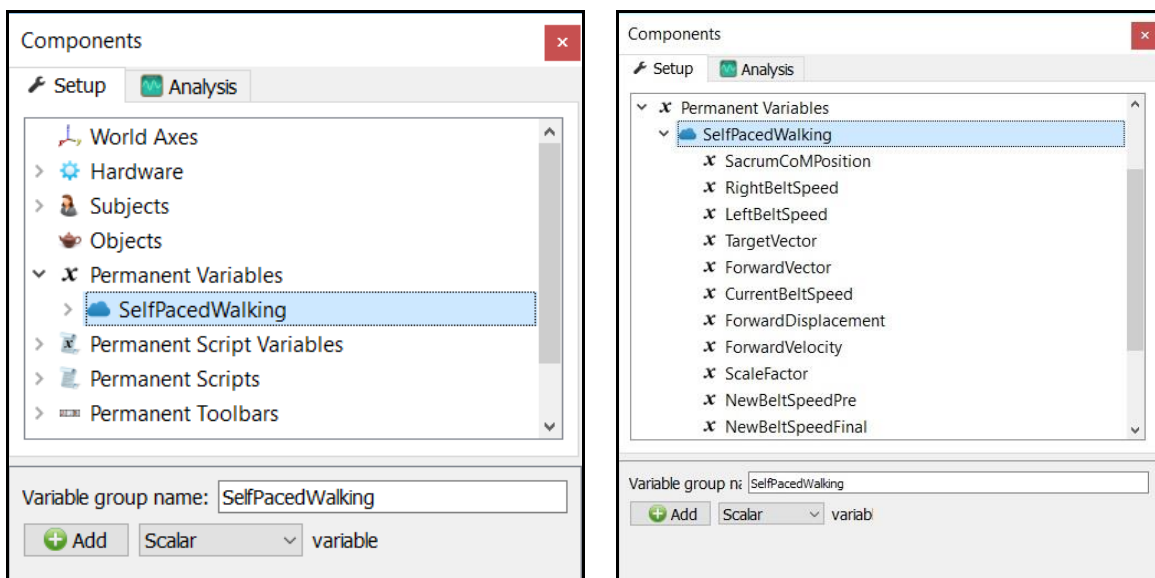


The MotionMonitor xGen Software Guide: Bertec Instrumented Treadmill and Self-Paced Walking

This document reviews the procedures for configuring the Bertec FIT treadmill controls in The MotionMonitor xGen. The Component Set, Self Paced Walking, contains all of the necessary variables and scripts for implementing the following procedures. After receiving the component set from your Client Support Engineer, it can be loaded through the File|Import Component Set menu item in the Live workspace

The following settings provide a demonstration for how self-paced walking can be performed using the sacrum position for the subject. All of the necessary variables will be loaded by the Self Paced Walking Component Set. The images below show the Variable Group containing all of the self-paced walking variables under the Permanent Variables Setup Components tab along with the variables themselves.



Each of the self-paced walking variables are described in more detail below.

SacrumCoMPosition – Has been defined as the Sacrum center of mass vector position for the subject. This variable may need to be updated to reflect the subject name for the Subject in your workspace or alternative position variable to be used to controlling the belt speeds.

RightBeltSpeed – Has been defined as the scalar right treadmill belt speed. This variable may need to be updated to match your Bertec Treadmill hardware component name.

LeftBeltSpeed – Has been defined as the scalar right treadmill belt speed. This variable may need to be updated to match your Bertec Treadmill hardware component name.

TargetVector: This is the vector position, relative to the world, that we are trying to keep the subject at, particularly in the world axes direction that the subject is walking in. Typically, this position is placed just in front of where the subject would be standing if they were in the middle of the treadmill belts, from front to back. This variable may need to be updated depending on the Forward vector definition.

ForwardVector – This is the unit vector defining the direction the subject is facing. This variable may need to be updated to match your World Axes layout and the direction that the subject is facing while walking on the treadmill.

CurrentBeltSpeed – This variable is defining the scalar average speed of both belts (LeftBeltSpeed & RightBeltSpeed).

ForwardDisplacement – This variable is defining the forward scalar displacement for the Sacrum CoM position.

ForwardVelocity – This variable is defining the forward scalar velocity of the Sacrum CoM by taking the derivative of the ForwardDisplacement variable.

ScaleFactor – This is a scalar variable similar to a gain setting used to adjust the sensitivity for the rate at which the belt speeds change.

NewBeltSpeedPre – This is a scalar variable with an if statement for controlling how the belts speed up or slow down depending on the SacrumCoMPosition relative to the TargetVector. This variable may need to be updated depending on the Forward vector definition.

NewBeltSpeedFinal – This is a scalar variable with an if statement to help ensure that the belt speed does not go negative and also sets the belt speed to 0 if the subject falls too far behind the target position. This variable may need to be updated depending on the Forward vector definition. This variable can then be added to the Bertec Treadmill control device to control the left and right belt speeds, as seen in the image below.

These settings are specific to a World Axes layout where the subject is walking in the negative y-axis direction. These variables are not optimized for anything other than walking. Caution should be taken when first working with these variables and it is recommend testing without the Sacrum sensor actually attached to a subject or with the subject standing to the side off of the treadmill to see how the treadmill responds. In the event that the SacrumCoMPosition should become invalid, the subsequent calculations will remain constant until the SacrumCoMPosition returns a valid reading again.