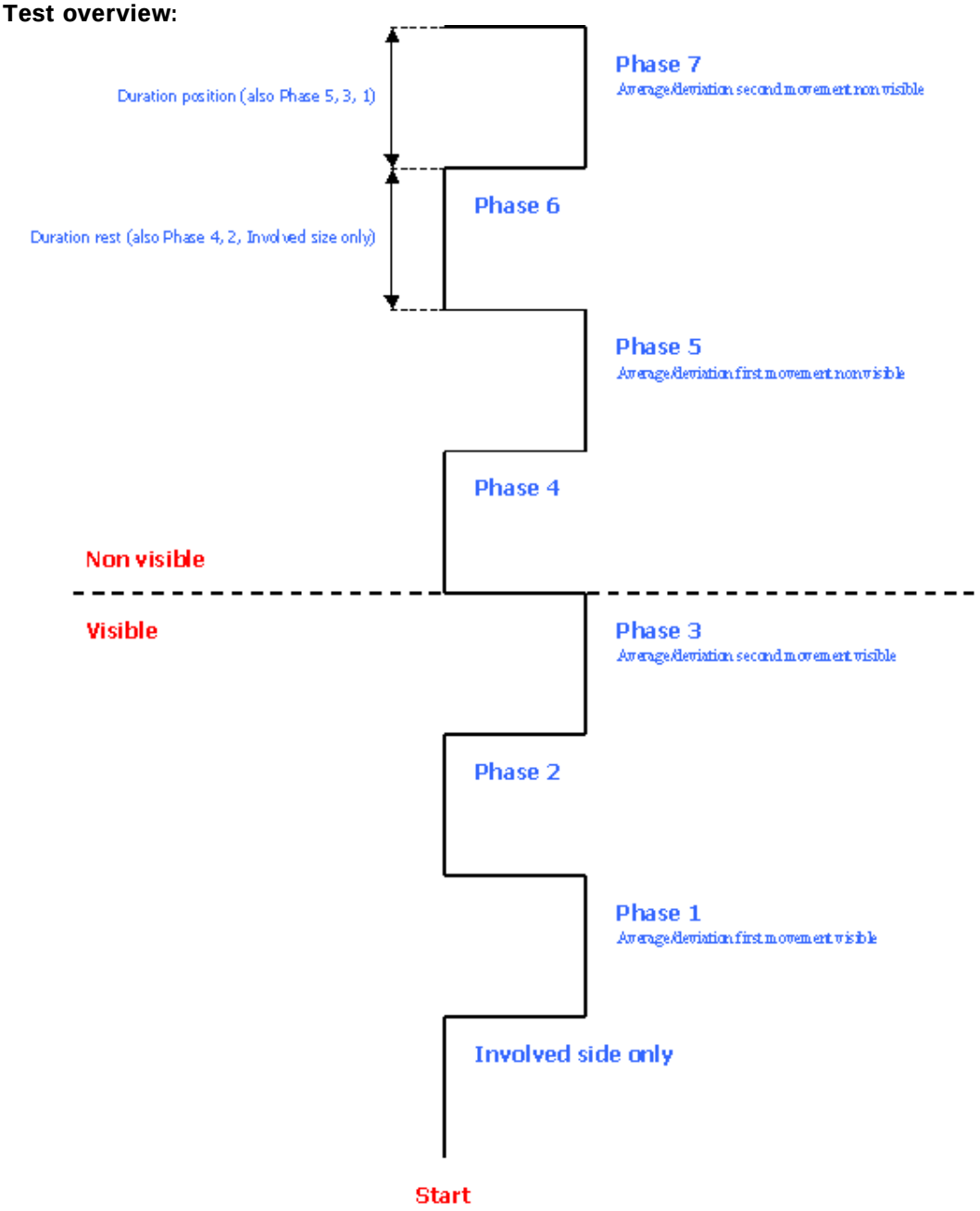


The test person should move to the right vertical line before the horizontal line disappears and maintain the crosshair on that line until the next horizontal line disappears. Repeat the same process for all four positions. Remember the last two positions have no crosshairs.

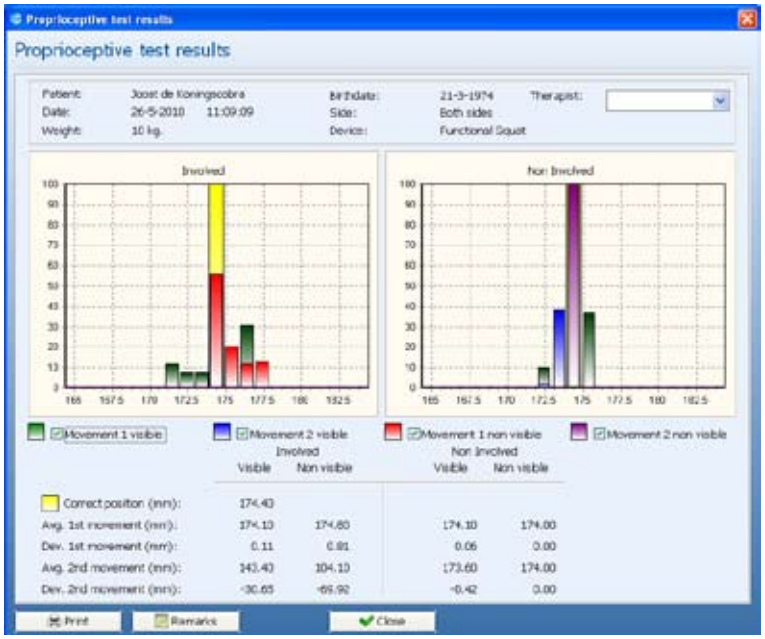


The test person should follow the hypothetical red line and be in time at the “correct” position (black circle), at this point the measurement starts and the horizontal line disappears. After two times in position the red crosshair disappears and we ask the test person to close their eyes so no visual input at all is possible.

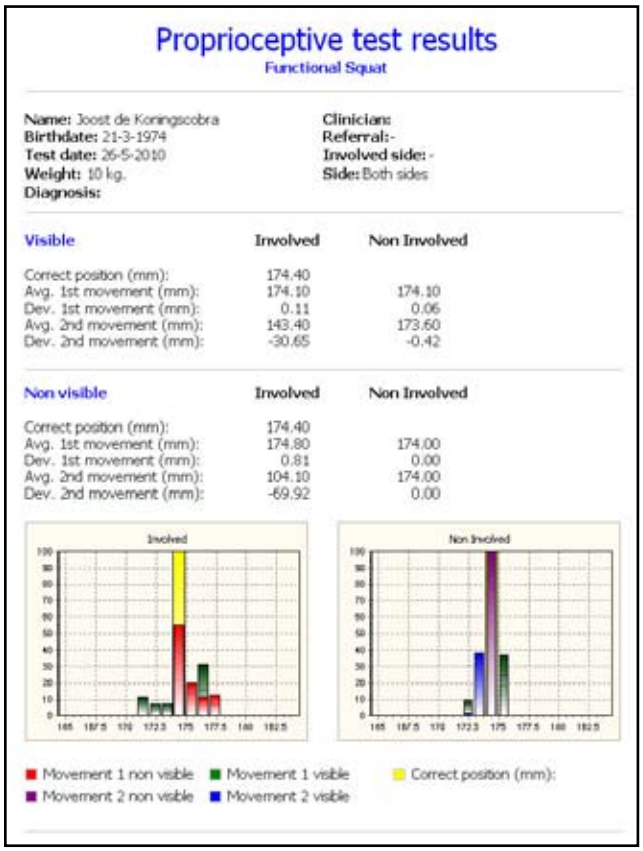
Test overview:



After the test you will get the following screen:

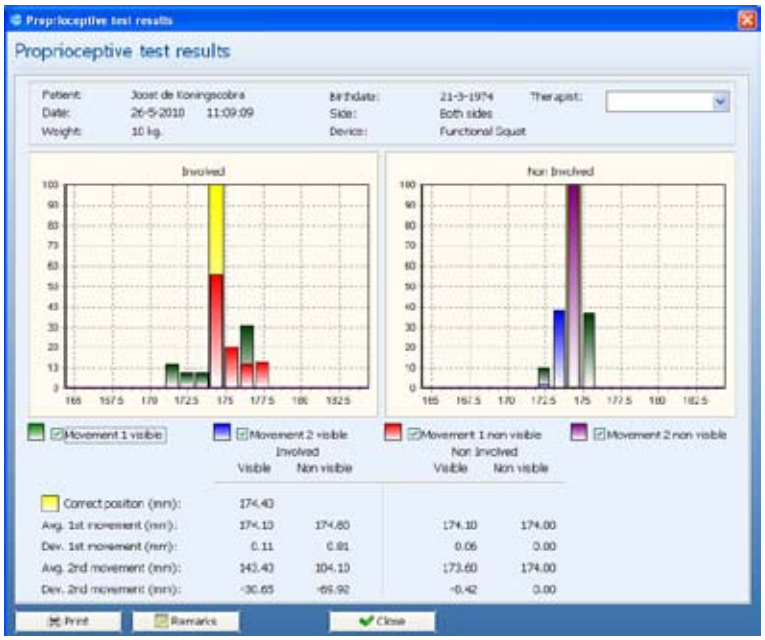


To print to paper use the “Print” button. If you want a print preview on the screen use the command; “ctrl-p”
To add a note use “Remarks”.
To compare results use “Overlay”. Choose the test results you want to compare with and press “OK”. The result will be displayed.



12.4 Interpretation Proprioceptive Test

Directly after the test we check the distribution of the bar graphs.



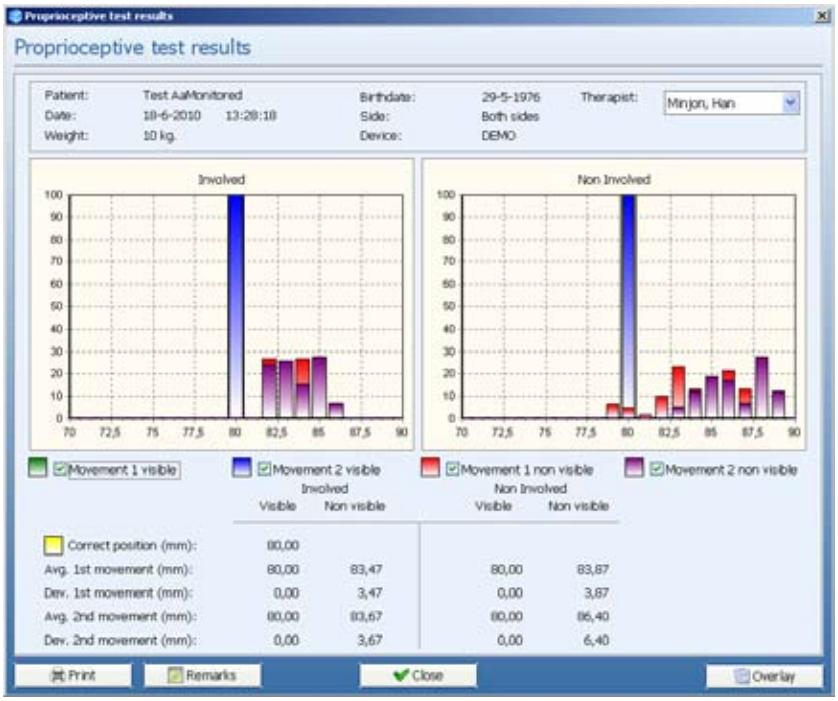
The green and blue marker (first and second) show us the actual position of the patient relative to the correct position when the crosshair was present (reps 1&2).
The red and purple marker (first and second) show us the actual position of the patient relative the correct position after the crosshair disappeared (reps 3&4).

Green and blue bar:
The green and blue bar do NOT tell us anything about the quality of Proprioception!!

If the patient is not capable of getting the green and blue marker in the correct position, this means the coordination is not OK. This information tells us that we are not ready to do a Proprioceptive test; but rather we should train to achieve better coordination ability first.

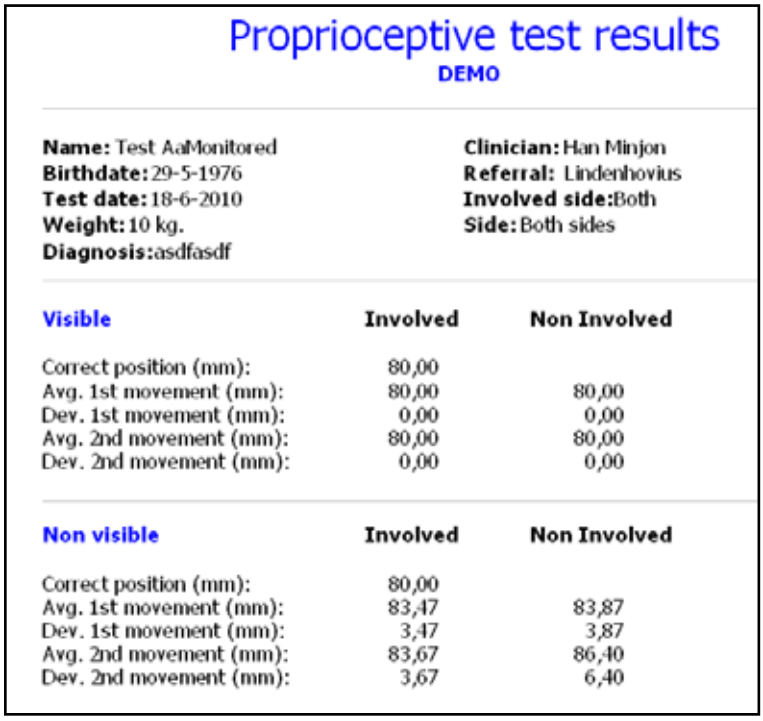
If the patient has both green and blue bar on or close to the correct position, we can interpret proprioceptive ability by reviewing the size and location of the red and purple bar.

Red and purple bar:
The red and purple bar tell us how well the patient can re-acquire the correct joint position (learned with the green and blue bar). The bars should be as high as possible, meaning a long time at a specific position, ideally in the neighborhood of the correct position. If you observe many small bars, the patient was moving around during the test time and uncertain about the correct position. In the graphical view, it may not always be possible to see all the bars, so we refer to the data including average and deviation.



In the above picture you see that the green and blue bar are on the correct position. Both the red and purple bar are moving during the test through a wider range of motion as expected.

To print to paper use the “Print” button. If you want a print preview on the screen use the command; “ctrl-p”. Press “OK” to get a preview.



Proprioceptive test results

DEMO

Name: Test AaMonitored
Birthdate: 29-5-1976
Test date: 18-6-2010
Weight: 10 kg.
Diagnosis: asdfasdf

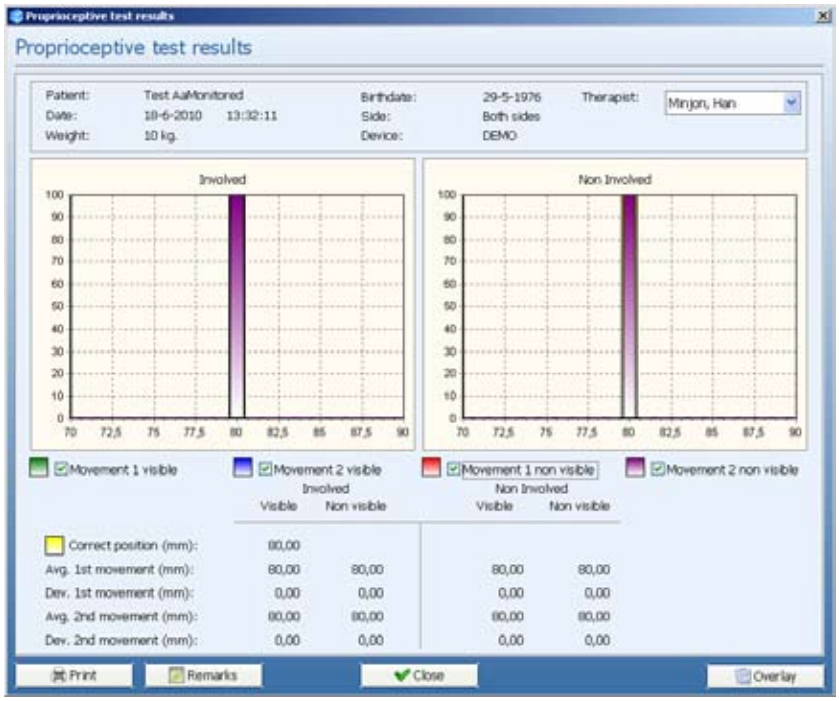
Clinician: Han Minjon
Referral: Lindenhovius
Involved side: Both
Side: Both sides

Visible	Involved	Non Involved
Correct position (mm):	80,00	
Avg. 1st movement (mm):	80,00	80,00
Dev. 1st movement (mm):	0,00	0,00
Avg. 2nd movement (mm):	80,00	80,00
Dev. 2nd movement (mm):	0,00	0,00

Non visible	Involved	Non Involved
Correct position (mm):	80,00	
Avg. 1st movement (mm):	83,47	83,87
Dev. 1st movement (mm):	3,47	3,87
Avg. 2nd movement (mm):	83,67	86,40
Dev. 2nd movement (mm):	3,67	6,40

In the above printed numbers the correct position was 80, both visible markers have an average of 80 and essentially no (or 0,1) deviation which is what we would expect of a person with good coordination.
The non visible first movement average was 83,47 which tells us that the test person overshot the correct position 3,47 cm to the right.
The non visible second movement average of 83,67 is 3,67 cm less than the expected position, but the deviation of 3,67 indicates the test person had uncertainty about their joint positioning.

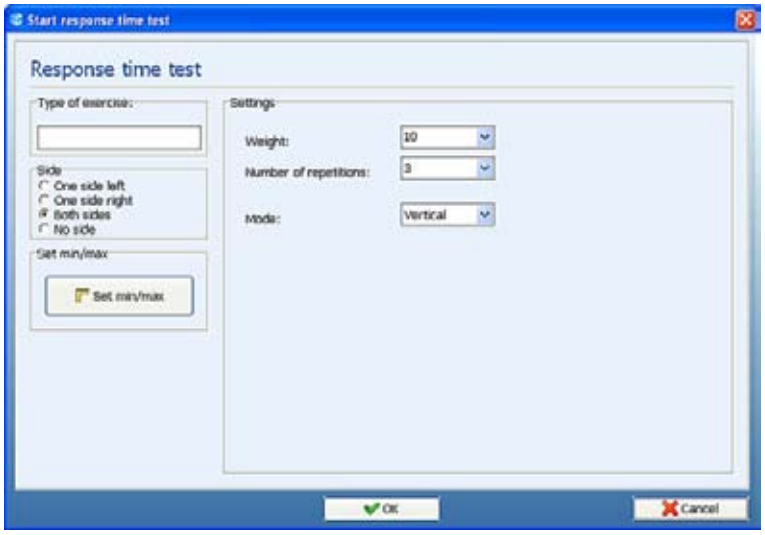
The numbers in a good test :



In this case the correct position was 80 and both the green bars and the red bars are in the correct position (average 80) and without any deviation (stable during the test).
This is the best score possible.

12.5 Response time test

The Response Time test is designed to measure the test person's reaction time using an unexpected movement and their ability to finely control the weight after moving it.



The Start Position corresponds to the specific location (expressed as a percentage) within the full range of motion where the test will be performed.

Set min/max: Where in the previous max. force test and endurance strength test the range of motion was not so important, in the Response Time test it is important to establish the desired range of motion. Make sure the foot does not come off of the foot plate when setting the min/max.

How to set the Range of Motion: push Set min/max and ask the patient to complete 1 repetition with slow speed and return back to the starting point.
The Min value should be around “0” the max value is the end of the range. If the “min” value is not “0” please reset the electronics (Reset button). Then make the repetition (to set min/max) again, ending in the “min” position. When the desired range is established hit “OK” to accept the values.

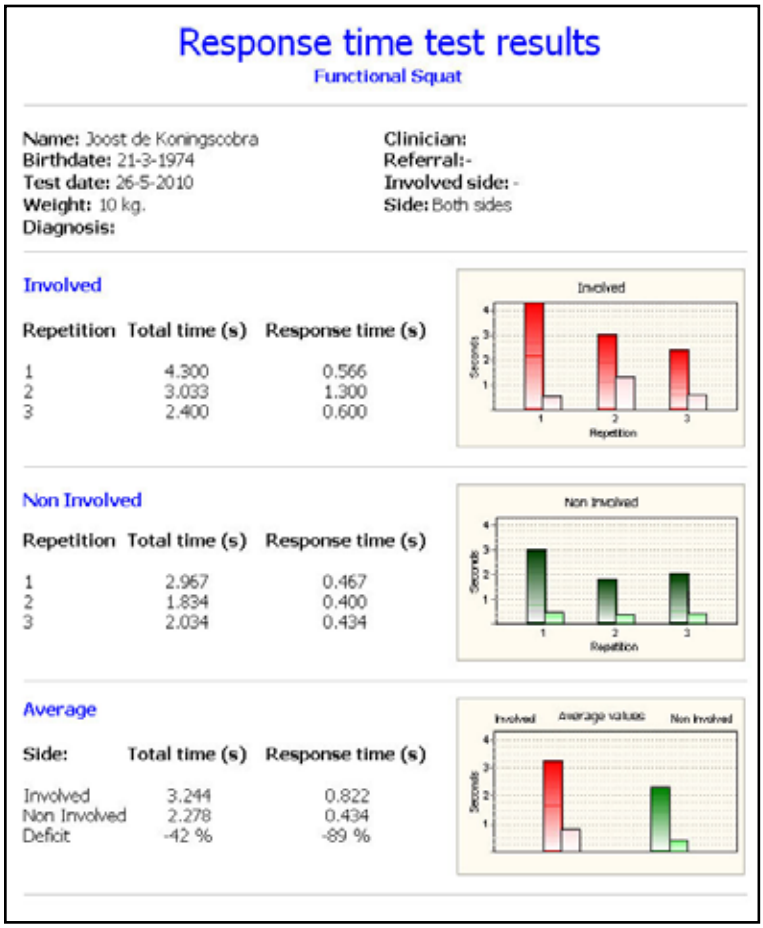
Weight: Use 5 to 10 kg’s for the performance of this test
Choose “OK” to begin the test. Press any key. The following screen appears:

Instruct the patient to move the stick figure into the empty box. When the stick figure is relocated to the center of the box, the box will turn green. After a couple seconds (this time varies), the box will randomly move to either the left or right of its initial position. The patient should be instructed to relocate the stick figure into the box at the new position as quick as possible. The time that it takes for the test person to react and initiate movement of the stick figure is the “Response Time”.

When the stick figure is properly located in the box, the box turns green. It is essential to control and hold that new position so that the box remains green. The time for this to occur is designated the “Time to Finish”. The test administrator must then click the “Next Measurement” button or the “Enter” key on the keyboard.
Each side is tested three times. (unless we are using the Back extension or Abdominal Crunch machines).

After three measurements are collected for the non-involved side, the following screen appears:

To print to paper use the “Print” button. If you want a print preview on the screen use the command; “ctrl-p”
To add a note use “Remarks”.
To view a line chart, use “Toggle chart”.



Response time test results

Functional Squat

Name: Joost de Koningscobra
Birthdate: 21-3-1974
Test date: 26-5-2010
Weight: 10 kg.
Diagnosis:

Clinician:
Referral:-
Involved side: -
Side: Both sides

Involved

Repetition	Total time (s)	Response time (s)
1	4.300	0.566
2	3.033	1.300
3	2.400	0.600

Non Involved

Repetition	Total time (s)	Response time (s)
1	2.967	0.467
2	1.834	0.400
3	2.034	0.434

Average

Side:	Total time (s)	Response time (s)
Involved	3.244	0.822
Non Involved	2.278	0.434
Deficit	-42 %	-89 %

12.6 Interpretation response time test

Response Time: is defined as the time that it takes for the test person to react and initiate movement of the stick figure in response to the moved box. The “Response Time” is sometimes represented as a negative number. This means that the test person initiated movement in the direction opposite of the box movement before eventually relocating the stick figure to the box.

Total time: is defined as the total time elapsed from the initial movement of the box to the point where the box has turned to red and remained red.

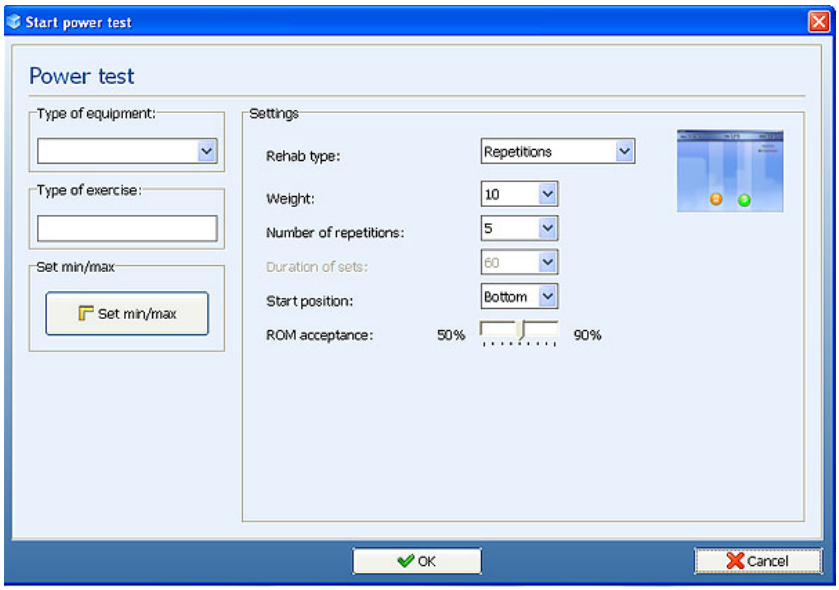
Three repetitions are performed for each side. The results are then averaged to facilitate the calculation of a deficit.

Deficit: Defined as the percent difference relative to the Non-Involved side, e.g. 5 sec

	Inv		Non involved
If there is no deficit the value is 0%	5	-	5
If the Involved side is 20% slower it will say “20%”	6	-	5
If the involved side is 20% faster (not expected) it say’s “-20%	4	-	5

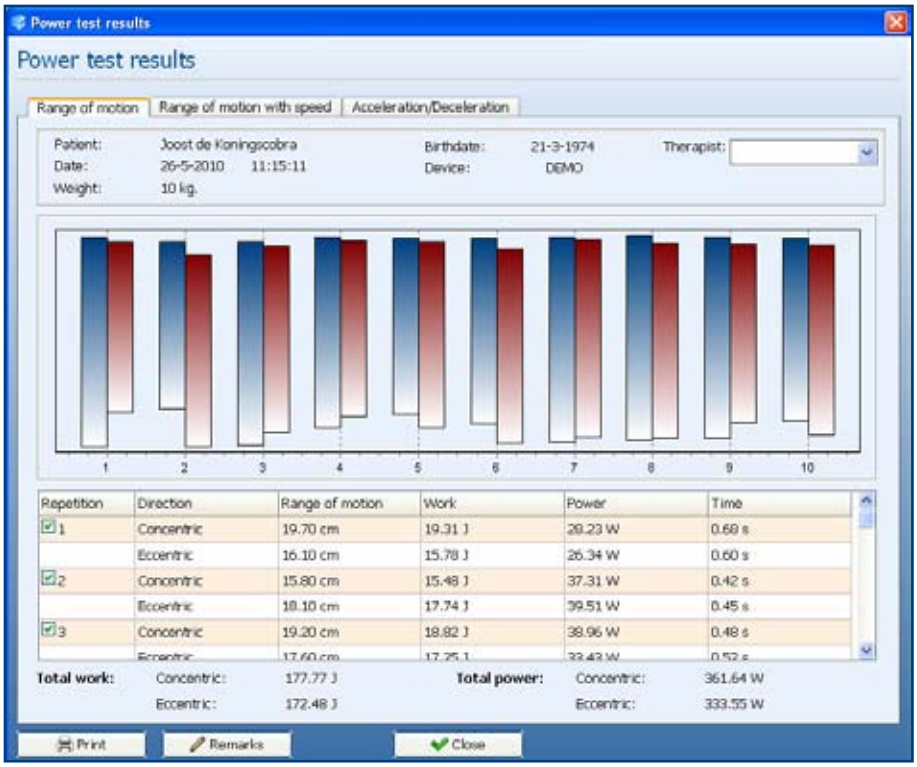
Clinical Relevance of the Data: The smaller the “Response Time”, the faster the test person’s ability to react to unexpected demands. Longer “Time to Finish” durations may mean less fine motor control abilities necessary for holding the moved weight.

12.7 Power Test



1) Select Type of equipment (optional).
2) Choose Number of repetitions or Repetitions per time. After choosing Repetitions per time fill in the Number of sets and Rest time between sets.
4) Select weight.
4) Select number of repetitions or duration of sets.
5) Select start position.
6) Set Range Of Motion acceptance, this is the percentage of deviation when the software registers the repetition.
7) Set min/max.
Press 'Any key' to start the test.

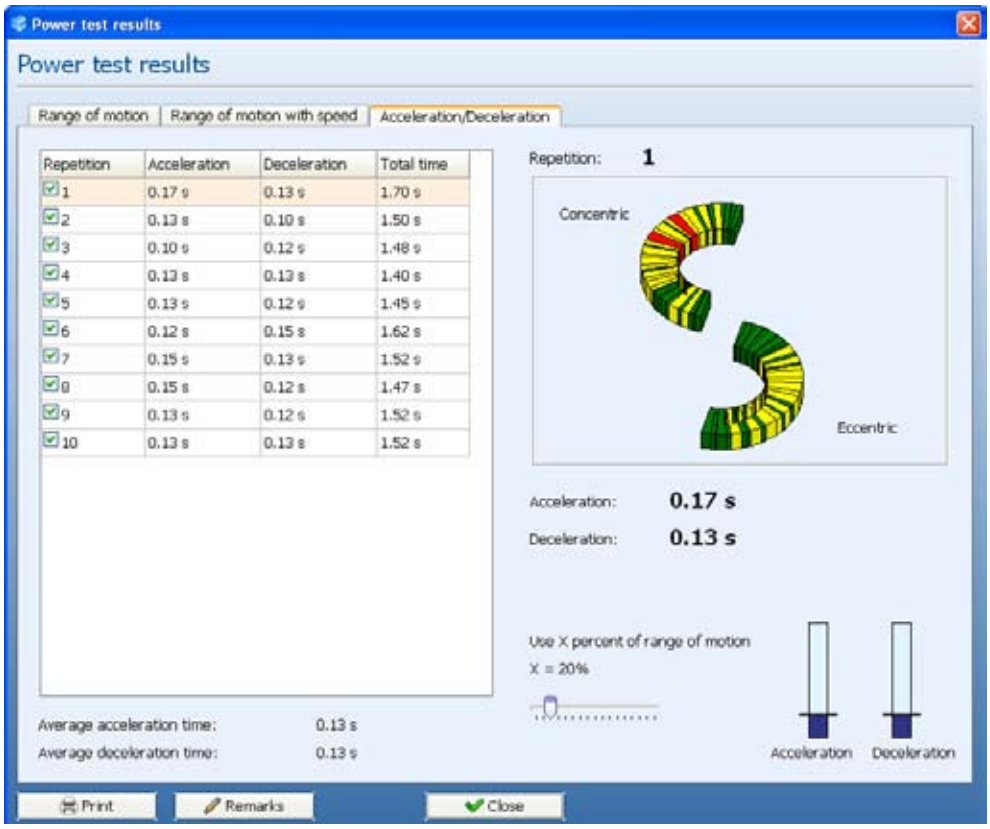
After finishing the test, the following screen will appear:



If the repetition of the test is activated, these results will be counted into the Total work and Total power. Press on the next tab for going to the next page.

The average speed is shown per repetition. The second Repetition of the Fatique section is always set at 100%.

The other repetitions are calculated on this percentage.
Change legend speed can be adjusted in steps of 15 cm/s.
Press on the next tab for going to the next page.



This screen shows per repetition the deceleration and acceleration of the test.
“Use x% of range of motion” shows the area of the motion in which the deceleration and acceleration is calculated per second.
To view the visual image of the motion, click on the specific Repetition in the grid.

Press “Print (ctrl+P) to print the report.
To add a note use “Remarks”.

Power test results

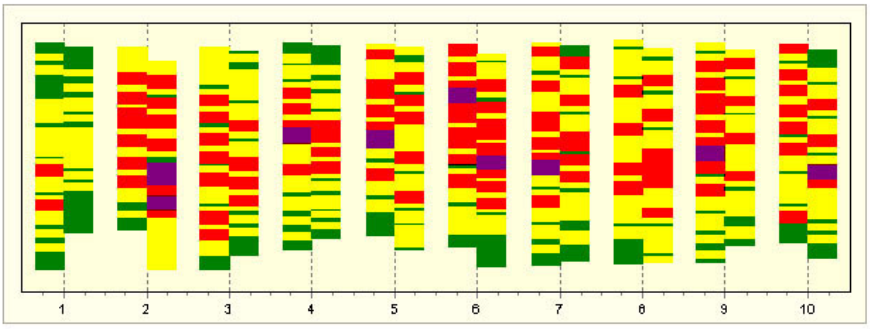
DEMO

Name: Joost de Koningscobra
Birthdate: 21-3-1974
Test date: 26-5-2010
Weight: 10 kg.
Diagnosis: ACL

Clinician: Joost Heuperman
Referral: Akkermans
Involved side: Left
Side: Both sides

Concentric	Involved
Total work:	177.77 J
Total power:	361.64 W
Average speed:	36.90 cm/s
Average acceleration time:	0.13 s

Eccentric	Involved
Total work:	172.48 J
Total power:	333.55 W
Average speed:	36.90 cm/s
Average deceleration time:	0.13 s

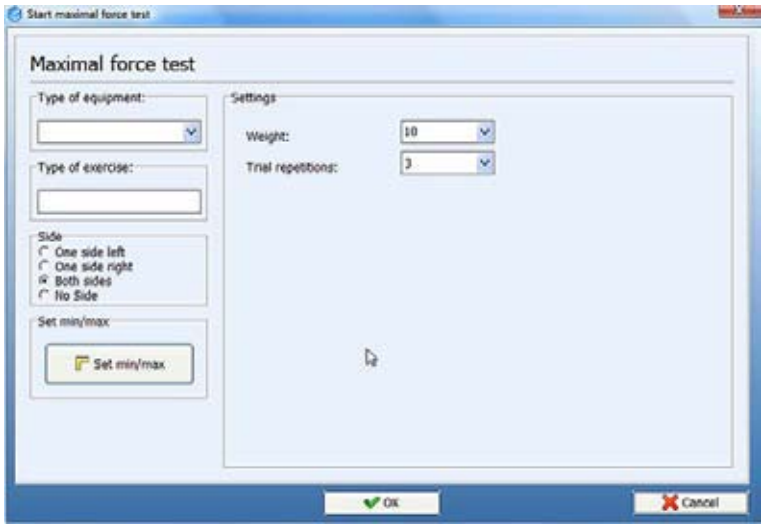


Speed < 30 cm/s
Speed > 30 cm/s
Speed > 45 cm/s
Speed > 60 cm/s

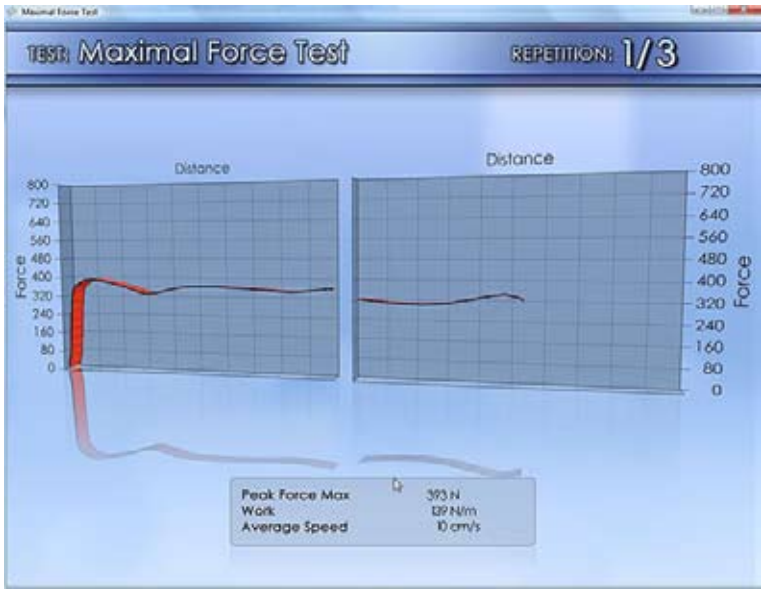
12.8 Maximal Force Test

It is important, before the maximal Force test is started, to do a good warm up.
The test person should be familiar with the piece of equipment.

The test should be done high speed concentric, and slow speed eccentric.
The test person should go up (concentric) high speed to get information about maximal speed combined with maximal weight. If the speed is too high (e.g. on squat : not able to keep heel and toe attached to the footplate) the test should be redone with a higher weight.
The test person should go down (eccentric) controlled because typically the test person is stronger in eccentric activity and gravity is helping the patient going down
The Maximal force test, the first screen you get:



In this screen you can select the amount of trial repetitions. The weight to do the 1RM test should be selected within a maximum of 5 trial repetitions .
Set Min Max is needed to scale the range of motion. The test person should make one repetition (with light weight) after you press Set MinMax, and you press “OK”.
After setting the range of motion the trial repetitions can be done.



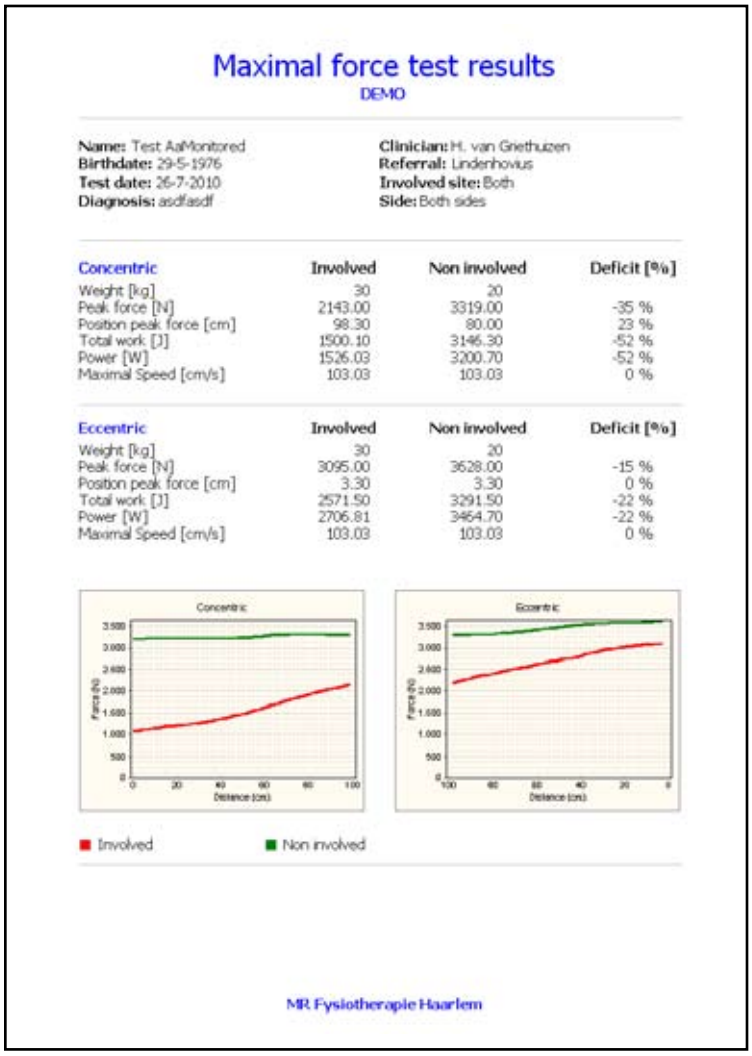
After the trial repetitions the weight for the 1RM test can be selected.

Press “OK” to perform the 1 RM test.
During the test, you see the curves.
The clinician should observe the quality of movement and ask the test person if this repetition felt like his maximum performance. If not the test should be redone by using the “retry” button.
When you finish the one repetition the software asks if the test is OK or if you want to “Retry”. If you Retry you get some rest. If you have to retry several times (maximum of 2) in a maximal force test (if the weight is still too easy) the test is not reproducible and should be done again another day.

If you press “Yes” the software automatically switches to the involved side. If you press “No” you have to do the test again. If you press “Previous” the test before this last one is saved. Testing should always start with the non-involved side. Only with the Back Extension and Abdominal Crunch machines there is “one side only”.

After finishing the involved side (press “OK” after the test) you will get the first information on the screen.

To print to paper use the “print” button. If you want a print preview on the screen use the command; “ctrl-p”. To add notes, use the “Remarks” button.



Maximal force test results

DEMO

Name: Test AaMonitored
Birthdate: 29-5-1976
Test date: 26-7-2010
Diagnosis: asdfasdf

Clinician: H. van Griethuizen
Referral: Lindenhovius
Involved site: Both
Side: Both sides

Concentric	Involved	Non involved	Deficit [%]
Weight [kg]	30	20	
Peak force [N]	2143.00	3319.00	-35 %
Position peak force [cm]	98.30	80.00	23 %
Total work [J]	1500.10	3146.30	-52 %
Power [W]	1526.03	3200.70	-52 %
Maximal Speed [cm/s]	103.03	103.03	0 %

Eccentric	Involved	Non involved	Deficit [%]
Weight [kg]	30	20	
Peak force [N]	3095.00	3628.00	-15 %
Position peak force [cm]	3.30	3.30	0 %
Total work [J]	2571.50	3291.50	-22 %
Power [W]	2706.81	3464.70	-22 %
Maximal Speed [cm/s]	103.03	103.03	0 %

Concentric

Eccentric

Involved

Non involved

MR Fysiotherapie Haarlem

12.9 Interpretation Maximal Force Test

Doing the Maximal Force test you get the following information:

Concentric versus Eccentric:
The concentric movement is important, it shows you how much weight the test person could move with what speed.
The eccentric movement is not so important. Gravity is helping the weight coming down and the eccentric muscle force is always higher than concentric so gives no extra information.

Non-involved=Green versus Involved=Red.
The numbers of the involved side compared to the non-involved side and the deficit between them.

In our example:

Weight: The (maximal) weight you used in step 5 to do the one repetition max force test

Peak Force: The combination of the weight and speed makes the curve; the highest point in the curve is the Peak Force.

Position Peak Force: Location where the Peak Force is reached.

Total Work: The amount of Work delivered. The total volume under the torque curve

Power: This is the Total Work divided by the time it takes to perform the work.
Maximal Speed: The maximal speed performed during the one repetition.

Deficit:
The value of the Non-Involved side is the number we work with, i.e. 100

	Inv	-	Non involved
If there is no deficit the value is 0%	100	-	100
If the Involved is weaker it say's -10%	90	-	100
If the involved is stronger (not expected) is say's 10%	110	-	100

Normally you expect to see a -x% if the involved side is weak.

How to look at the numbers:

The weight: because only the weight is less than the combination of weight and speed you get more information in the peak force. Especially when the weight during the test is the same at the involved and non-involved side.

Peak force: this will tell you the combination of weight and speed. A higher speed with the same weight makes the peak force higher. The weight at involved and non-involved can be the same but because of a different speed you still can find a deficit.

Total Work: this has to do with the weight, the speed, the range of motion. It shows you the total capacity within the range of motion.

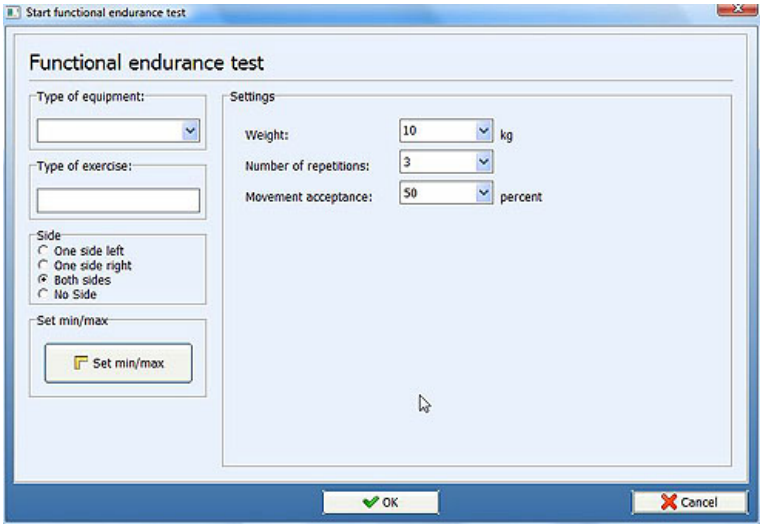
Average power: because the speed is related to the time, you already see this in total work.

Maximal speed: you always see a higher peak force if there is a higher maximal speed (if the same weight is used).

In healthy persons left - right deficit should be within about 10%.
In high level athletics the left-right deficit should be within about 3%, though we recognize there may be greater deficits due to the asymmetries created by the demands of muscular activity required in a specific sport.

12.10 Functional Endurance Test

The Functional Endurance Test is performed to get information about the endurance strength of muscle groups.



IMPORTANT: The endurance test should be done at high speed.
Instructions to the test person before the test should be: perform the total number of repetitions with the highest speed possible.

The weight and amount of repetitions should create maximal fatigue of the muscle groups causing a reduction of speed. Since the weight during all the repetitions is constant, the reduction of speed is the most important sign of this test.

Set Min Max is needed to scale the range of motion. The test person should make one repetition (with light weight) after you press “Set min/max”.
Press “OK” and hit “Any key” to start the test.

The repetitions with the non-involved side are done first. After the rest period perform the same repetitions on the involved side.

During the test you see the software counting the repetitions. A repetition is counted if more than 50% of the range of motion is realized.

When all repetitions are done you get the following screen :

To print to paper use the “Print” button. If you want a print preview on the screen use the command; “ctrl-p”
To add a note use “Remarks”.

12.11 Interpretation Functional Endurance Test

Doing the Functional Endurance Test you get the following information. As a general rule the eccentric data is not pertinent. So we focus on the concentric data.

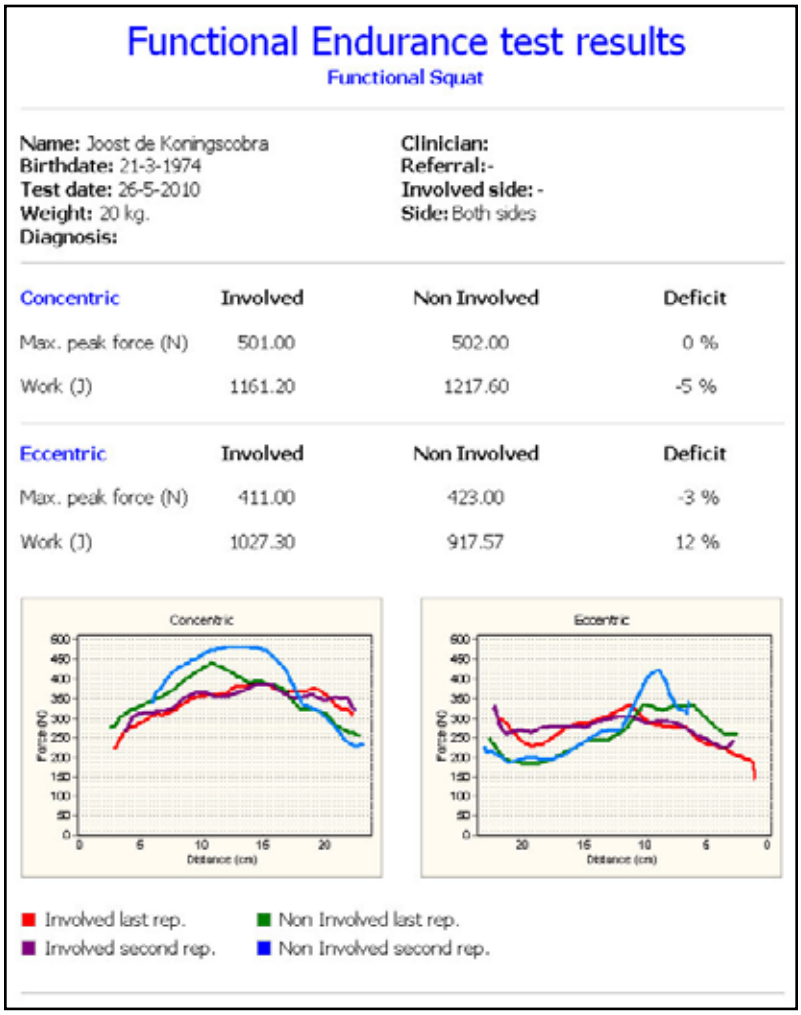
Initial review of the curves shows that fatigue on the non-involved side is negligible (the blue and green curves are almost superimposed), and that fatigue on the involved side is significant (about 12%). However, it is important to look closer at the individual curves for comparison. In the above dialog you can select which curves you want to see. By clicking on the box you can either select or de-select the curve you want.

In the picture above we selected only the Involved rep. 2 and Non Involved rep. 2
In this example we see that a deficit between the blue Non-Involved curve and the Purple Involved curve already exists.
Therefore we should focus our rehabilitation more on developing the absolute strength for this patient to overcome the existing deficit.

If the mentioned curves are the same in the beginning (what we expect) we should look how they are at the end, we select the Involved Last rep. and the Non-Involved Last rep.

In the above example we see that the Green (Non Involved) repetition has the typical shape of a well-performed test, ie a test performed at maximal speed. The shape of the graph for the last repetition of the involved side (red) is indicative of a repetition performed with a much lower speed.

To print to paper use the “Print” button. If you want a print preview on the screen use the command; “ctrl-p”
To add a note use “Remarks”.



Functional Endurance test results

Functional Squat

Name: Joost de Koningscobra
Birthdate: 21-3-1974
Test date: 26-5-2010
Weight: 20 kg.
Diagnosis:

Clinician:
Referral:-
Involved side: -
Side: Both sides

Concentric	Involved	Non Involved	Deficit
Max. peak force (N)	501.00	502.00	0 %
Work (J)	1161.20	1217.60	-5 %

Eccentric	Involved	Non Involved	Deficit
Max. peak force (N)	411.00	423.00	-3 %
Work (J)	1027.30	917.57	12 %

The Numbers we get:

Weight: The weight you selected to do the test.
Repetitions: The number of repetitions asked in this test
Peak Force: The combination of the weight and speed makes the curve; the highest point in the curve is the Peak Force. In this case we only see the curve of the second repetition, the Peak Force could also possibly be made in one of the other repetitions. We do not see this in our curve.
Position Peak Force: This is the position in the range of motion where the peak force is made
Total Work: The total amount of Work delivered. The total volume under the force curve of all repetitions together
Average Power: This is the Total Work divided by the time it takes to perform the work
Maximal Speed: The maximal speed performed during the one repetition

Deficit: The value of the Non-Involved side is the number we work with, i.e. 100

	Inv	-	Non involved
If there is no deficit the value is 0%	100	-	100
If the Involved side is weaker it say's -10%	90	-	100
If the involved side is stronger (not expected) it say's 10%	110	-	100

Normally you expect to see a -x% if the involved side is weak.

How to look at the numbers:
The weight: because only the weight is less than the combination of weight and speed you get more information in the peak torque.

Peak force: this will tell you the combination of weight and maximal speed.

Position of peak force: In healthy situation you expect the position of the peak force at the same position in both concentric curves. This tells you, in numbers, if the shape of the curve is similar.

Total Work: this has to do with the weight, the speed, the range of motion. It shows you the total capacity within the range of motion of all repetitions together.

Average power: because the speed is related to the time, you already see this in total work

Maximal speed: you always see a higher peak force if there is a higher maximal speed (if the same weight is used)

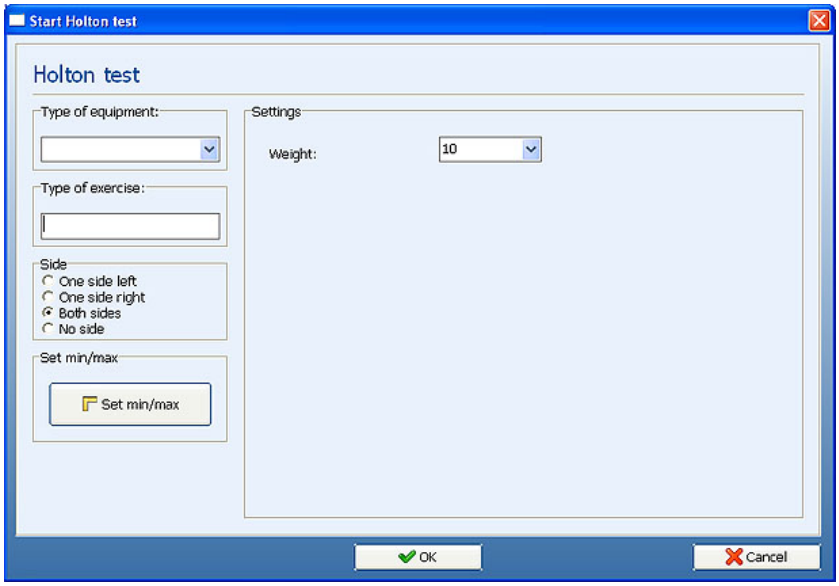
In healthy persons left - right deficit is typically within about 10%

The importance of this test is to look at the deficit between the second curve and the last curve. This deficit (not in a separate number) should be the same at both sides.

12.12 Holten

Holtens Test is a maximum force test using a predictive formula as published by Holten (reference). It is primarily used for patients who because of joint problems cannot complete a maximal force test, and the accompanying 1 time max repetition that is required of the max force test.

Select “Test”, then “Holten” from resulting menu. The following dialog appears:



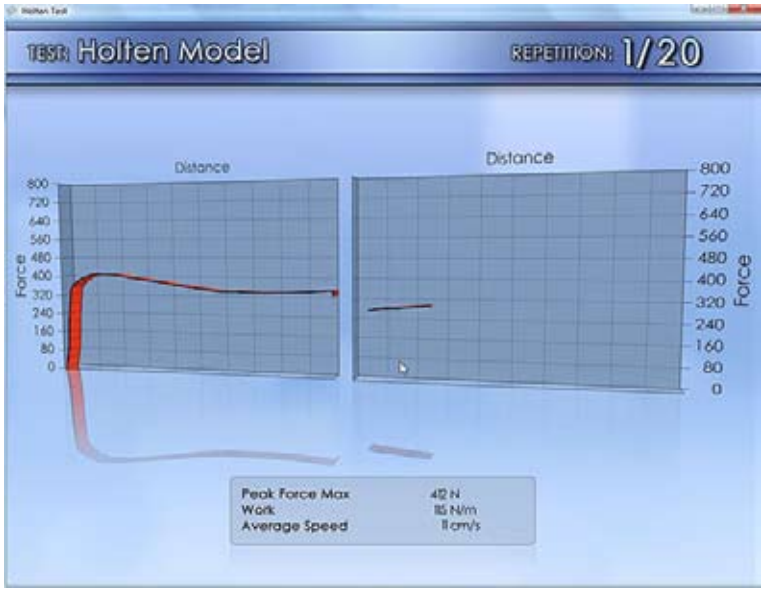
Type in the weight at which the test will be performed. Weight should be light enough so that the test person can perform at least 10 reps, but heavy enough so that they cannot complete the entire 20 reps. Clinical experience will help in the weight selection process.

Set min/max: Where in the previous max. force test and endurance strength test the range of motion was not so important, in the Holten test it is important to select the proper range of motion.

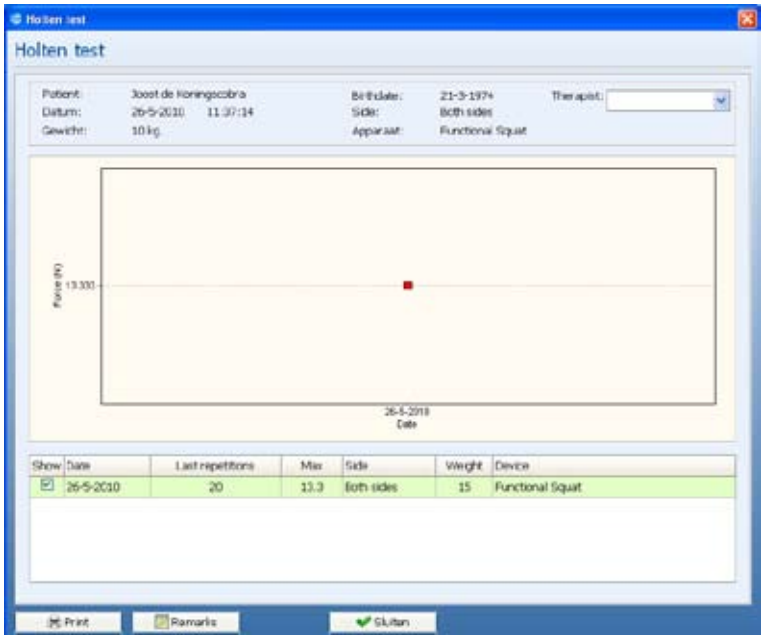
Make sure the foot does not come off of the foot plate when setting the Min/Max.

Set min/max is needed to scale the range of motion. The test person should make one repetition (with slow speed) after you press “Set min/max”.
The Min value should be around “0” the max value is the end of the range. If the “min” value is not “0” please reset the electronics (Reset button). Then make the repetition (to set min/max) again, ending in the “min” position. When the desired range is established hit “OK” to accept the values.

Press “OK” and hit “Any key” to start the data collection process.

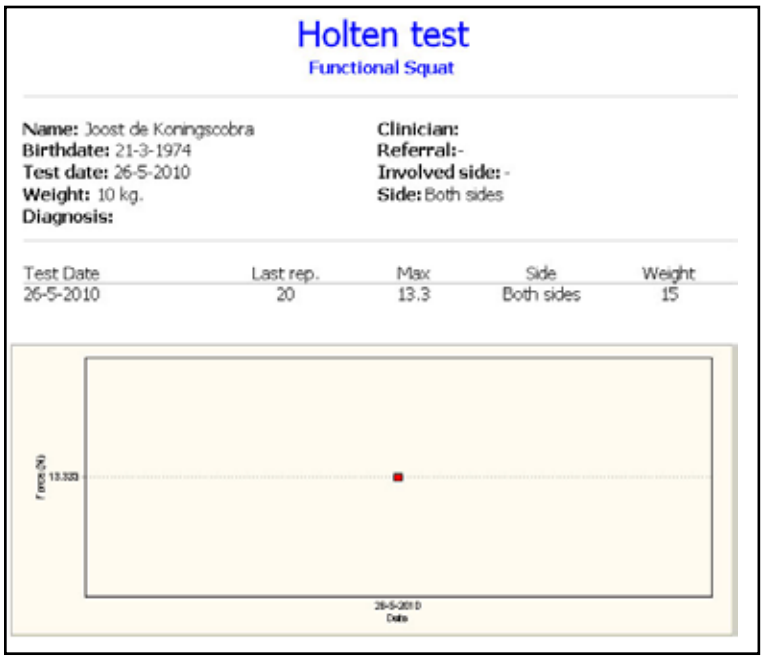


Each successful rep is counted. If the test person cannot complete a rep, click “Esc” to end the test.



The results are shown. To print to paper use the “Print” button. If you want a print preview on the screen use the command; “ctrl-p”.

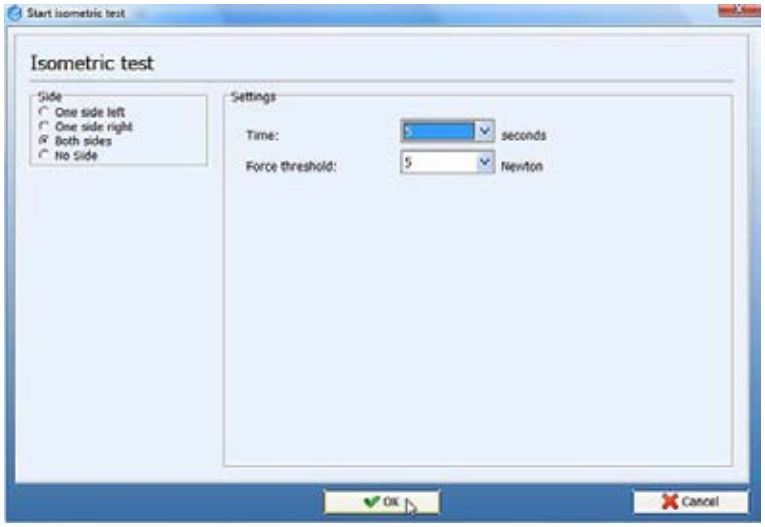
To add a note use “Remarks”.



12.13 Isometric Test

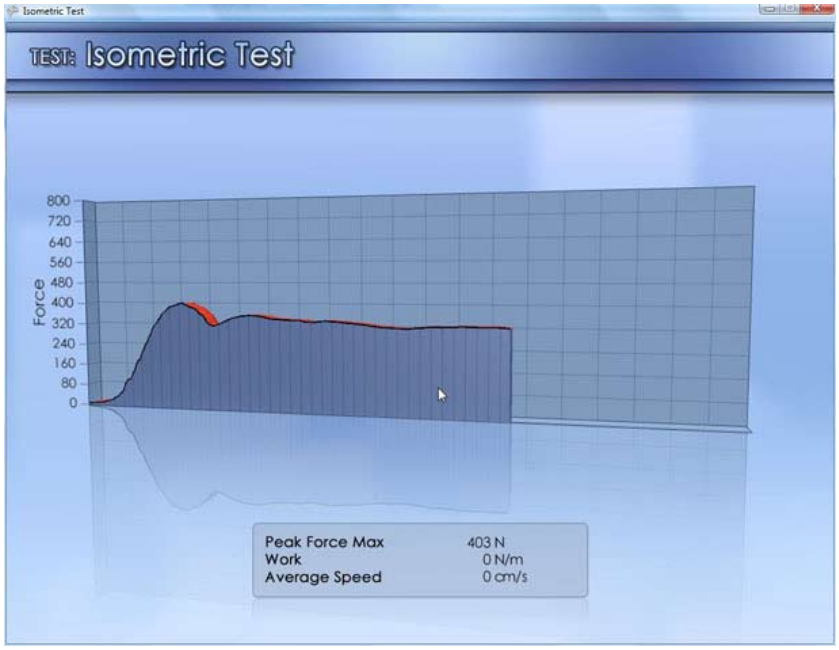
The Isometric Test is designed to quantify the maximum force the test person can generate at a specific joint angle. The isometric test can be a safer alternative than the Max force test for certain patient populations. This may allow testing of strength and/or pain threshold earlier in the rehab process. This can serve as a baseline to judge future strength gains and pain reduction.
Note: With the Functional Squat, all Isometric tests are performed single legged. If the test person exceeds 4000N the test should be stopped to prevent patient and machine overload.

Select “Show tests”, then “Isometric” from resulting menu. The following dialog appears:



1) Select One side left/right, Both sides leg or No side (no use of legs) training.
2) Select time in seconds.
3) Select force threshold in Newton.

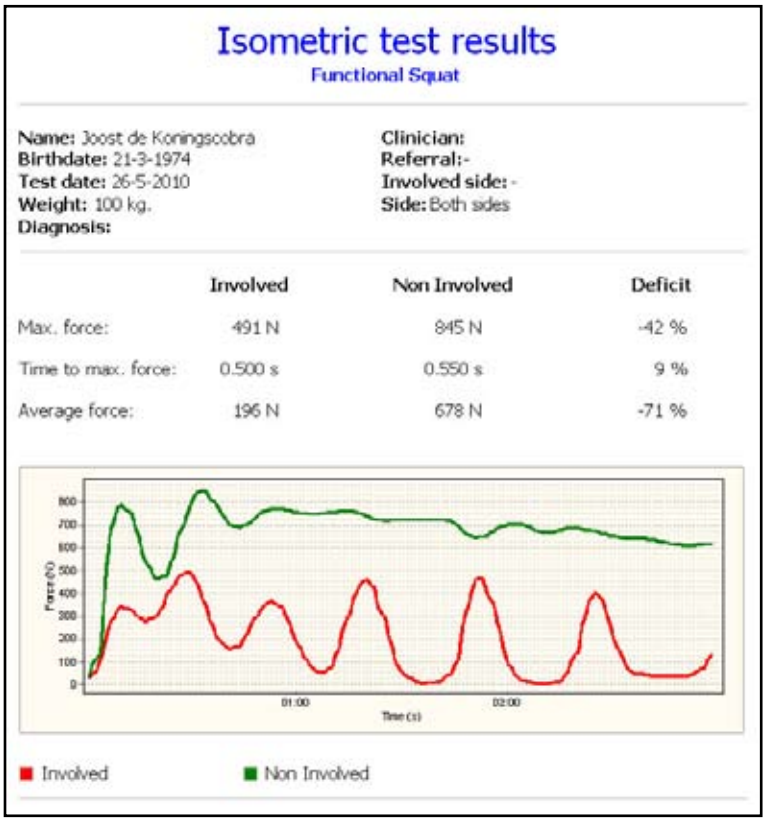
Click “OK”. Click the “Start Test” button to initiate the test. The software begins recording data and graphing the force once the threshold of 100 N is exceeded. The threshold is designed to protect the overstress of the joint against overzealous test persons who may rapidly apply the force in an effort to maximize their performance.



The green bar displays the relative load relative to the threshold. When the load approaches 75 N (3/4 of the bar) the bar turns yellow.

The Non-involved side is tested first, followed by the Involved Side. A single rep is performed for each test since the test is intended to be a maximum exertion, thereby depleting the energy stores of the involved muscle groups.

To print to paper use the “Print” button. If you want a print preview on the screen use the command; “ctrl-p”.
To add a note use “Remarks”.



Isometric test results

Functional Squat

Name: Joost de Koningscobra
Birthdate: 21-3-1974
Test date: 26-5-2010
Weight: 100 kg.
Diagnosis:

Clinician:
Referral:-
Involved side: -
Side: Both sides

	Involved	Non Involved	Deficit
Max. force:	491 N	845 N	-42 %
Time to max. force:	0.500 s	0.550 s	9 %
Average force:	196 N	678 N	-71 %

12.14 Interpretation Isometric test

Several pieces of information that we need to look at when evaluating the isometric strength curves:

Max Force: The maximum force registered during the test. This is an indication of the test person's ability to stabilize the joint under certain load conditions.

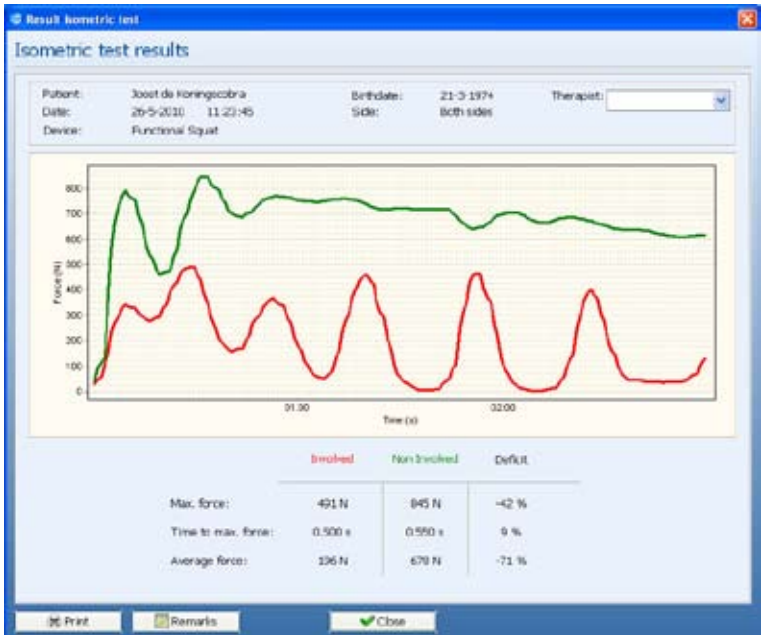
Time to Max Force: The specific time during the test in which the max force was reached. The quicker the test person is able to generate the max force, the more likely the joint is prepared to stabilize and can react to provide that stabilization.

Average Force: The average of all force values recorded over the entire duration of the test. This parameter gives indication of the test person's ability to maintain the force, relative to the peak. If the average is low despite a high max force, we can say that the test person's endurance is not high.

Deficit:
The value of the Non-Involved side is the number we work with, i.e. 100 N

	Inv	-	Non involved
If there is no deficit the value is 0%	100	-	100
If the Involved is weaker it say's -10%	90	-	100
If the involved is stronger (not expected) is say's 10%	110	-	100

Normally you expect to see a -x% if the involved side is weak.



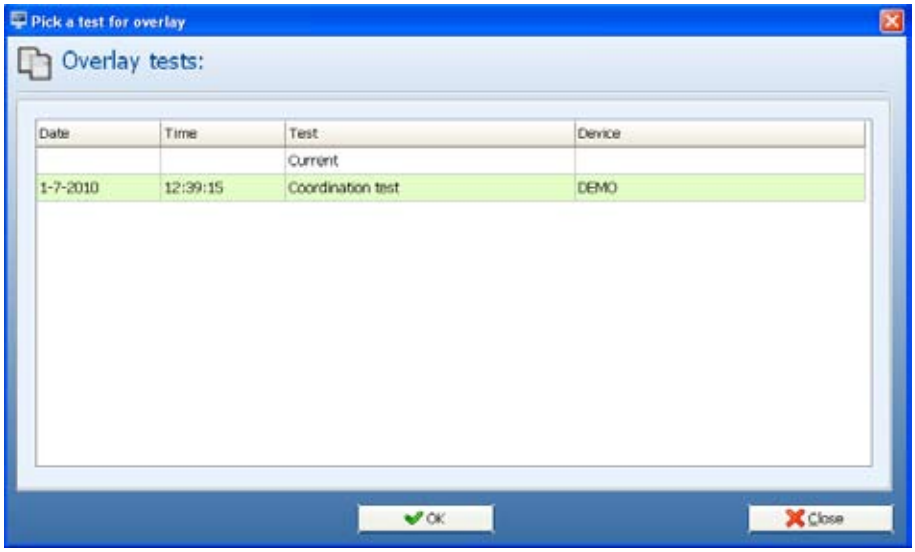
While it is beyond the scope of this document, the shape of the force curve can yield valuable information to the trained clinician.

13. Test history

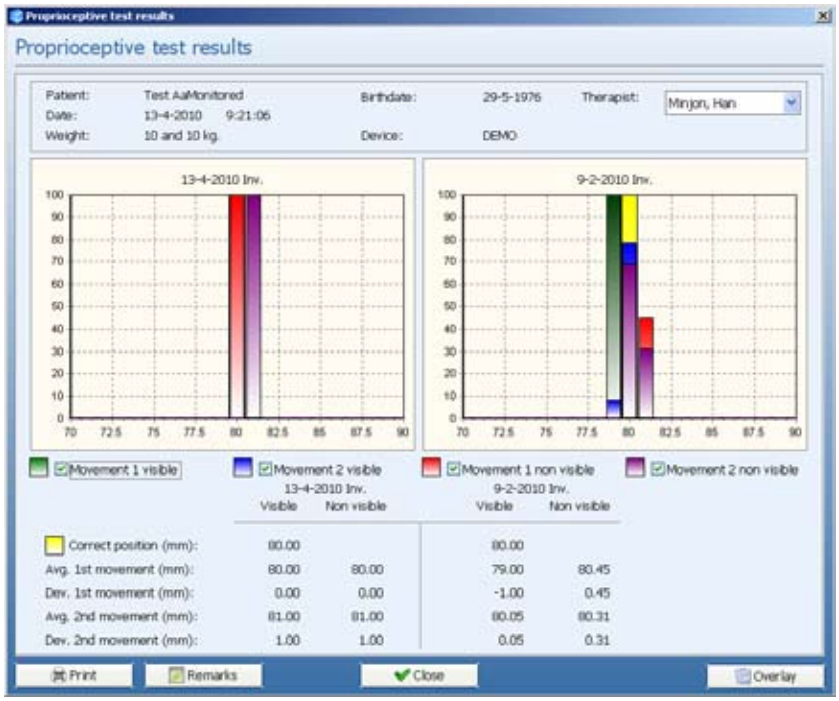
In the main menu you find the option "Test history":

In this menu you can find all the tests the selected patient performed. You will either see all the test on the machine selected or, use toggle, to see all tests the patient performed on all machines (if they are connected by a network).

Select the test and press “OK”, the test results will be displayed.
If you want to compare tests of the same type. Select the first test and use F12 (overlay) to select the other test.



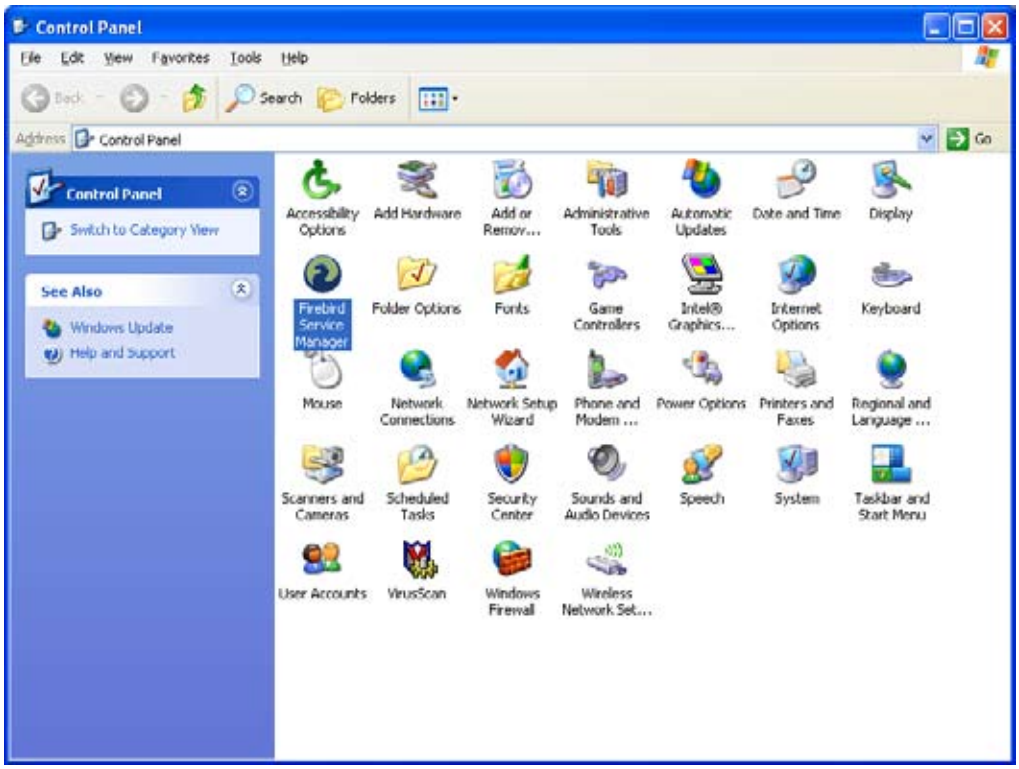
Press "OK". The results will be displayed in the following screen.



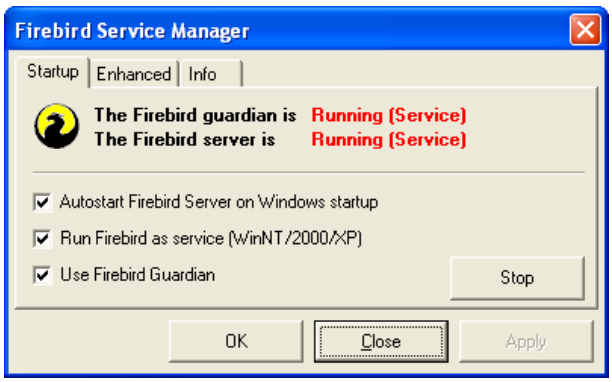
14. Uninstall

For safely removing the MRS software and to avoid problems, follow the steps in this chapter.

Open the Control Panel via the “Start” button.
Locate the icon “Firebird Service Manager” and double-click on it.

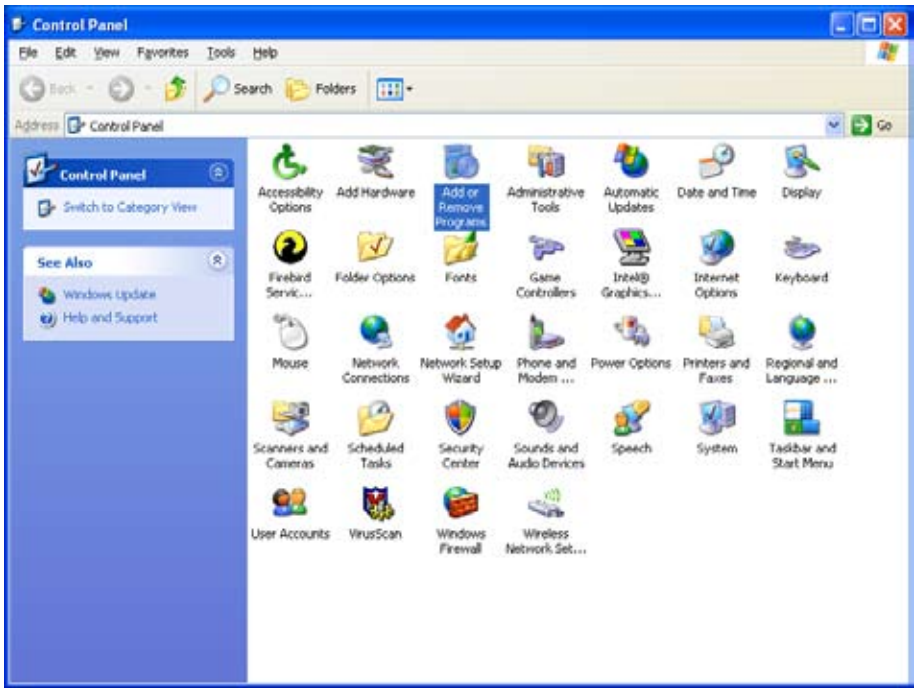


Firebird will open the following screen:

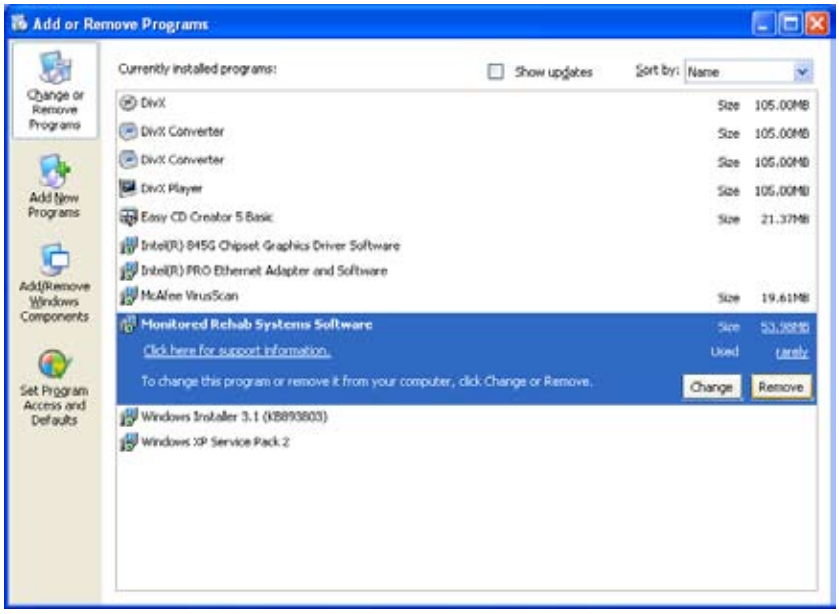


Press the “Stop” button.

The red text is changing into “Stopped”. This means that Firebird is not active at this moment.
Press “Close”



Locate the icon “Add or Remove Programs” in the control panel.
Double-click on the icon.



Select “Monitored Rehab Systems Software” and press the “Remove” button.
The software is now definitely removed.

15. Shortcuts

F2	New Patient
F3	Edit Patient
F4	Select Patient
F5	Rehab
F6	Functional exercises
F7	Coordination test
F8	Isometric training
F10	Administrator settings
F11	Test history
Ctrl H	Extended history

MONITORED REHAB SYSTEMS

Monitored Rehab Systems B.V.
Claes Tillyweg 2 | 2031 CW Haarlem | The Netherlands
Phone: +31 (0)23 750 5444 | Fax: +31 (0)23 750 5445
www.mrsystems.nl | info@mrsystems.nl