# TIMTRAINER MANUAL


NeuroGym®
TECHNOLOGIES

1644 Bank Street, Suite 103
Ottawa, Ontario
K1V 7Y6

Tel: 613-523-4148
Fax: 613-523-9848

# Table of Contents

# Introduction

The TIMTRAINER is a training tool that combines computer games with motion-sensing biofeedback. It enables training to be done actively while providing real-time feedback. The computer game environment increases the effectiveness of training by creating greater motivation to perform desired movements, and providing speed sensitive and spatially oriented environmental goals.

Biofeedback and computer games enhance motor learning. Biofeedback offers direct knowledge relating to the quality of the movement (knowledge of performance or KP) while computer games provide knowledge of the movement's success relating to environmental goals (knowledge of results or KR). Both KP and KR are used by the nervous system to create, update and refine motor programs that underlie skilled movement.

The TIMTRAINER uses a webcam based motion capture system that detects movement without the need for wires or sensors attached to the performer. The motion recorded by the camera can be scaled to allow even very small movements to effectively control the computer games. The scaling feature also provides a means of progression, where larger movements can be encouraged as motor skills improve.

The TIMTRAINER provides an effective training environment for a variety of training goals, including:

- Increasing the active range of motion of a joint
- Improving coordination of movements spanning multiple joints, including oppositional movements of the fingers
- Improving static balance and postural control
- Improving dynamic balance and protective reactions

# Overview of Equipment

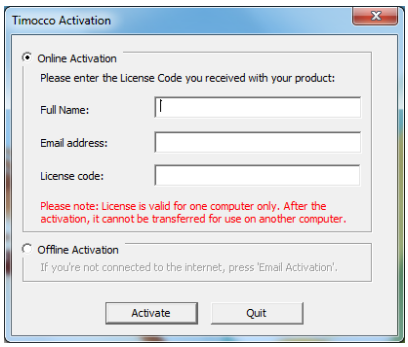
## Equipment Included with TIMTRAINER Software

- USB external Camera
- Sensor balls (red, blue and green)
- Finger sensors (red, blue and green)
- Manual

## System Requirements

- Dual core CPU, processing speed of at least 2GHz with 2GB RAM
- Camera with a resolution of at least 640x480

## Installation and Set-up

| Task | Instructions |
|---|---|
| **Software Installation** | **1** Make sure that you are logged in as an administrator on the machine.<br>**2** Go to the Timocco website www.Timocco.org/swtrainer/ in order to download the TIMTRAINER software.<br>**3** Follow the step-by-step instructions in the TIMTRAINER Installation SetupWizard.<br>  |
| **Software Licensing** | **First time users will have to go through the following licensing phase:**<br>**1** The TIMTRAINER needs to be activated by your product license code. You should receive this code from a sales representative by Email, or on a note inside the package itself.<br>**2** Once the software installation is finished a window will open, asking you to enter the product license code, as well as your name and Email address.<br>**3** The code should be copied with the dashes (i.e. ABCDEF-1234-GHI).<br>  <br>**The activation process only needs to be done once.**<br>**The License code will only activate one computer** |

## TIMTRAINER Main Screen

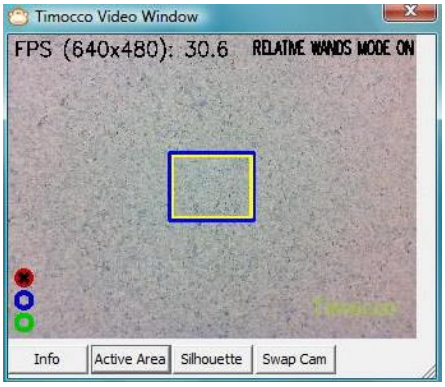
From the main screen, any of the three gaming environments (TIMPONG, TIMPINCH, and TIMSKI) can be chosen by left-clicking the mouse.


In all of the gaming environments three common buttons are available on the right hand side of the screen. The top-most button is the close button. This button will close the TIMTRAINER software. Below the close button is the Home button. The Home button returns the user to the TIMTRAINER main screen where another TIMTRAINER game can be opened if desired. Near the bottom-right side of the screen is a maximize/minimize button.

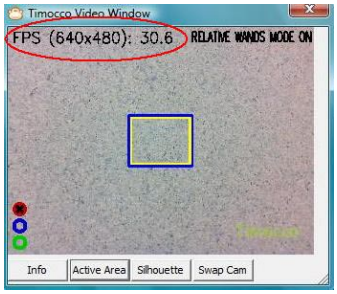
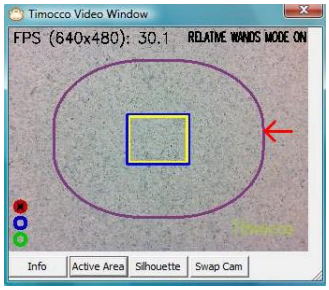
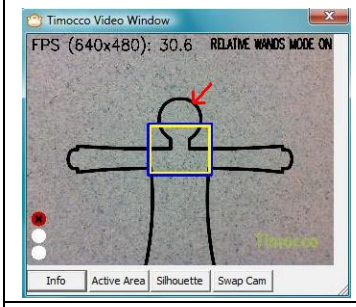
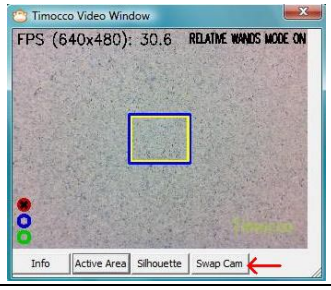
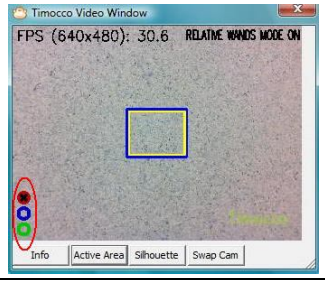
**To return to the Main Screen from any of the three gaming environments, click on the Home Button.**

## Camera Window

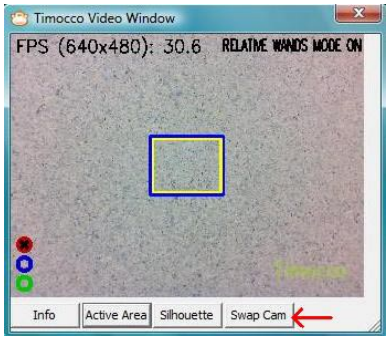
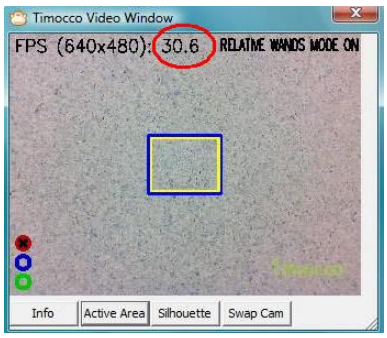
The camera window can be opened in any of the three TIMTRAINER games. The camera view provides a direct view from the camera and shows how the sensor ball(s) are being tracked by the camera.

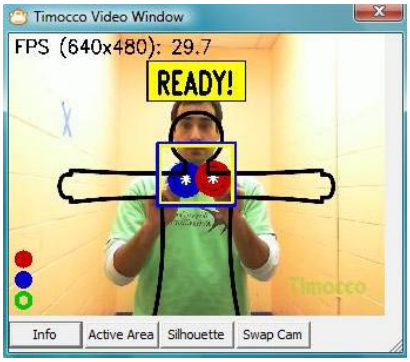
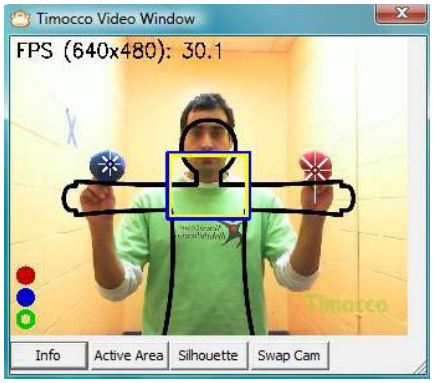



The camera view is also overlaid with information about the current settings, including:

| Option | Description |
|---|---|
| **Info**<br>  | Indicates the brightness and clarity of the picture. In order for the sensor ball to be tracked properly, the FPS rate must be 25 or higher. Move the camera to better lighting if the FPS rate is below 25. The number in brackets after 'FPS' represents the resolution of the camera. In this example, the resolution is 640x480. |
| **Active Area**<br>  | ***This function is only active in the TIMPONG game.*** The Active area is the purple circle present within the camera view. During game play, the sensor ball(s) should travel across the entire active area (either horizontally or vertically) in order to control the movement of the paddle on the game screen. The active area is adjusted using the scale slider. |
| **Silhouette**<br>  | Shows an outline of a head, arms and a torso. This function is useful in order to align the camera properly, especially if the player is facing the camera and his/her head and shoulders will be active in game play. |
| **Swap Cam**<br>  | Allows the user to switch from one camera to another if more than one camera is available to the computer. |
| **Active Colour**<br>  | Indicates which ball colour(s) are active in controlling the paddle(s) on the game screen. A colour is shown as active (solid circle, often with an x in the middle) or inactive (open circle). |

## TIMTRAINER Set-up

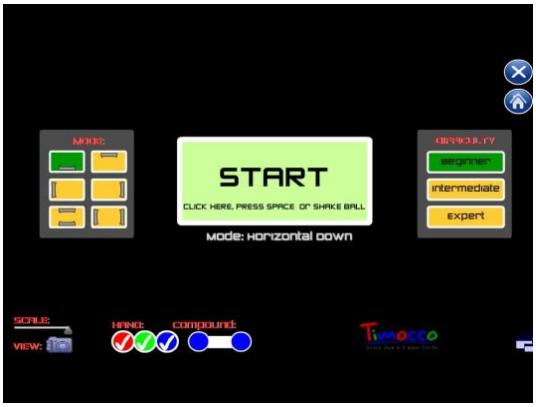
| Task | Instructions |
|---|---|
| **Sensor Ball Choice and Placement** | **1** Decide on the colour of ball(s) to be used. Remember to choose colour(s) that are NOT similar to those on the player's clothing or within the background of the camera's field of view.<br><br>**2** Attach the sensor ball(s) to the body part(s) or object(s) you wish to track during the desired movement. Try to locate the ball(s) in a place where its movement will be greatest (ie. For movements of the limbs, locate the coloured ball as far distally as possible in order to maximize its displacement). |
| **Camera Setup and Placement** | **1** If you are using an external camera, make sure that the USB cable is plugged in.<br><br>**2** If your computer includes a built-in camera, you can move between this camera and the external one you have, by pressing the "Swap Cam" button located at the bottom of the video window.<br>  <br>**3** Make sure that the picture is bright and clear (FPS rate must be 25 and above). If the frame rate is lower than 25 FPS, more room lighting is required. Click on the Info button to see the FPS rate if it is not already visible at the top of the camera view screen.<br>  <br>**4** Locate the optimal **camera height** for the particular training situation. The height of the camera will vary depending on where the sensor ball is located. For example, a low camera height is required when the sensor ball is placed on the player's foot. |

| | |
|---|---|
| | **5** Find the **optimal distance of the camera** from the sensor ball(s). The camera distance will vary depending on the size of the movement is that is being performed. For example, while training a pinch movement in the TIMPINCH game, the camera should be very close to the finger sensors (within 10-30cm). While training stepping or weight shift motions, the camera should be placed 1-2m away from the sensor ball(s).<br><br>**6** Double check that the proper camera height and distance have been found. Open the camera view in the TIMTRAINER software. Make sure that the full movement that is being trained can be seen within the camera's field of view. |
| **Calibration** | **1** Place the sensor ball(s) inside the centre box of the camera's field of view. The tracker will identify the colours and a "READY" marker will appear at the top of the camera screen.<br><br>  <br><br><br>**2** Once the sensor ball(s) are detected by the camera, a star-like marker will appear over top of the ball. This marker will follow the sensor as it moves around the camera's field of view and indicates that the sensor is being tracked by the camera.<br><br>  <br><br><br>**3** Only sensor balls that are being tracked by the camera are able to be used in order to play a TIMTRAINER game. |

| | |
|---|---|
| **Other Instructions** | **1** Select specific game options in order to play the game as desired. Please see the specific TIMTRAINER Game Options section for more detailed instructions.<br><br>**2** If using the TIMPONG game, the sensor ball colour must be selected before proceeding to the calibration process. After calibrating the sensor ball(s), the size of the 'Active Area' that is used to control the game paddle can be increased/decreased. Please see the TIMPONG section for detailed set-up instructions.<br><br>**3** If any problems arise while calibrating the sensor ball(s) in the TIMPINCH or TIMSKI games then:<br>• Click on the home button.<br>• Open the TIMPONG game and make sure the camera view is open.<br>• Select the appropriate sensor ball colour(s) and re-calibrate.<br>• Re-open the TIMPINCH or TIMSKI game and the sensor ball(s) should now be tracked by the camera. |

## TIMPONG Game

In the TIMPONG gaming environment the sensor ball(s) control a paddle(s) in a virtual tennis game. The movement of the game paddle(s) is controlled by the movement of the coloured ball(s) registered by the camera. The object of the game is to move the paddle to intercept the game ball as it moves in random trajectories across the game screen. Hitting the ball increases the game score. The ball can be missed three times before the game ends ('GAME OVER'). TIMPONG can be played with one or two paddles.




### Camera View

To view the camera window if it is not already open, click on the camera button on the bottom left side of the TIMPONG game screen.

**Proper sensor ball placement, camera placement and calibration are important for camera tracking.**

**Please see the Camera Window and TIMTRAINER Setup sections of the manual for more detailed instructions.**

The important options in the camera view for the TIMPONG Game include:

> ***Active Colour(s)*** – In the TIMPONG game, the active colour is chosen by clicking on the appropriately coloured circle in the 'Hand' options at the bottom of the TIMPONG game screen. Please note that the compound option is available only for future versions of the TIMTRAINER software.
>
> ***Active area*** – the Active area is the purple circle present within the camera view. During game play, the sensor ball(s) should travel across the entire active area (either horizontally or vertically) in order to control the movement of the paddle on the game screen. The active area is adjusted using the scale slider.

### Scale Slider

The Scale slider is located at the bottom of the TIMPONG game screen and is used to set the Active Area in the camera view. The Active Area in the camera view represents the distance that the sensor ball needs to move in order to move the paddle across the screen. Within the Active Area, movement of the sensor ball will produce proportional movement of the paddle in the game screen. To adjust the size of the Active Area, left click on the slider and drag – the Active Area in the camera view will expand or contract as the slider is moved.

> ***Setting the Scale:***
> When the coloured ball has been attached to the desired body part, observe the movement in the camera view screen and adjust the scale slider so that the edges of the active area match the range of movement.

## TIMPONG Game Options

### Mode Selection

Mode selection allows the movement of the paddle in the game screen to be adjusted. For single player games, the paddle can be located on the left or right side of the screen with vertical movement, or on the top or bottom of the screen with horizontal movement. Two player options using vertical movements (paddles on the left and right sides of the screen) or horizontal movements (paddles on the top and bottom of the screen) are also available.

> NOTE: If vertical movement of the paddle(s) is selected, the camera's active area will only register vertical movements of the sensor ball(s). If horizontal movement of the paddle(s) is selected, the camera's active area will only register horizontal movements of the sensor ball(s).

### Difficulty

TIMPONG games can be set to one of three levels of difficulty; beginner, intermediate and advanced. In the beginner level, the game ball will begin to move at a very slow speed, allowing more time for movement of the paddle. Each time the ball is successfully hit with the paddle, the

ball's speed will increase slightly until a miss occurs. After each miss, the ball will begin to move again at a slow speed. In the intermediate and advanced levels, the game ball will begin to move with a higher initial speed, requiring faster movements of the paddle.

> NOTE: Difficulty can only be adjusted at the beginning of a game. If the initial ball speed is too fast or too slow, exit the game and begin a new game with a different level of difficulty.

## TIMSKI Game

In the TIMSKI gaming environment, the sensor ball controls a pair of skis that are located at the bottom of the TIMSKI game screen. The object of the game is to navigate around flags within a downhill slalom course. Points are rewarded when a flag is successfully negotiated. Points are taken away if the skier hits a tree or a bush. The speed of descent can also be controlled with a second sensor ball placed to the right of the first.


### TIMSKI Set-up Screen

The first screen available after opening the TIMSKI game is a set-up screen. Within the set-up screen are several different set-up sections/boxes. The Difficulty box allows the choice between easy, medium and hard levels. The Custom box allows several game options to be altered.

## Difficulty

TIMSKI can be set to one of three levels of difficulty; Easy, Medium and Hard. Each level of difficulty has pre-set Custom options.

**For quick set-up of TIMSKI, choose one of the levels of difficulty and DO NOT change any of the custom options.**

## Custom Box

Click on the Custom button in order to expand the Custom options view.

The Custom box includes 7 game options that can be altered with the use of a slider. It also includes a drop-down menu which allows the choice between a pre-set vertical velocity and a variable vertical velocity. The variable vertical velocity is controlled by a second sensor ball.

### *Slider Game Options*

The sliders are set such that the lowest settings are at the left most point and increase in a graduated manner as the slider is moved to the right. To adjust the slider, left click on the slider and drag.

| | |
|---|---|
| Speed | Controls the vertical speed that the skier descends the hill. This option changes to 'Vertical motion scale' when 'Set speed right ball (steady)' is chosen. |
| Amount of trees | Controls the number of trees present on the course. |
| Amount of flags | Controls the number of flags present on the course. |
| Game duration | Controls the length of the game, in seconds. |
| Flag width | This option is present from an earlier version of the software and is no longer an active game option. |
| Flag distribution | Controls the frequency of the flags as they appear on the course. |
| Horizontal motion scale | Controls the left/right speed of the skier. A high setting is recommended for the horizontal motion scale in order to be able to navigate between the flags more easily. This speed can also be changed with the 'Horizontal' slider present in the game screen. |

### *Ski Speed Drop-Down Menu*

The drop-down menu allows you to choose between (1) a pre-set vertical speed and (2) setting a second sensor ball for variable vertical speed control.

*Pre-set Speed*

In pre-set ski mode, the skier will move down the hill at a set speed. This speed can be changed with the 'Speed' slider at the top of the Custom box. Please note that the pre-set vertical speed cannot be changed when outside of the set-up screen.

In the pre-set speed option, it is possible to choose your sensor colour before entering the game and camera screen. Simply click on the colour of the sensor ball you wish to choose. Please note, however, that the camera should automatically detect the sensor ball when entering the game screen menu and as such, it is not necessary to choose the sensor colour in the set-up screen. As well, the compound sensor option is present only for future versions of the software and is not functional at this point in time.

*Variable Vertical Speed - Set Speed Right Ball (Steady) Option*

The Set Speed Right Ball (Steady) option enables a second sensor ball to be selected that will be used to control the speed by which the skier descends the hill. This setting is useful when movement in two planes of motion is desired. For example, a lateral weight shift can be used for the horizontal motion of the skier and a squat motion can be used for the vertical speed of the skier as he/she descends the hill.

In order for the vertical speed sensor ball to be detected properly by the camera, it must be placed to the right side of the sensor ball that is being used to control the horizontal motion. The vertical speed sensor ball should also be located in an area where the entire up/down motion of the sensor ball will be detected by the camera. Once the second sensor ball is placed correctly on the player, it should automatically be detected by the camera.

Once the game screen is opened, the vertical motion of the speed sensor ball will be displayed in the acceleration bar that appears on the right-hand side of the screen. A ‘ball’ inside the acceleration bar is used to represent the movement of the speed sensor ball as detected by the camera. Coloured boxes will fill from bottom-to-top as the vertical height of the sensor ball increases. The default setting allows for acceleration of the skier as the ball moves upward (the coloured boxes fill) and deceleration as the ball moves downwards (the coloured boxes empty). If the opposite acceleration/deceleration is required, then select the ‘Acceleration down’ box in the Custom settings.

The ‘Speed’ slider will change to ‘Vertical Motion Scale’ once the Set Speed Right Ball (Steady) option has been selected. The ‘Vertical Motion Scale’ will change the rate of acceleration of the skier as they speed up or slow down. This Scale Slider, labeled ‘Vertical’ will also be present in the game screen and can be changed at any time during the game.

## Camera Calibration Screen

Once the ‘Proceed to Game’ button has been pressed in the Set-up screen, an intermediate camera calibration screen will be displayed with a large camera view and instructions on how to calibrate the sensor balls with the camera. The sensor ball(s) can be calibrated at this point in time with the large camera view or later in the game screen view. If the calibration is to be done at a later time, click on the Skip button and the TIMSKI game screen will open.

## TIMSKI Game Screen

### Camera View

To view the camera window if it is not already open, click on the camera button on the left-hand side of the TIMSKI game screen.

**Proper sensor ball placement, camera placement and calibration are important for camera tracking.**

**Please see the Camera Window and TIMTRAINER Setup sections of the manual for more detailed instructions.**

### Game Options and Display

| | |
|---|---|
| Start box | Located in the middle of the screen when the Game screen is first opened. Left click the mouse within this box to start a game. |
| End Button | Allows the user to stop the game before the time has reached zero. |
| Back to Setting Button | Opens the Set-up screen. |
| Pause Button | Allows the game to be stopped without re-setting the time and score. |
| Re-Calibration Button | Only present when Set Speed Right Ball (Steady) is selected in the Custom options. This button opens the intermediate calibration screen in order to allow the sensor balls to be re-calibrated and tracked by the camera if a problem with the initial calibration has occurred. |
| Show/Hide Camera Button | Opens or closes the camera view window. |
| Horizontal slider | Allows the horizontal speed to be changed by clicking and dragging the slider left/right. Moving the slider to the right will increase the horizontal speed. |
| Vertical slider | Only present when Set Speed Right Ball (Steady) is selected in the Custom options. The vertical speed can be changed by clicking and dragging the slider left/right. Move the slider to the right to increase the vertical speed. |
| Time | Displays the time left in the game. The full time will be displayed in seconds before the game has been started. Once the game has been started, the time will count down to zero at which point a 'Game Over' window will open and will display the final game statistics and score. |
| Score | Displays a real-time score. 10 points are rewarded every time the skier successfully navigates around a flag and 2 points are taken away for each tree or bush that is hit. |

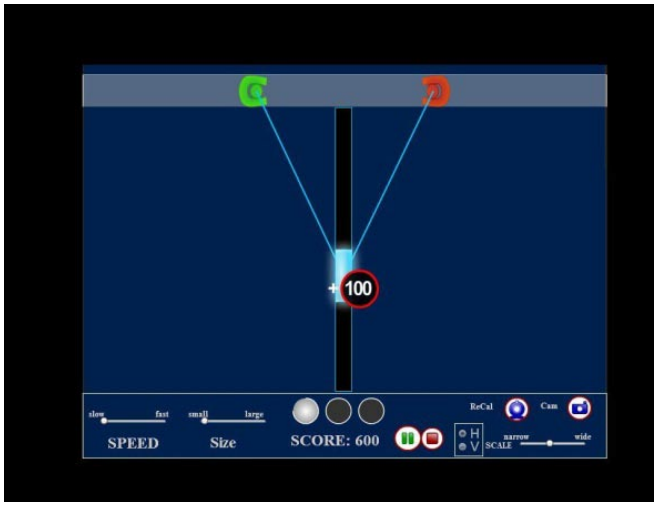
| | |
|---|---|
| Acceleration bar | Located on the right-hand side of the screen and is active only when Set Speed Right Ball (Steady) is selected in the Custom Options. A 'ball' is present inside the bar that represents the height of the sensor ball as detected by the camera. Each box within the acceleration bar will fill with colour when the sensor ball moves from a lower to a higher height. The skier will accelerate as the ball moves upward and the boxes fill and decelerate as the ball moves down and the boxes empty. Please note that the 'Acceleration down' box can be selected in Custom options if the opposite acceleration/deceleration is desired. |

## TIMPINCH Game

TIMPINCH is designed specifically for training small movements, such as the pinch grip, between two fingers. Small finger sensors are used for this game and must be placed on the end of two fingers.

In the game screen, the two finger sensors are represented by two game pieces and each game piece is attached to a virtual string. The end of each string is attached to a paddle and this paddle is used to hit a triangular shaped target. Please note that the movement of both the game pieces and paddle are restricted to one plane of motion due to virtual slider bars.

Points are rewarded if the paddle hits the target. The total points rewarded can be seen in real-time by looking at the 'Score' located at the bottom of the TIMPINCH screen. Misses are represented by three balls which are located above the Score. As misses occur, the balls become inactive. When three misses have occurred, all the balls become inactive and the game is over.




### Camera View

To view the camera window if it is not already open, click on the 'cam' button on the bottom of the TIMPINCH game screen.

**Proper finger sensor placement, camera placement and calibration are important for camera tracking.**

**Because the TIMPINCH game requires small movements of the fingers, the camera should be placed no farther than a ruler's length (about 30cm) away from the player's fingers.**

**Please see the Camera Window and TIMTRAINER Setup sections of the manual for more detailed instructions.**

### Scale Slider

A narrow/wide slider is present at the bottom of the TIMPINCH game screen. Adjusting this slider will change the sensitivity of the finger sensor game piece to the actual movement of the fingers. A 'narrow' setting will require the fingers to move more than a 'wide' setting in order to move the finger sensor game pieces, and the paddle, the full length of the game screen.

Please note that a recalibrate option is available at the bottom of the TIMPINCH game screen. If the camera is not properly tracking the finger sensors, click on the 'ReCal' button and repeat the calibration process.

## TIMPINCH Game Options

| | |
|---|---|
| Start Box | Located in the middle of the TIMPINCH game screen. Click inside the start box to start the game. |
| Speed slider | Allows the speed of the target to be increased or decreased. |
| Size slider | Allows the paddle size to be increased or decreased. |
| Score | Displays a real-time score. Points are rewarded when the paddle hits the target. Points are NOT subtracted from the score when the paddle misses a target but one of three balls, present above the Score, becomes inactive. When three misses occur, all three balls become inactive and the game is over. |
| Pause/Play Button | Stops the movement of the target without re-setting the target's position, the score or the number of misses that have occurred. The pause button will be replaced with a play button once the game has been paused. Press the play button to resume the game. |
| Stop Button | Stops the game and re-sets the score as well as the number of misses. The Start box will then appear in the middle of the TIMPINCH screen. A new game may then be started if desired. |
| Graph Button | Graphs the location of the two finger sensors through the game. This function is best used at the end of a game or once the stop button has been pressed. The Graph button is not available while playing the game or when the pause button has been pressed. |

| | |
|---|---|
| 'H/V' box | Allows the user to choose between horizontal and vertical orientations.<br><br>In the horizontal orientation, the finger sensor game pieces are placed at the top of the screen and move left/right along the top of the screen. The paddle moves up/down to hit the target. In order to play the game, the player's fingers will be oriented horizontally. For example, the player's fingers can move parallel to the surface of a table.<br><br>In the vertical orientation, the finger sensor game pieces are placed at the left side of the screen and move up/down along the side of the screen. The paddle moves left/right to hit the target. In order to play the game, the player's fingers will be oriented vertically. For example, the player's fingers can move perpendicular to the surface of a table. |

# Training Scenarios

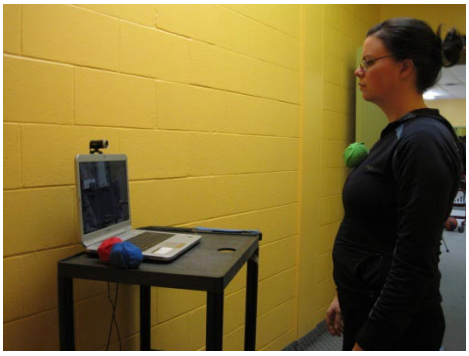
## Training Scenario #1: Weight shifting (lateral) with TIMPONG game and one sensor ball

**Training Objective:** Improve the ability to shift body weight between the left and right legs.

**Recommended Set-up:**

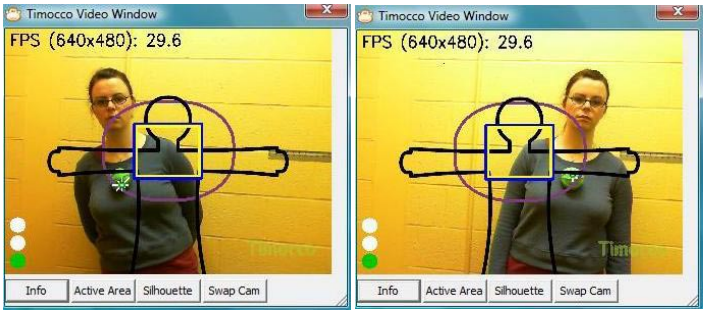
**1** Attach the sensor ball to upper chest region of the player, approximately at the midline.

**2** Place the camera about 1-2m away and directly in front of the player. Align the camera such that the sensor ball is in the middle of the camera's field of view.



**3** Select the active ball colour and then position the ball momentarily within the central box region of the camera view until 'Ready' appears. At this point, the ball will be tracked and can be used to play the game.

**4** Calibrate the motion of the ball. Move the Scale Slider left/right in order to match the Active Area in the camera view with the side-to-side motion of the player.




**5** Choose the desired Mode selection (horizontal is recommended) and Difficulty for the TIMPONG game.

## Training Scenario #2: Weight shifting (lateral) with squat using TIMSKI and two sensor balls

**Training Objective:** Improve the ability to shift body weight between the left and right legs while varying the degree of knee bending/squatting. In the ski game, the lateral weight shifting will be used to move the skier left/right and the squat motion will be used to control the speed of the skier as he/she descends the hill.

**Although the squat motion was chosen for the vertical speed in this example, remember that many other movements can be used. For example, shoulder flexion/extension may also be used.**

**When choosing a movement for vertical speed, make sure that both the horizontal and vertical sensor balls can be detected by the camera at the same time.**

### Recommended Set-up:

**1** Choose the Set Speed Right Ball (steady) option in the drop down menu within the Custom box of the TIMSKI setup screen.

**2** Choose other desired game options. Remember that the 'Difficulty' option already has pre-set custom options for easy, medium and hard.

**3** Increase 'Horizontal' speed (shift to right of scale)

**4** Click on the 'Proceed to Game' button in the setup screen. An intermediate calibration screen will appear. Calibrate the sensor balls with the camera at this point in time or press 'skip' and calibrate at a later time within the game screen. In order to calibrate, position the sensor balls momentarily within the central box region of the camera view until 'Ready' appears. At this point, the balls will be tracked and can be used to play the game. Remember that the ball to the left is controlling the horizontal motion and the ball to the right is controlling the vertical speed while descending the hill.

**5** Attach one sensor ball to upper chest region of the player, approximately at the midline. Place the second ball beside and directly to the right of the first ball.

Another option is to use poles (as shown in the diagram below). Place one sensor ball on the pole for the horizontal motion and one sensor ball on the player for the vertical motion. Make sure that the ball that is to be used for the vertical motion is placed to the right of the other sensor ball.

**6** Place the camera about 1-2m away and directly in front of the user.

**7** Ask the player to shift his/her weight left and right while squatting high and low. Make sure that both sensor balls are being tracked by the camera.

**8** Start the game by clicking on the Start box.

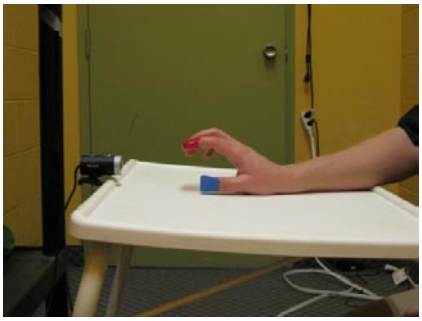
## <u>Training Scenario #3:</u> Pinch grip with TIMPINCH and two finger sensors.

**Training Objective:** Improve the ability of the thumb and index finger to move towards and away from each other.

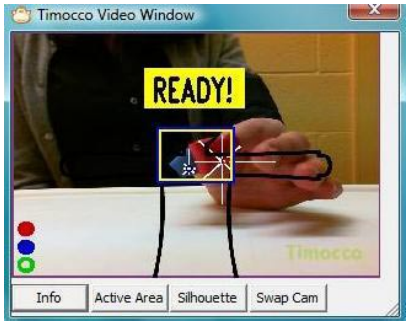
**Recommended Set-up:**

**1** Attach the finger sensors to the ends of the thumb and index fingers.

**2** Place the camera about 10-30cm away, and at the same height as the hand. It is easiest to place the camera and hand on a table.



**3** Calibrate the finger sensors with the camera by positioning the finger sensors momentarily within the central box region of the camera view until 'Ready' appears. At this point, the finger sensors will be tracked and can be used to play the game.




**4** Decide on a horizontal or vertical orientation and click on the appropriate selection in the 'H/V' box.

**5** Choose the desired paddle size and target speed.

## Training Scenario #4: Stepping motion with TIMPONG and one sensor ball

**Training Objective:** Improve the ability to step-up with one leg while maintaining balance on the opposite limb.

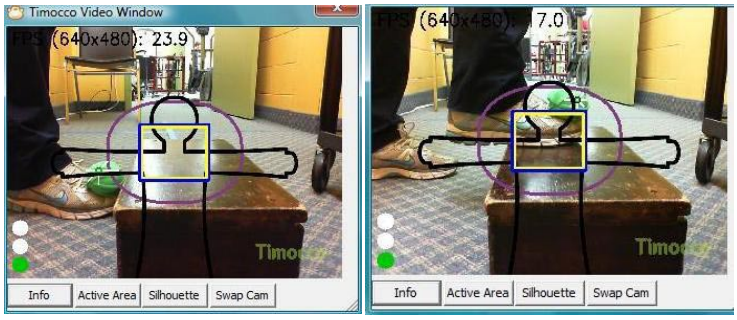
**Recommended Set-up:**

**1** Attach the sensor ball to the shoe of the foot that is to perform the step-up motion.

**2** Place the camera approximately 1m away, at the same height and directly to the side of the bench that is to be used for the stepping motion. Align the camera such that both the step-down and step-up positions are viewed within the camera's field of view.

**3** Select the active ball colour and then position the ball momentarily within the central box region of the camera view until 'Ready' appears. At this point, the ball will be tracked and can be used to play the game.

**4** Calibrate the motion of the ball. Move the Scale Slider left/right in order to match the Active Area in the camera view with the step-up motion of the foot.




**5** Choose the desired Mode selection (vertical is recommended) and Difficulty for the TIMPONG game.

## Training Scenario #5: Single joint movement with TIMPONG game and one sensor ball.

**Training Objective:** Improve the active range of motion, improve the movement within a particular range, and/or improve the proprioception of a particular joint/limb.

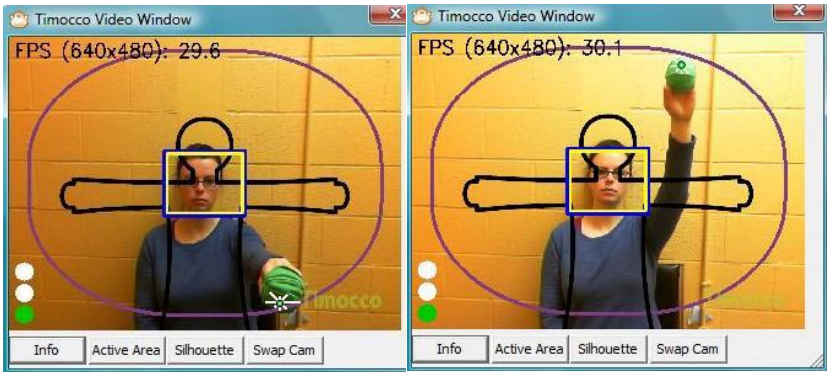
**Recommended Set-up:**

**1** Attach the sensor ball to the distal end of the limb/joint segment.

**2** Place the camera approximately 1-2m away and directly in front of the player. Align the camera such that the full range of motion is viewed within the camera's field of view.

**3** Select the active ball colour and then position the ball momentarily within the central box region of the camera view until 'Ready' appears. At this point, the ball will be tracked and can be used to play the game.

**4** Calibrate the motion of the ball. Move the Scale Slider left/right in order to match the Active Area in the camera view with the full range of motion of the limb/joint segment.




**5** Choose the desired Mode selection and Difficulty for the TIMPONG game.

# Index