SeeMe

REHABILITATION BY FUN

Functional description of therapeutic modules

Module: WARM UP

BRIEF DESCRIPTION:

The aims of the module are to familiarize the patient with the mechanism of motion detection in the SeeMe system and to develop in the patient's spatial awareness in the virtual environment. Therefore, it is recommended that a new patient use the module as the initial exercise. In the screen the patient sees the mirror image of her/his body. S/he is able to move the whole body or only a its particular limb, depending on the decision of the person leading the exercise.

RECOMMENDATIONS AND POSSIBILITIES:

The module is recommended to every patient newly introduced to the system and as a routine warm up before every exercise session. Especially recommended to the patients who, for whatever reason, cannot cope with exercises in the other modules.

PATIENT REQUIREMENTS:

The exercise in this module is very simple. The only thing required from the patient is the ability to observe how the elements of the screen react to the patient's body movements (basic visual and acoustic biofeedback).

TASKS:

To perform body/limb movements in any plane of motion according to the therapist's instructions and without using movement patterns, to touch objects in virtual reality at any pace and without time limits and to observe the effects of the patient's interaction with the elements of the screen.

DIFFICULTY LEVELS:

The Warm-up Module consists of 3 exercises which differ with respect to their of difficulty:

Level 1: The patient's aim is to touch the bubbles flying in the virtual space. The bubbles are randomly spread over the screen. Each bubble is set in motion by the patient's movements and makes a certain sound when collides with another bubble.

Level 2: The patient's aim is to touch 4 lamps placed in the 4 corners of the screen. Each lamp lights up when touched and goes out as soon as the touch is withdrawn. The exercise helps to understand hand movement in the frontal and sagittal planes (side movements and up-down movements, respectively)

Level 3: The patient's aim is to touch the cubes arranged in a semicircle. Each cube is assigned a certain number from 0 to 9 and the patient's task is to touch the cubes in the order from 0 to 9. This exercise requires the patient to focus in order to find the consecutive numbers.

DATA AND REPORTS:

In this module no data is saved for any further analysis. The module is meant only as a warm-up for the other exercises.

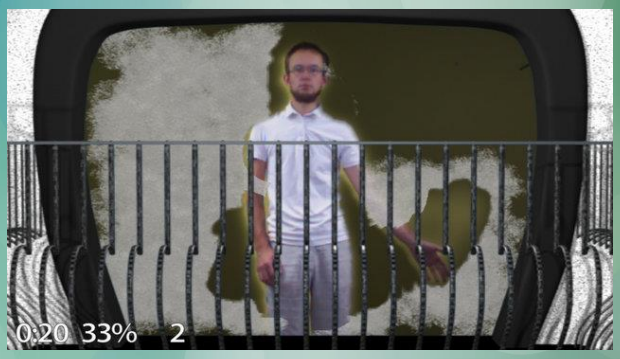
HINTS AND TIPS:

If the patient moves her/his hands towards the screen, and tries to touch the objects in the screen by touching the screen, the therapist should start the exercise from the level 2: place the patient in the middle of the screen so that s/he can reach the lamps in the corners of the screen by only moving hands up and down and to the sides (in the therapist's screen the therapist activates only the patient's palms). This procedure allows to eliminate the bad habit that may occur when a patient is introduced to the system.

Module: Cleaner

BRIEF DESCRIPTION:

In the game Cleaner the patient cleans a set of windows in virtual reality by wiping off the virtual dirt. The patient's aim is to clean as many windows as possible in the amount of time set by the therapist. The area that the patient is supposed to clean is under the strict control of the therapist. For instance, if the patient is unable to clean the left side of the window, the therapist can cover only the right side of the window with dirt and gradually enlarge the dirty area with time.



RECOMMENDATIONS AND POSSIBILITIES:

Recommended to patients with musculoskeletal dysfunctions of the upper limbs as well as to those with neurological disorders. The module can be used for increasing the range, quality and patients' awareness of movements performed with the upper limbs. The proposed exercise serves to strengthen muscles, stretch the arms up and sideways, and to exercise the injured upper limb with or without the support of the healthy one. During the exercises the patient sees the mirror image of her-/himself.

PATIENT REQUIREMENTS:

The exercise in this module is very intuitive and therefore do not require any special abilities of the patient. It is possible to perform the exercises in sitting or standing positions. The exercise is appropriate also for patients with upper limb amputations.

TASKS:

In the standard version of the exercise the patient is required to perform the movements analogous to the movements normally performed during actual window cleaning (left/right and up/down upper limb movements). However, the therapist can modify the parameters for the exercise in order to change the standard task. For instance, the patient's task may be to clean only the upper part instead of the whole window. The patient performs the exercise at her/his own rate and the system counts the number of windows cleaned in the set amount of time.

DIFFICULTY LEVELS:

The difficulty of the exercise depends on the arrangement of the exercise parameters. That is, the therapist can adjust the level of difficulty to the patient's individual needs by changing certain parameters. For instance, for patients with limited range of upper limb movement the therapist can make the window dirty only in the area which the patients is able to reach leaving clean these parts of the window that the patients cannot reach. Another option is to set the system to measure the percentage of the window cleanness, which allows to examine the patients' actual range of motion. The therapist can also choose the color of the dirty areas of the window and determine which part of the patient's body will be used for cleaning. The change of color is helpful when it is difficult for the patient to differentiate between the color of the dirty area and the color of the patient's clothes, or the color of the room. Due to the possibility of choosing the active body part for performing the exercise, the therapist can prevent the patient from using (only) the healthy hand for cleaning the window. In order to make the task more difficult and to increase the patient's body awareness the therapist can use the option of 'floating image'. This will produce the visual effect due to which the image of the window and the patient will appear to move as if located on a boat moved by waves.

DATA AND REPORTS:

The module helps to save data concerning the range of the upper limb movements and the level of effectiveness in accomplishing the exercise.

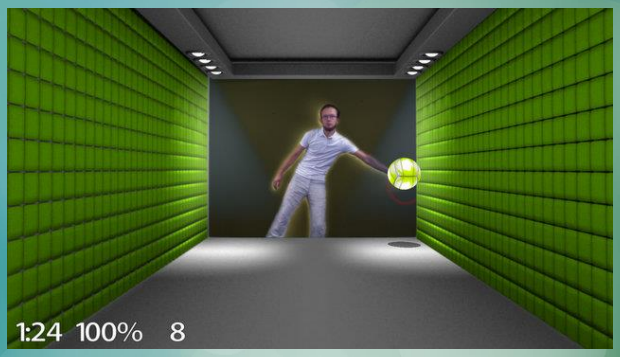
HINTS AND TIPS:

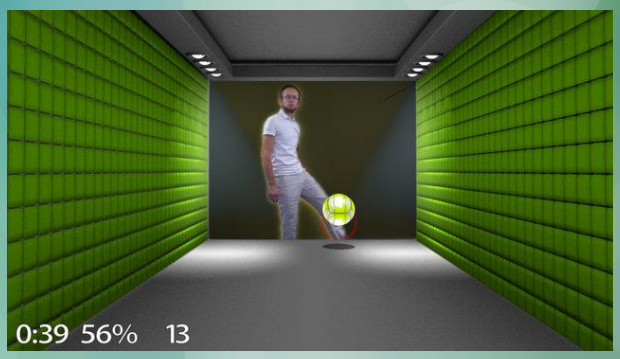
The recommendations mentioned in the section RECOMMENDATIIONS and POSSIBILITIES do not exhaust the possible uses of the module. The proposed exercise can be used also to train the patient's legs. For this, the focus of the camera has to be placed on the legs of the standing/sitting patient (by the use of the slider panel). In this version of the exercise the patient cleans the window with her/his feet. It is also possible to obtain interesting results when the patient uses her/his head to perform the exercise. However, in case of any variation from the standard version of exercise, the patient's results have to be evaluated by the person leading the training.

Module: Ball

BRIEF DESCRIPTION:

In the game Ball the patient has to deflect virtual balls flying towards her/him from various directions. The therapist can introduce negative stimuli into the game. The negative stimuli takes the form of virtual flying shoes which the patient has to dodge. The amount and velocity of the objects flying towards the patient are controlled by the therapist. During this exercise the patient sees the mirror image of her/himself in the screen.





RECOMMENDATIONS AND POSSIBILITIES:

Recommended to patients with musculoskeletal dysfunctions of upper and lower limbs, as well as to patients with neurological disorders. The objectives of the module are to increase the range of movements, improve visual-motor coordination, develop the ability of predicting trajectory of objects in motion in 3-dimensional space, strengthen certain muscles, and exercise the injured upper limb with or without the support of the healthy one. During the exercise the patient sees the mirror image of her-/himself in the screen. The exercise consists in reacting immediately to stimuli that appear in a certain rhythm. The patient performs movements in all planes of motion and receives immediate visual and acoustic feedback.

PATIENT REQUIREMENTS:

The patient can perform the exercise either sitting or standing. The exercise is very intuitive and do not require any special abilities of the patient. It can also be performed by patients with limb amputations.

TASKS:

The patient's task is to deflect the balls which fly towards her/him, like a volleyball player or goalkeeper. The image of the patient is placed in the center of the screen and the balls are thrown against the patient. Her/his task is to evaluate the distance of a ball flying toward her/him and to block it in the right moment. The patient also has to dodge the shoes that fly toward her/him. In order to do that the patient has to be able to differentiate between the balls and shoes and decide how to behave in relation to these objects.

DIFFICULTY LEVELS:

The difficulty of the exercise depends on the arrangement of the exercise parameters. The therapist can modify the target area and the velocity of the balls. The negative stimuli are also controlled by the therapist – s/he decides whether to introduce it and modifies its frequency of appearance. The therapist can also choose which parts of the patient's body will be used to deflect the balls. What is more, if the patient has problems with predicting the trajectory of the ball, it is possible to add special markers which show the patient the target area of the flying ball.

DATA AND REPORTS:

The module saves data concerning the level of correctness in performing the exercise, the level of the patient's physical activity during the exercise, and the range of the upper limb movements. The module also reports the number of appropriate and inappropriate responses to positive and negative stimuli.

HINTS AND TIPS:

When the patient cannot properly evaluate the distance between her/him and the ball, or the target of the ball, s/he uses her/his body to control as big part of the target area as possible. This makes the patient more engaged in the exercise and causes him/her to move a lot, which is good for her/him. The therapist may try to use this situation for the greater benefit of the patient.

Module: React

BRIEF DESCRIPTION:

In this game the patient's task is to touch the virtual furry balls in the amount of time set by the therapist. The balls appear at random on the patient's left and right. If the patient does not manage to touch a ball within the given time, the ball disappears and another ball appears in a random spot of the screen.

RECOMMENDATIONS AND POSSIBILITIES:

The exercise improves the patient's general spatial awareness and proprioception. The patient performs bilateral movements in response to the stimuli randomly appearing on her/his left or right. This exercise is recommended to patients with impaired concentration and inhibited response to stimuli. The module allows to practice and examine the patient's dynamic reactions to randomly appearing moving and motionless objects, as well as it examines and improves the speed and effectiveness of decisions made by the patient in in response to positive and negative stimuli. The module is also a very good gauge of reaction-time and target-reaching time. It may be used to measure the differences in reaction- and the target-reaching times achieved by the left and the right hand.

PATIENT REQUIREMENTS:

The patient can perform the exercise either sitting or standing. The exercise does not require any special abilities of the patient. The module is also appropriate for patients with limb amputations (in such cases it is not possible to compare reaction- and target-reaching times achieved by the right and left limbs; therefore the reports should be interpreted as concerning periodic changes in the patients' results). In order to fully benefit from the exercise the patient needs to have unlimited range of motion.

TASKS:

To reach towards the appearing objects as quickly as possible. To refrain from reaching (to restrain the movement) when the negative objects (balls with spines) appear.

DIFFICULTY LEVELS:

The module has 4 levels of difficulty. Basically, the levels differ in the complexity of arrangement of the appearing objects. Besides that, on every of the levels the therapist can modify the amount of time for which an object is visible in the screen, the frequency of appearance of new objects, the amount of objects appearing on the left and on the right of the patient (for instance, to relieve the injured limb or to intensify the training). The therapist can also determine which part of the patient's body is active during the exercise.

Level 1: Single furry balls (only positive stimuli) appear during the exercise. The patient's task is to spike all of the appearing balls. Level2: Single furry or spiny balls (positive and negative stimuli) appear during the exercise. The patient has to spike the furry balls and refrain from touching the spiny balls – wait until a spiny ball disappears from the screen. Level3: Unlike on the two previous levels, the balls that appear on this level are in motion and move vertically on the right and left side of the screen. Level 4: 4 static balls appear in the screen at a time. Each set of 4 balls contains 2 furry (positive stimuli) and 2 spiny balls (negative stimuli). The patient has to avoid the spiny balls and spike only the furry balls as quickly as possible.

DATA AND REPORTS:

The system saves data concerning and permits to analyze the level of correctness in performing the exercise, the level of the patient's activity during the exercise, reaction-times measured independently for each part of the body, as well as the quality of actions taken in response to negative stimuli.

HINTS AND TIPS:

The module offers various options of usage depending on the creativity of the therapist. For instance, it is possible to set the patient and the camera in the positions that allow to perform the exercise using feet instead of hands. Another option is to turn the patient sideways to the camera and to measure the times in which the patient reaches the targets located in front of and behind her/him.

Module: Raft

BRIEF DESCRIPTION:

The patient's task is to steer the raft with her/his body movements and to collect as many fish as possible while bypassing the barrels. The fish and the barrels swim at right angles to the direction of the raft and the patient can move the raft sideways. The game very realistically reproduces the behavior of swimming objects, such as the inertia of the raft and the effect of floating on the water.

RECOMMENDATIONS AND POSSIBILITIES:

To practice side-stepping, maintaining balance, side bends, divided attention, and simple decision-making. Also recommended for dynamic balance training.

PATIENT REQUIREMENTS:

The module is designed for patients who are able to maintain standing position (also supporting on crutches or a walker). Patients on wheelchairs can perform the exercise by balancing the body. The exercise does not require any additional abilities.

TASKS:

The patient catches or bypasses the objects that move toward her/him by steering the raft instead of directly using her/his active limbs. The exercise has 2 modes: "stepping mode" and "balance mode". In the stepping mode the camera follows the patient's position which is reflected by the position of the raft in the screen. For instance, in order to move the raft to the left the patient has to take a few steps to the left. In the balance mode the patient does not have to take her/his feet off the ground in order to move the raft. For instance, to move the raft to the left, the patient has to do a side bend to the left.

DIFFICULTY LEVELS:

Besides the options of adjusting the method of controlling the raft, the frequency of appearance of the objects in the game, as well as the speed of the raft and objects moving towards it, the game has 3 difficulty levels. On each of the levels the logic of the exercise is slightly different.

Level1: Only positive reactions – there are only fish in the water and the patient has to collect them.

Level2: Only negative reactions – there are only barrels in the water and the patient has to bypass them.

Level 3: Reactions to both types of stimuli – there are fish as well as barrels in the water and the patient's task is to collect as many fish as possible while avoiding the barrels.

DATA AND REPORTS:

The system saves data concerning the level of the patient's activity and her/his correct behaviors. Also, the system keeps separate statistics of positive and negative actions of the patient.

HINTS AND TIPS:

When there is a risk that the patient may fall over during the exercise, the therapist can stand behind the patient to protect her/him from falling. This will not disturb the work of the system in any way.

Module: Maze

BRIEF DESCRIPTION:

In the game Maze the patient's task is to push an object through a virtual maze. Specifically, the patient has to move a virtual cube towards the point of destination appointed somewhere in the maze. The complexity of the maze is controlled by the therapist.

RECOMMENDATIONS AND POSSIBILITIES:

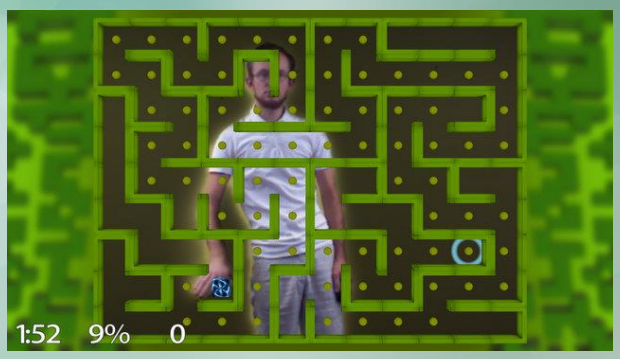
The module is designed to help the patient learn functionality and economy of movements. The exercise improves concentration, spatial vision and prediction, as well as the fitness of the upper limbs. The patient can perform the exercise either sitting or standing. The amount of time devoted to perform movements and the speed of movements are irrelevant for this type of exercise.

PATIENT REQUIREMENTS:

In order to perform this exercise the patient needs to have either full, or only slightly limited range of motion in the upper limbs. It is also required that the patient understand and is able to follow simple instruction.

TASKS:

The patient's tasks are to find in the maze the path leading from the starting point to the point of destination and to move the given object along this path. The patient moves the object by pushing it with her/his hands in the chosen direction. The tasks may be either very simple or very difficult, depending on the size of the maze. The path of movement, the starting position of the object, the point of destination, and the layout of the maze are randomly generated and therefore different every time the exercise is started. In this way, the patient cannot learn the correct path by hard but has to stay focused and keep thinking about the task.



DIFFICULTY LEVELS:

The difficulty of the maze depends on its size. There are 3 sizes to choose from: the small, medium, and the big maze.

In order to make the task easier for the patient, the module has a few options of giving hints. For instance, the therapist can check the box 'show the way' (in the therapist's panel) and put in the maze green pebbles showing the optimal path to the target point. Every time the patient pushes the cube in the right direction, the nearest pebble disappears and every time the patient pushes the cube in the wrong direction, there appears an additional pebble to show the optimal path from the cube to the target point.

DATA AND REPORTS:

The system saves data concerning the level of the patient's activity during the exercise and how this activity corresponds to the patient's results. The system also counts the number of the cube's movements at intervals of 10 seconds. These kinds of data allow to determine whether the patient understands the task, whether s/he is mentally involved in the task or performs the exercise without any reflection, and whether the task is difficult enough.

HINTS AND TIPS:

If the patient is standing too close to the screen so that s/he reaches beyond it with her/his hand, the therapist may move the 'Kinect-zoom' slider to the lower value instead of moving the patient away from the screen.

Module: Space

BRIEF DESCRIPTION:

The game Space consists in defending a space ship. The patient sees the mirror image of her-/himself located on the ship. The ship is equipped in laser cannons located on the edge of the ship. The patient fires the cannon by touching it. The laser ray from a cannon is fired in the direction to which the cannon points. The patient uses the cannons to neutralize the objects flying towards the patient's ship.

RECOMMENDATIONS AND POSSIBILITIES:

The exercise is mainly recommended for increasing the range of movement of the stretched limbs set in stretched position. The module also develops divided attention and skills of observation. The exercise requires performing certain movements in a set amount of time. While looking at the approaching objects, the patient has to judge which of the objects may reach her/his ship first and eliminate these objects as early as possible. The module can be used in the rehabilitation of cognitive-behavioral functions (the treatment of attention deficit disorder, perception disorders, memory impairment, abnormal thinking, and impaired spatial skills.) Also, the module is recommended as the gauge of the maximum angle in the patient's range of motion.

PATIENT REQUIREMENTS:

The module does not require any special abilities. It also is not required that the patient be fluent in memorizing and identifying the objects which threaten her/his ship. The diverse scoring motivates the patient to focus her/his attention and exercise her/his memory. The patient can perform the exercise either sitting or standing.

TASKS:

The patient's task is to score as many points as possible by shooting down the flying objects. The patient can encounter 3 kinds of objects. For shooting each object of the first kind the patient scores 1 point, and for each object of the second and third kind, the patient scores 5 and 10 points, respectively. What is more, hitting an object of the third kind (worth 10 points) eliminates all the other enemy objects that are in the screen at the given moment. In such case the patient scores the points also for the automatically eliminated objects. Therefore, the most efficient way of scoring points consists in remembering which of the objects are worth more points and always aiming the most valuable object visible in the screen at a given moment. If the patient does not manage to shoot an object down, it hits the patient's ship. The only consequence of such collision is the unpleasant noise.

DIFFICULTY LEVELS:

The module is not divided into actual difficulty levels, but the difficulty is modified by the dynamics of the game and the range of directions from which come the enemy objects. The therapist can change the speed of the flying enemy objects and the number in which they simultaneously appear in the screen. The therapist can also choose which of the patient's body parts are active during the exercise and adjust the zoom angle.

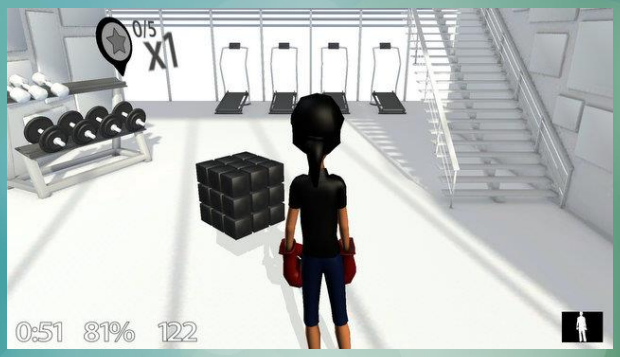
DATA AND REPORTS:

The system saves data concerning the level of the patient's activity during the exercise, the level of correctness in performing the exercise, and the ranges of movement in the patient's limbs on the left and right sides of the body.

HINTS AND TIPS:

For training the lower limbs (for instance, if the patient is supposed to support the body on one leg and try to maintain balance during the exercise), mark the two lower segments of the wheel in the active area of the game. This will help to avoid the situation where the patient shoots the lower part of the screen when standing still.

Module: Gym



BRIEF DESCRIPTION:

The game Gym places the patient in a virtual gym. Unlike in the previous modules, the patient does not see the mirror image of her-/himself in the screen, but a 3-dimensional virtual person designed to reflect the patient's movements and gestures. The patient sees the virtual person from behind, so the image presents non-mirror reflection of the patient's movements. The patient's aim in this module is to hit, kick, or box the cubes that appear in the screen. The arrangement and the speed with which the cubes appear and disappear, as well as the dynamics of the whole game are subject to modification. The module accurately records and demonstrates the difference in the speed of movement between the left and right side of the body. The exercise does not require that the patient be set in a certain position with respect to the camera – the system adjusts to the patient's position and places the targets symmetrically with respect to this position.

RECOMMENDATIONS AND POSSIBILITIES:

The module serves to increase and examine the speed of reaction time, as well as to practice the bilateral movements during which the upper and lower limbs cross the centerline of the body. Additionally, the module involves making decisions with respect to negative stimuli and gives opportunity to exercise rhythmicity and to perform movements in a limited amount of time.

PATIENT REQUIREMENTS:

The exercise parameters are subject to modification, which eliminates any limitations with respect to the patients' needs.

TASKS:

The main task is to score points for breaking the cubes which appear in three colors: green, red, and grey. The green cubes are meant for hitting and by breaking them the patient scores some points. The red cubes are not meant for hitting, that is, the patient should not hit them. The gray cubes can be hit by the patient but by hitting them the patient does not score any points – a grey cube can be treated as a green cube which has expired. Besides scoring the points for hitting the green cubes, the patient is rewarded for her/his appropriate reactions to all types of cubes. For reacting correctly several times in a row the points that the patient scores from the given moment are multiplied until the patient hits a red or grey cube. Then the multiplying factor is again reduced to 1.

The cubes can be arranged in various positions so that the patient can hit them by moving to the side as well as to the front/back. The therapist can modify the exercise also with respect to the part of the body used by the patient and, for instance, make the patient use only one hand, legs instead of hands, or all limbs together to hit the cubes.

DIFFICULTY LEVELS:

The game has 3 levels of dynamics to choose from, which affects the speed of the objects' appearing and disappearing from the screen. It is also possible to modify the distance between the objects and the patient, as well as to adjust the area in which the objects appear either to the hands or to the legs of the patient. With progress, the therapist should use obstacles (the red cubes) and the advanced system of counting points in the patient's training.

DATA AND REPORTS:

The system saves data concerning the level of correctness, activity, and the speed of both the performed movements and incorrect reactions to negative stimuli.

HINTS AND TIPS:

When the activities in the exercise are not limited to movements in the lateral plane, the therapist can make the exercise easier by suspending the patient's hands on elastic cord hanging from the ceiling, or harder by asking the patient to perform the exercise using weights or dumb-bells.

Module: Sorter

BRIEF DESCRIPTION:

The module designed for training the range of motion, coordination, and maintaining balance in the upper limbs. In the screen the patient sees a 3D virtual person designed to reflect the patient's movements. The virtual person is facing the patient, so during the exercise the patient sees the mirror-image reflection of her/his movements performed by the virtual person. The aim of the game is to sort the balls that fall from above the patient's head by putting them into right goals. The color of the ball corresponds to the color of the goal, so that, for instance, a blue ball should go to the blue goal, etc.

RECOMMENDATIONS AND POSSIBILITIES:

The module is recommended to patients with movement coordination impairments and limited range of motion in the upper limbs. The exercise also improves balance, perceptiveness and concentration.

PATIENT REQUIREMENTS:

It is required that the patient be able to differentiate colors and to keep her/his hands at least minimally lifted. If the patient needs any physical support to perform the exercise, her/his hands may be suspended on the elastic cord hanging from the ceiling.

TASKS:

The patient's task is to turn a falling ball to the right goal. There are 4 colors of balls and goals and the patient should focus on putting a ball of a given color into a goal of the same color. The patient turns the balls using a virtual bat which s/he holds two-handedly: one end of the bat in the right, and the other end in the left hand. A ball can either be turned just as it is falling, or can be stopped on the bat and then rolled along the bat into the chosen direction.

DIFFICULTY LEVELS:

The therapist can reduce the number of goals in the game from 4 to 2. The 2-goals-variant of the game does not require any complex movements: the patient has to only set the hands in an appropriate position and maintain the bat at the appropriate angle. The 4-goals-variant of the game, on the other hand, requires the patient to move dynamically in order to flick the balls up and direct them to the upper goals. The therapist can also modify the gravity parameter and in this way control the speed with which the balls fall and the ease with which a ball bounces off the bat.

DATA AND REPORTS:

The system monitors the effectiveness of the patient's actions, as well as the level of activity and the range of movement in the right upper limb at regular intervals of 10 seconds.

HINTS AND TIPS:

If the patient manages to sort the balls in the 2-goals-variant of the game but cannot cope with the 4-goals-variant of the game, the therapist should reduce the gravity parameter in the 4-goals-variant of the game. This modification will decrease the speed with which the balls fall, which in turn will make hitting the ball easier for the patient.

Module: Oarsman

BRIEF DESCRIPTION:

The game Oarsman consists in establishing/breaking time records in river canoeing. The game simulates the behavior of a real kayak on the water. The desire of breaking a time record motivates the patient to compete with her-/himself as well as with other patients. The patient's movements affect the velocity of the kayak and are reflected in the screen by the movements of the 3D virtual canoeist.

RECOMMENDATIONS AND POSSIBILITIES:

The module designed for practicing the movements involved in the action of standing up, as well as for weight training. When performed with increased intensity, the exercise puts strain on muscles. The exercise can be set in one of the three modes: hand-movement (steering with hands), squat-movement (steering by performing squats), or standing-up mode (designed for patients in wheelchairs).

PATIENT REQUIREMENTS:

The module does not require any special abilities. The 3 independent modes make the exercise very flexible with respect to the patient's needs. When performing the exercise in the squat-movement mode, the patient can be suspended in the air (by, for instance, being tied to the cords hanging from the ceiling) or supported on the walker.

TASKS:

The objective of the exercise is to travel a certain distance in the kayak. The user steers the kayak by performing some kind of regular movements, depending on the chosen mode. The patient can control the velocity of the kayak, but not its direction, as it moves only forward. The exercise should be performed several times. and patient's scores should be compared to motivate her/him to break her/his own record.

In the hand-movement mode the patient has to move her/his hands symmetrically forward and backward. The range of these movements as well as their speed translates into the velocity of the kayak.

In the squat-movement mode the patient has to squat and get up. The depth and speed of performing the squats translates into the velocity of the kayak.

The standing-up mode is similar to the squat-movement mode. However, this mode is designed for the patients who cannot stand/squat on their own. The mode includes getting up in the wheelchair but allows the patient to support her-/himself by holding the wheelchair handle. This mode also requires less demanding movements.

DIFFICULTY LEVELS:

The therapist can modify the level of the patient's effort by changing the length of the distance, or by setting a certain 'rowing difficulty'. This second modification can, for instance, make the kayak swim faster with less effort put into rowing. With such facilitations the game is accessible to the patients who are not capable of performing squats or move their arms with the full range of motion.

DATA AND REPORTS:

The system saves data concerning the level of correctness and activity, as well as the depth and angular differences of the performed movements.

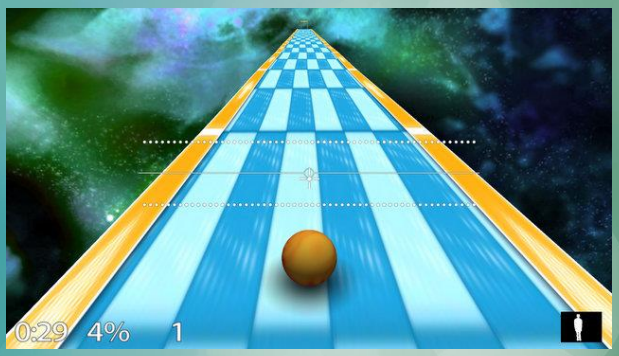
HINTS AND TIPS:

The therapist can add a training note at any time during the training or after it. The note may be required, for instance, when the conditions of the exercise change, the patient's comfort worsens during the exercise, or when the therapist simply wants to note the information that will be useful in further training. The note will be automatically updated with the date, hour and the therapist's name, and visible as a record in the training journal.

Module: Slide

BRIEF DESCRIPTION:

The patient's task is to steer the ball with her/his body movements. Balancing the body of the patient affects both the speed and direction of the ball rolling. If the ball falls out of the prepared track, after a while it returns to the track, and the patient continues to exercise from the same place.

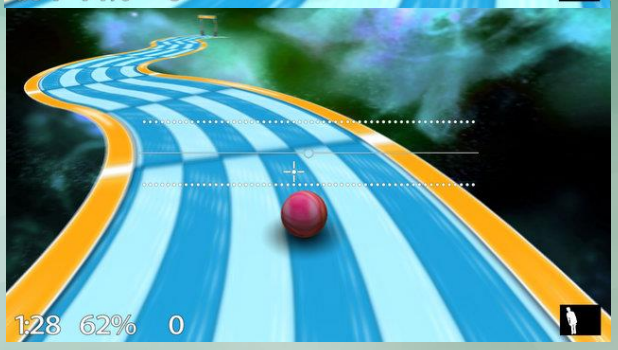


RECOMMENDATIONS AND POSSIBILITIES:

The module is used to practice balance, tilting torso and maintain a balance in all directions. Depending on the design of the track may require the patient to maintain a stable position, or to adjust dynamically to the curves.

PATIENT REQUIREMENTS:

The module does not impose specific requirements in relation to the patient. It can also be used in patients with very severe disabilities. With an intuitive sliders in the panel can set the parameters so that the ball can react to the slightest movements of the torso. The module is also dedicated to patients in wheelchairs.



TASKS:

The purpose of this exercise is to drive the ball through the generated track. When the ball falls, it returns to the track and exercise continues from the point of decline. Balancing the body in the front and rear axis affects the speed of rolling and the movements of the torso in the right and left axis affects the direction. Range of movements required can be parameterized. The track has a limited and fixed length. During the exercise system tracks the time patient needs to finish the track. The patient drives the track many times and tries to get the shortest time possible. The module also develops the ability to predict the situation on the track and the ability of making decisions about braking and acceleration.

DIFFICULTY LEVELS:

The therapist can parameterize the difficulty of the track. It can be generated as a random track with ease or hard curves, or as a way sine of a given period and amplitude. The therapist can determine also the sensitivity and range of motion of the body, in which the patient should work as well as the maximal speed of the ball.

DATA AND REPORTS:

The system collects information about the accuracy, activity, deviations from the optimal tilt in the front / rear axis, and the deviations from the optimal tilt in the left / right axis.

HINTS AND TIPS:

The "Sight" visible on the screen shows the current setting values for the patient. Placing a cross with a circle is possible when the patient leans accurately to the angles given by the therapist. In that position, the maximum speed is achieved.

Nazwa modułu: Walker

BRIEF DESCRIPTION:

Walking and running on the platform placed in the clouds. Patient's steps on the spot are reflected on the screen by moving the little character. Speed (frequency) of the steps affects the character's moving speed.

RECOMMENDATIONS AND POSSIBILITIES:

The module is used to train walking, transferring body weight from foot to foot, alternating lifting the feet, and (in the most difficult option) for practicing jumps.

PATIENT REQUIREMENTS:

The module requires a standing position and is not intended to be used in a sitting position.

TASKS:

The aim of the game is to reach the finish line in the shortest time. Along the way, depending on the route setting, the patient may have to overcome various obstacles.

DIFFICULTY LEVELS:

There are 9 tracks prepared. The difficulty of the exercise is determined by selecting the difficulty of the track. In the easiest option, the patient has to overcome the straight track without any obstacles. In more difficult options there are obstacles that require the patient to be more careful. The more difficult tracks are composed of elements such as:

Moving platforms – patient needs to wait till the platform comes and step onto it when it's close.

Pendulums - patient must observe the pendulum and to assess whether it has time to go before it hits, or is it better to wait and go when it goes by.

Gaps - an empty element in the track. It requires to approach the edge of the track and to jump. Patient needs to jump on the spot and needs to take both feet off the ground. The required jump height is about 15 cm.

Rolling obstacles - an obstacle in the form of a cylinder. Patient must observe the obstacle and determine the right moment to jump over it.

DATA AND REPORTS:

The system collects data about the accuracy, activity, and the number of steps performed in subsequent time intervals.

HINTS AND TIPS:

If during exercise the module seems to detect the movements of the patient incorrectly, pay attention to the small screen-in the bottom right corner of the screen. You should see there entire patient's body (white) on the black background. If there are red stripes visible it means the patient can not be seen by the system.

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