

myoRESEARCH® 3.12

Software Release Notes



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Improving the Study of Human Movement

With Noraxon, you can integrate and synchronize biomechanics data from multiple capture and assessment technologies within a single software platform.

Noraxon's myoRESEARCH® 3 (MR3) biomechanics data capture and analysis software is designed to improve the research and diagnostic workflow by giving users access to real-time data, accurate biofeedback, and extensive reporting and analysis capabilities.

MR3 is built on a modular platform that offers users the flexibility to work with a single technology or a fully equipped biomechanics technology suite while significantly reducing setup and processing time. MR3 automatically synchronizes all data recording and processing of EMG video, 3D kinematics (IMU), multiple pressure and force systems, and any other third-party device that streams an analog signal.



myoRESEARCH delivers data you can count on.

- Purpose-built for research, tailored to a wide range of applications in the medical, clinical, sports science and performance and human-factors practices
- Multi-device architecture is easy to understand and minimizes setup challenges
- Improved teaching and communication with easy export to video
- Broad library of standard biomechanical reports that can be customized
- Instant biofeedback with threshold training and audio-visual cueing



myoRESEARCH® Platform Updates

The MR3.12 Update Includes:

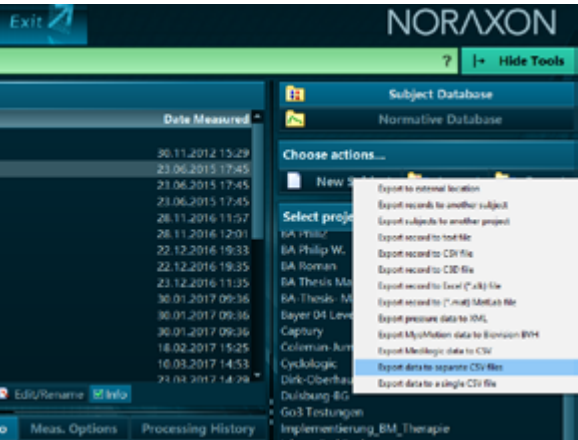
- New Export System: Batch Export and Extended Parameter Selection functions
- New Normative Datasets: Enhanced set of reference files for Gait & Running, including Motion Capture and EMG comparative data
- Enhanced Replay/Video Speed options
- Improved Multi-Activity Recording
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- Improved POI Analysis Element



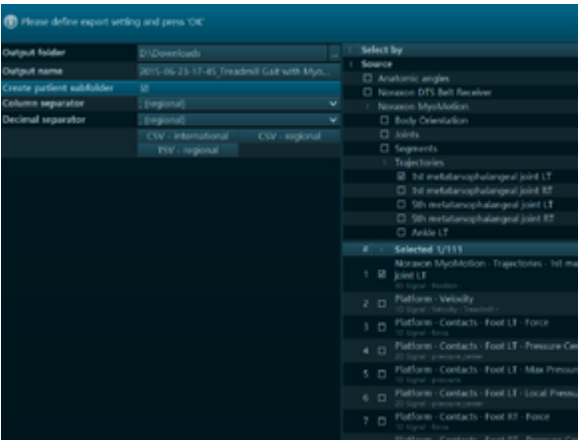
Improved Data Export Functionality

Researchers receive a powerful tool to export raw or processed data from any system within the multi-device family.

- **Single or Multi .csv**
Using the new .csv options, users can create file folders or individual appended .csv files.
- **Trajectory Export**
All records with myoMOTION™ data now have the option to export the model-based trajectories.
- **File Path Control**
Be able to partition or aggregate your data any way you wish with this new feature.
- **Source Data Navigation**
Quickly use categorical filters to find the data channels you are looking for even faster.
- **Template Saving/Loading**
Once you have a desired export protocol or data selection, you can save these choices as a template and use them any time you need to export in the future.
- **C3D Data Export – Motion Across Platforms**
Now users can export motion data as a C3D file for use in other software platforms.
- **Report Export Includes Comments**
Now users can export subject and record comments along with the other reported metrics.



Choose from a variety of data export formats.



Expanded data control for .csv export.



New Normative Datasets

- **Gait & Running**
We collected published datasets and aggregated them to have better reference within our platform.
- **EMG and IMU Data**
Two of the new norms have both EMG and IMU data, allowing for more complete datasets to be compared and analyzed.

NOTE: The new norms are dependent on the new myoMOTION™ naming convention.

NORMATIVE SOURCES:

- **EMG Floor Gait**
 1. Winter 91
N=11 to 27 subjects, dependent on the selected muscle EMG floor gait
 2. Schulte-Frei et al 2009
N=36 subjects aged between 19 and 30 years (18 female, 18 male)
- **IMU Treadmill Gait**
 1. Bolling 2014
N=26 subjects aged between 16 and 40 years (6 female, 21 male)
- **EMG Treadmill Gait and Running**
 1. Gemmel 2017
N= 32 subjects (female mean age: 22.6 ± 3.5 , male: 22.6 ± 6.7)



Example Normative data sets.

NEW

Modified Playback Bar

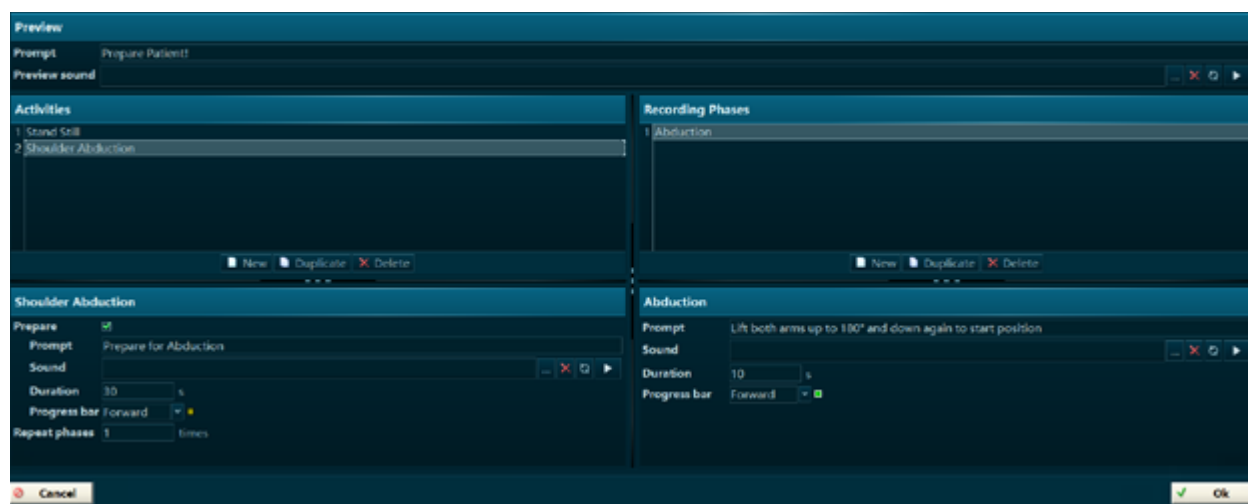
- **New Replay Speeds**
Now users can select at more useful fraction or multipliers of the playback speed.
- **User Selected Speed**
The user can now type in a speed they desire to playback the recording at, allow for full customization of the viewer experience.
- **On the Fly**
Now you can toggle between speeds without having to first pause the record.



NEW

Improved Multi-Activity Recording

- **Multi-Activity for All Hardware**
EMG, IMU, Video and Pressure are all supported with the improved multi-activity functionality.
- **Prepare Time**
User can now use "prepare" duration of a given activity to remove unwanted data from your resulting record.



Multi-activity design menu provides flexibility to create your own sequence tests.

NEW

Marker Comments

- **Faster Commenting**
Marker comments can directly be edited in the record viewer, saving you time and steps.



NEW

Improved POI Report Element

- **Point of Interest Analysis with Better Control**
POI Report Element has received more selection possibilities to show animation or video windows or selection to user defined markers.

myoMUSCLE™ Module

The MR3.12 software release is fully integrated with Noraxon's next generation Ultium®-EMG system. Features such as extremely low baseline noise ($< 1\mu\text{V RMS}$), 24-bit signal resolution and high sampling rates (4000Hz) are paired with helpful myoMUSCLE software features like built-in impedance test and EMG signal status check.

Sophisticated advances in technology resulted in the patent-pending "SmartLead" system, which transforms the EMG device into an intelligent sensor for virtually any type of biometric and physiological data. And, the unique Lossless Data design assures high-fidelity transmission, even in difficult WiFi conditions.

The MR3.12 Update Includes:

- **Ultium® EMG Integration**
 - Ultium Smart Lead management
 - Acceleration integration
 - Status monitor
 - Offline recovery
 - Multi-Activity Recording improvements



myo
MUSCLE™



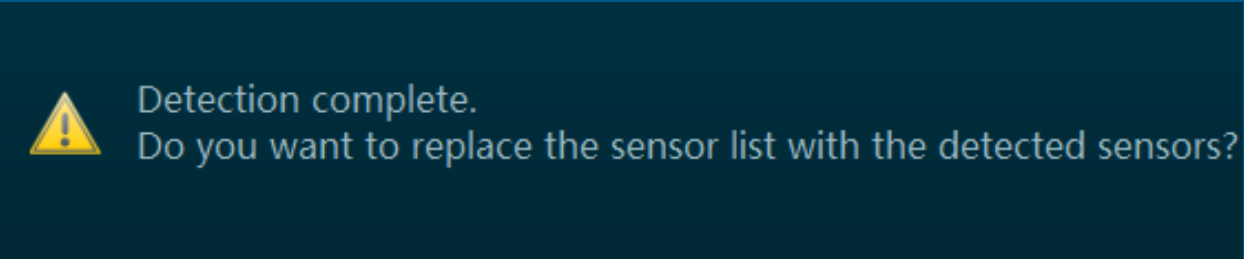
Ultium®-EMG Integration

Ultium System hardware features such as extremely low baseline noise, 24-bit signal resolution and high sampling rates (4000Hz) are paired with new myoMUSCLE software features like build-in impedance test and EMG signal status check for world-class data collection and analysis. The unique Lossless Data technology assures high-fidelity transmission, even in difficult WiFi conditions. The system features new “SmartLeads,” which transform the EMG device into an intelligent sensor for virtually any type of biometric and physiological data, from any type of hardware.

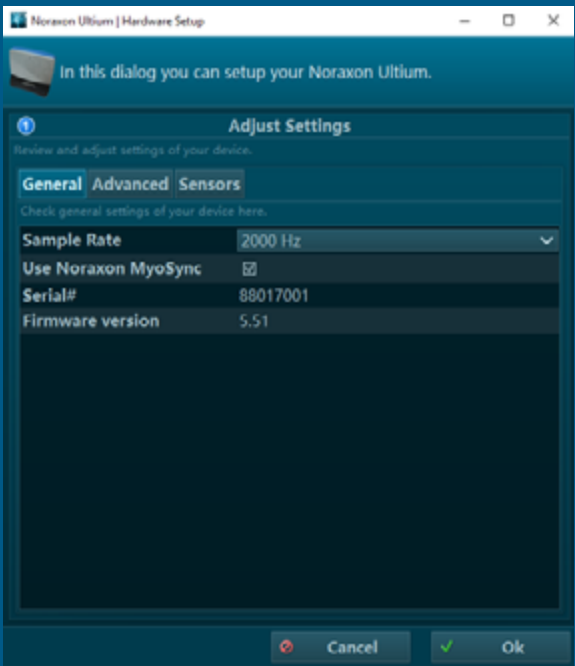
- **SmartLead Detection**
Detect every sensor in the charger, including smart leads. Allowing for quick hardware profile creation.
- **Find-my-Sensor**
Trigger LED visual to ensure each sensor is correctly located.
- **Onboard 3D Acceleration Data**
Enable the 3D accelerometer data to easily pair to your EMG data.
- **EMG Status Monitor**
Use the status monitor to understand the quality of your data.
- **Impedance Check**
Understand the signal quality coming from of your EMG system.
- **Offline Recovery EMG Data**
Data that is stored on the internal flash can now be offloaded 10x faster.



ultium® EMG



Automatic SmartLead detection determines which sensors are in the set up.



Settings control for the new Ultium-EMG.



Automatically detect or manually assign sensors for hardware setup.



myoMOTION™ Module

Users of Noraxon's 3D Motion Capture systems and myoMOTION software benefit from strong and innovative magnetic rejection algorithms that deliver a stable recording. Of key interest to researchers, a new and powerful Batch Data Export Menu to communicate data to external packages like matlab, OpenSim or C3D.

The MR3.12 Update Includes:

- Clinically Defined, Single-Segment Rotation Angles
- Enhanced Magnetic Distortion Modes
- Center of Mass (CoM) Estimation & Projection; Exportable 3D Trajectories
- Enhanced Step-Detection & Translation Calculation

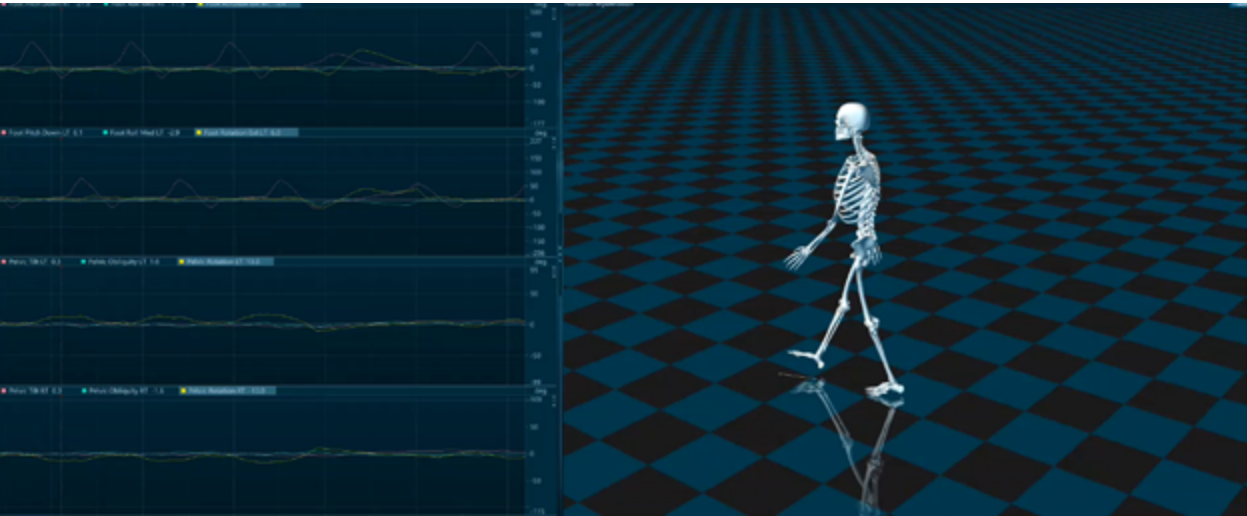


Single Segment Rotation Angles

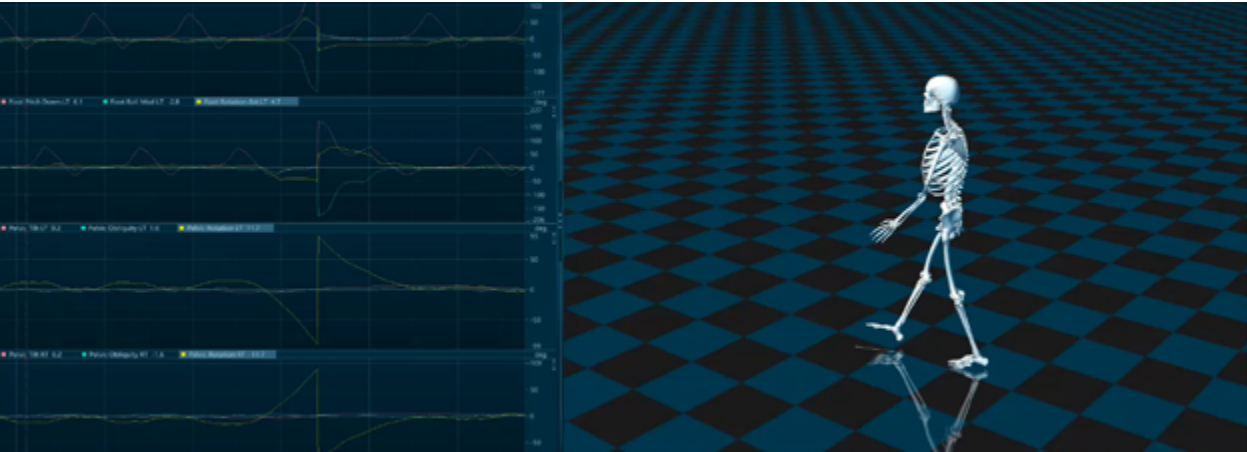
- **Clinically Defined Angles**
New anatomical angles that have been defined by clinicians, for simpler interpretation of the pelvis and foot variables.
- **Optimized Decomposition**
Based on the segment theoretical range of motion within each plane, the Cardan Sequence was optimized.
- **Clinical Renaming**
The variable names now match clinical nomenclature for easier variable identification.
- **Practical Range of Motion**
Range of motion was adjusted to fit the realistic biomechanical limits of human movement, rather than generic object orientation ranges.



Clinically-relevant single-segment angles.



Movement-based progression angle.



Calibration-based progression angle.

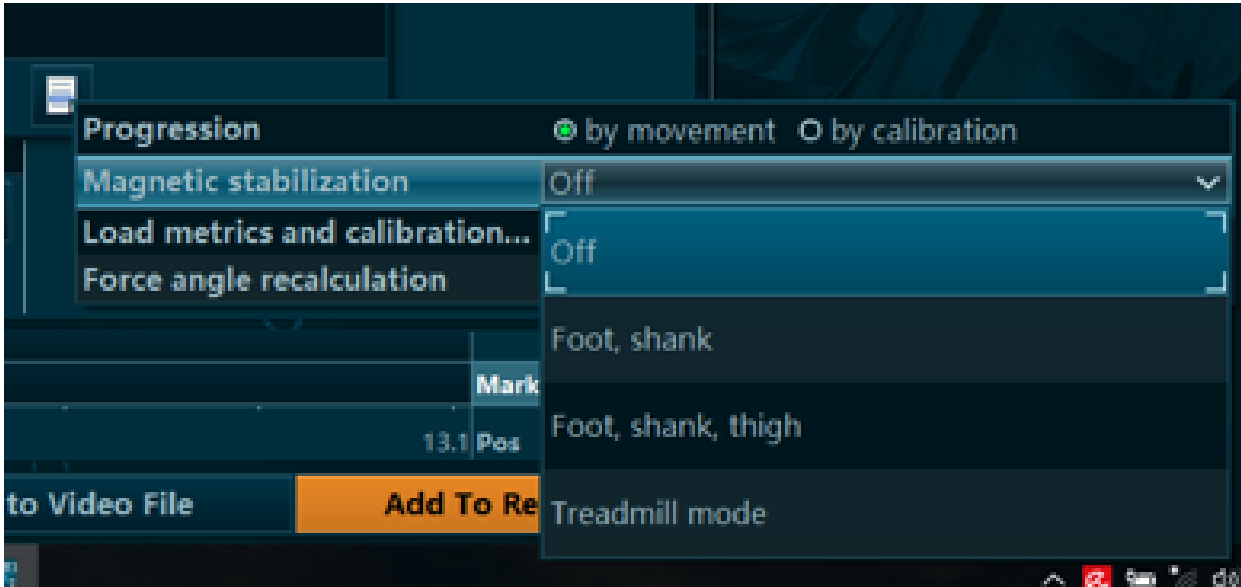
Name	Anatomical axes	Cardan Sequence	Range	MR Label and polarity (positive)
Pelvis	X - tilt	XZ'Y''	X: [-180 180]	Pelvic Tilt
	Y - rotation ext		Y: [-180 180]	Pelvic Rotation
	Z - obliquity		Z: [-90 90]	Pelvic Obliquity
Foot	X - pitch down	XY'Z''	X: [-90 270]	Foot Pitch Down
	Y - rotation ext		Y: [-90 90]	Foot Rotation Ext
	Z - roll lateral		Z: [-180 180]	Foot Roll Lat

Table 1: Single segment angles relative to calculated direction of progression



Enhanced Magnetic Distortion Correction Modes

- **High Pass Correction**
Each of the given approaches uses the sensor course angles and removes the sensed low frequency drift.
- **Multiple Strengths**
Depending on what is needed, stronger or weaker correction approaches can be used.

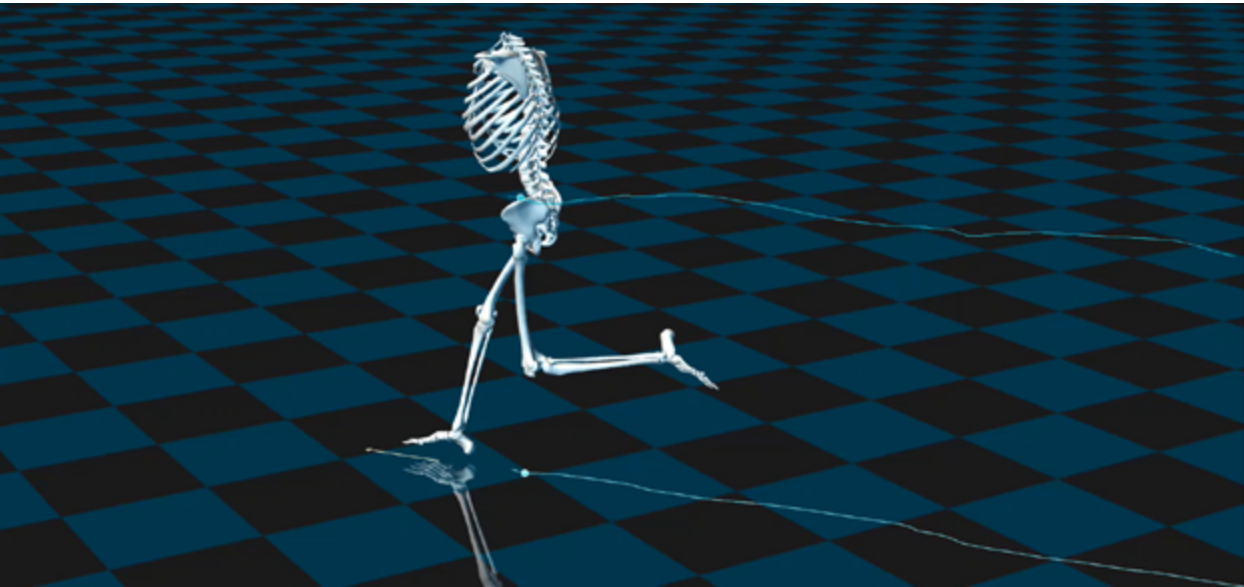


Options menu for additional magnetic stabilization modes.



Center of Mass (CoM) Estimation & Projection

- **3D CoM and Projection**
The 3D CoM location is displayed on the avatar and 2D position is projected onto the floor.
- **Published Standard**
CoM Estimations combine subject anthropometry and kinematics.
- **Exportable**
The 3D trajectories are a selectable channel for data export.

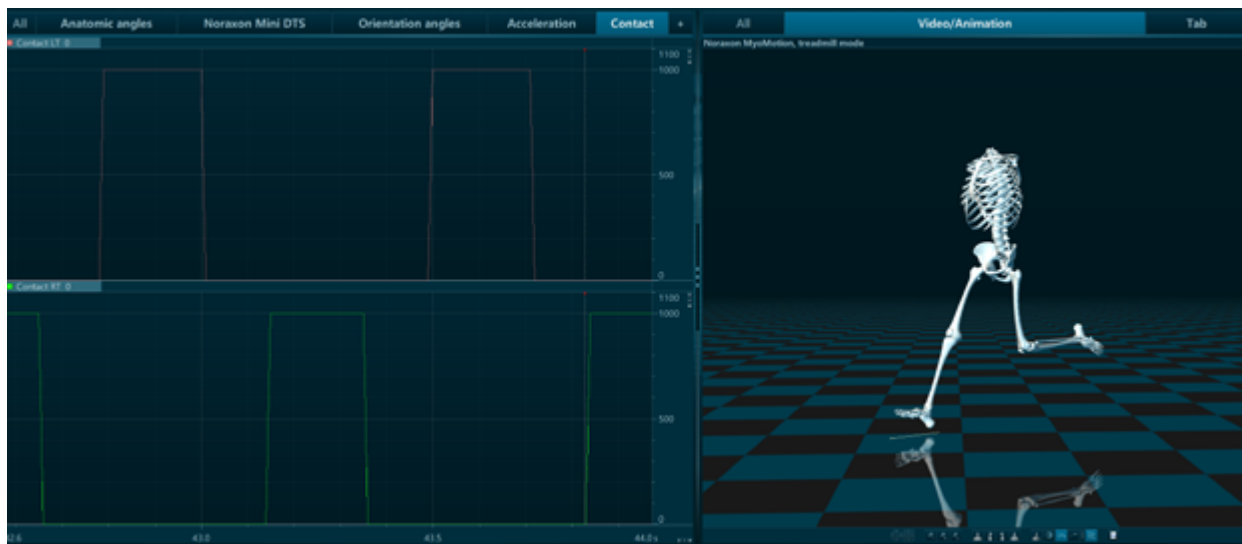
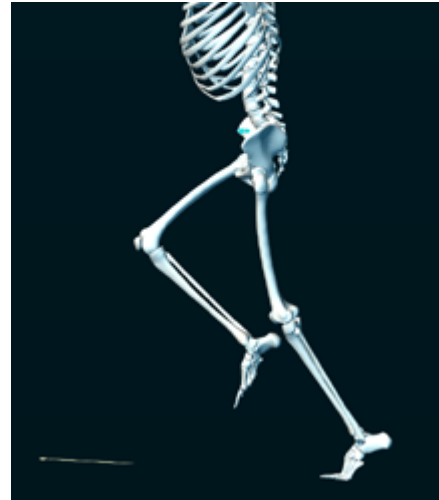


Center of mass (CoM) trajectory tracks in three dimensions.

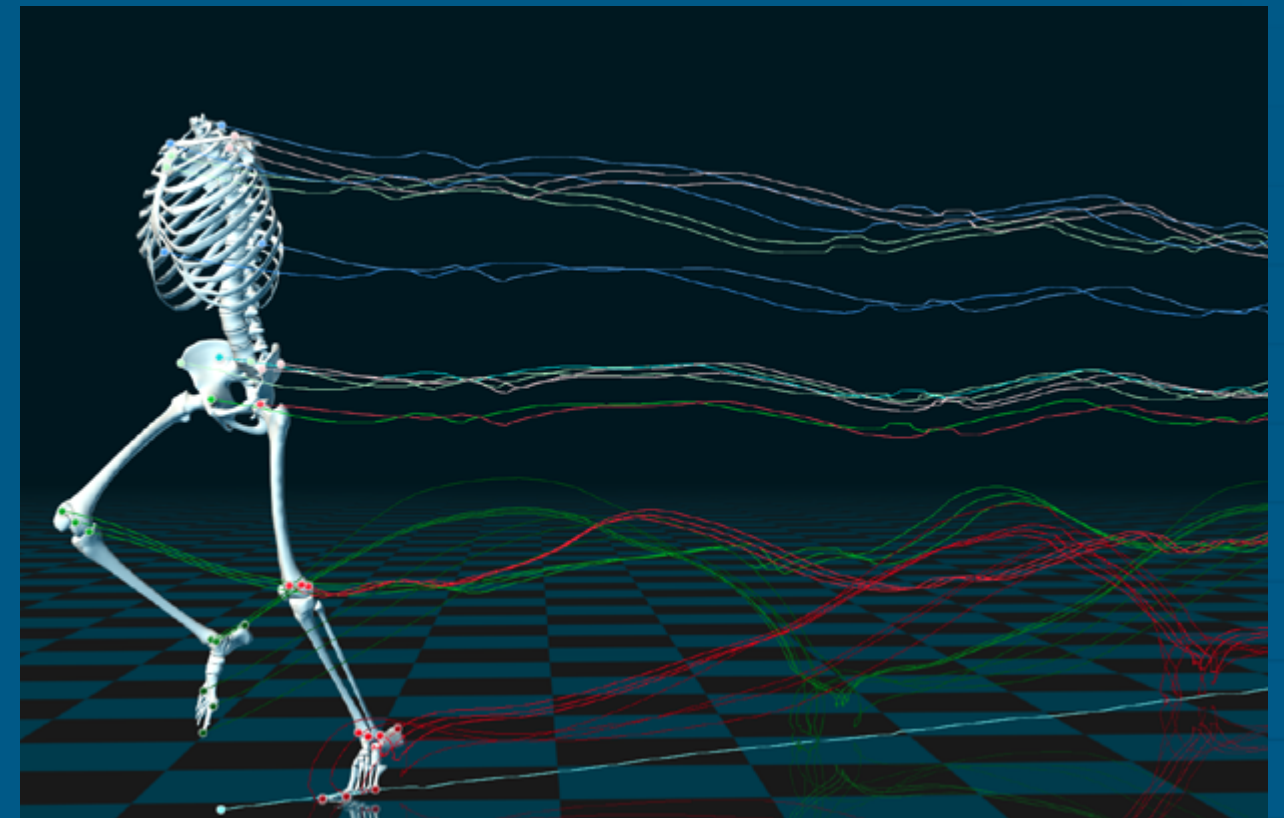
NEW

Enhanced Step-Detection & Translation Calculation

- **Improved Contact Detection**
The new contact detection algorithm offers improved accuracy.
- **Optimized Trajectories**
Now optimizing our forward and inverse kinematic calculations for higher sensitivity.
- **More Natural Animation**
Articulating foot animation for more realistic rendering of kinematic data.



Accurate contact detection using lower quarter IMU sensors.



Multi-joint trajectory mapping.



myoVIDEO™ Module

Users of the NiNOX™ high-speed, high-definition video cameras will benefit from large file size capability (>2GB), as well as strong video compression algorithms that reduce database file size up to 90% of original size, post hoc or real time!

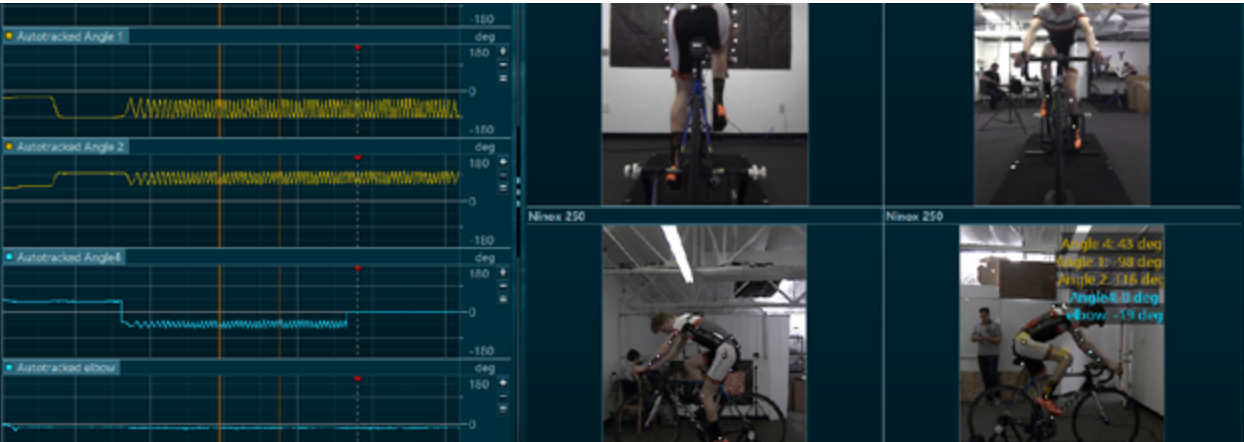
The MR3.12 Update Includes:

- Increased Video File Size
- Video Compression Modes
- Improved point tracking algorithms; speed adjustments for multi-angle tracking
- Video Tracking and Drawing Tools
- Save/Load function for marker tracking templates

NEW

Increased Video File Size

- **Multiple High-Speed Cameras**
Now recordings can create files over 2GB, allow high speed records to last longer than 5 minutes.



Automatic point tracking with multiple camera views.

NEW

Video Compression Modes

- **Reduce the File Size**
Video compression can be selected to run online, when saving a record, or post hoc out of database and manual selection.

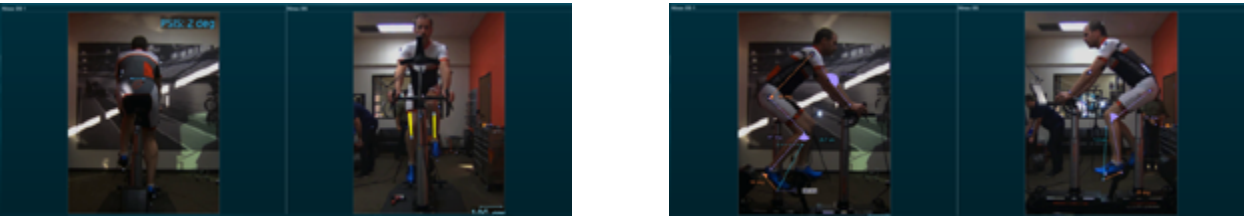


Video compression options.

NEW

Improved Point Tracking Algorithm

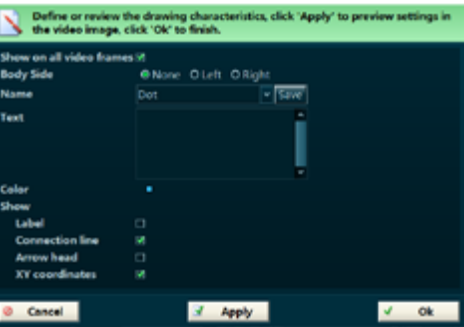
- **Improved 2D Tracking**
Enhanced techniques to detect and track markers, providing trackability on over 32 markers per video (optimal conditions).



NEW

New Video Tracking and Drawing Tools

- **Dot/Arrow** - Now use the Dot/Arrow tool to provide visual feedback, ideal to be used to display trajectories.
- **Global Reference** - Use the vertical or horizontal line as a reference for the 2-marker angle. This saves time and keeps the visual feedback clean.
- **Circle Track** - Automatic Tracking of the pedal position used for multi cycle statistic calculations
- **Control Background Interference** - Quickly remove any reflections or background areas that could influence the marker tracking quality.



Dot/Arrow tool edit screen.

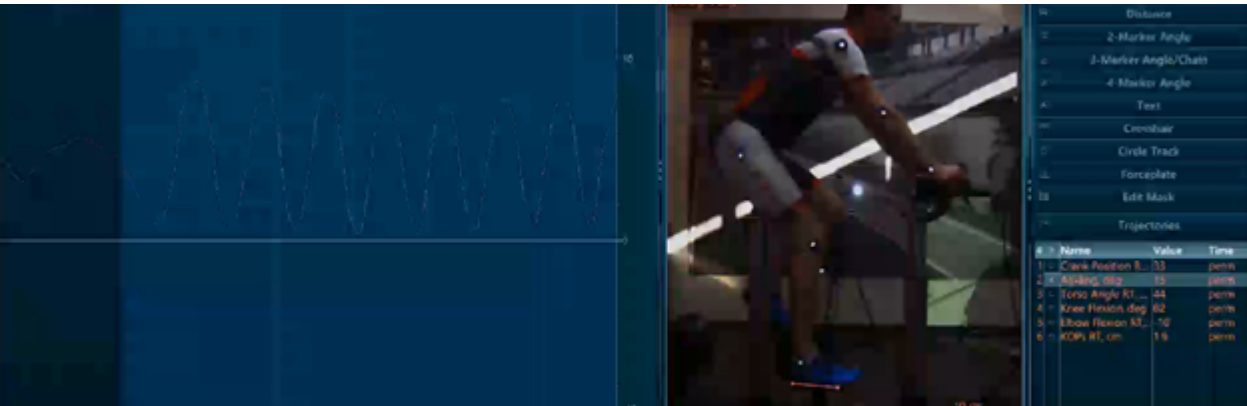


Video analysis tool options.

NEW

Marker Templates Save/Load

- **Reduce Analysis Time**
After creating the analysis point you need, save all Video Analysis channels in a Template, and simply load the Template for future video-based analysis work.



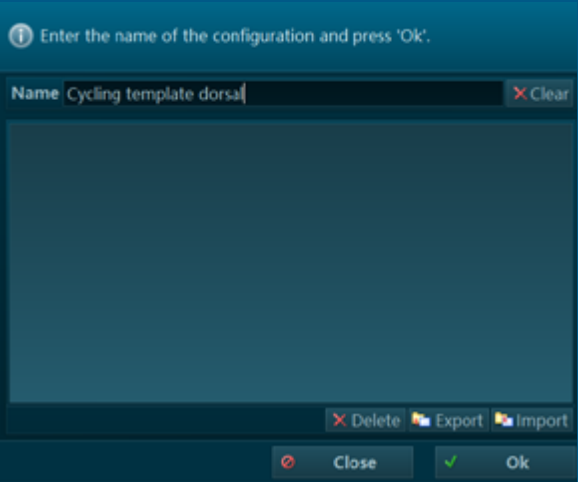
Two-marker angle tracking with reference to horizontal or vertical line.



Circle tracking to determine pedal stroke position.



Mask-editing to improve marker tracking.



#	<input checked="" type="checkbox"/>	Name	Value	Time
1	<input checked="" type="checkbox"/>	Circle Track, deg	7	perm
2	<input checked="" type="checkbox"/>	ankle base, deg	-117	perm
3	<input checked="" type="checkbox"/>	Knee LT, deg	91	perm
4	<input checked="" type="checkbox"/>	elbow, deg	-7	perm
5	<input checked="" type="checkbox"/>	hip LT, deg	-69	perm
6	<input checked="" type="checkbox"/>	trunk tilt, deg	144	perm
7	<input checked="" type="checkbox"/>	shoulder, deg	119	perm
8	<input checked="" type="checkbox"/>	body position, deg	-166	perm

✖ Delete

🔗 Properties

📄 Copy

💾 Save

📂 Load



myoPRESSURE™ Module

The pressure distribution technology supported by the myoPRESSURE module now features a new step-detection algorithm that detects certain gait patterns, including those from highly disabled neurological patients, rollator or walking aids.

The MR3.12 Update Includes:

- Selectable Gait Parameters
- New Running Parameters and Reporting
- Real-Time Stance Biofeedback with Option of Normalized Body Weight Distribution
- Improved Step Detection

NEW

Selectable Gait Parameters

- Control your Reports
The list/table of gait parameter is now fully customizable. Parameters which are not needed can be excluded from report via report element setup menu.

Gait Phase Parameters

Stance phase, %	Left	Right	Diff, %
Load response, %	Left	Right	Diff, %
Mid stance, %	Left	Right	Diff, %
Pre-swing, %	Left	Right	Diff, %
Swing phase, %	Left	Right	Diff, %
Double stance, %	Left	Right	Diff, %

Gait Spatial Parameters

Stance phase, %	Left	Right	Diff, %
Load response, %	Left	Right	Diff, %
Mid stance, %	Left	Right	Diff, %
Pre-swing, %	Left	Right	Diff, %
Swing phase, %	Left	Right	Diff, %
Double stance, %	Left	Right	Diff, %

Settings Of Gait parameters

Adjust settings of the selected report element.

Type: Phases

Draw difference: ☒

Difference formula: % of first value

Parameters

☒ Stance phase

☒ Load response

☒ Mid stance

☒ Pre-swing

☒ Swing phase

☒ Initial swing

☒ Mid swing

☒ Terminal swing

☒ Double stance

☒ Total flight

☒ Total contact

☒ Stance duration

☒ Load response duration

☒ Mid stance duration

☒ Pre-swing duration

☒ Swing duration

☒ Initial swing duration

☒ Mid swing duration

☒ Terminal swing duration

☒ Double stance duration

☒ Total flight duration

☒ Total contact duration

Cancel Ok

NEW

Running Parameters & Reporting

- New Running-based Phase Definitions
Running activities can now be analyzed with selectable running phase specific parameters.

Gait Phase Parameters

Stance phase, %	Left	Right	Diff, %
Swing phase, %	Left	Right	Diff, %
First flight, %	Left	Right	Diff, %
Mid swing, %	Left	Right	Diff, %
Second flight, %	Left	Right	Diff, %
Stance duration, sec	Left	Right	Diff, %

Gait Spatial Parameters

Stance phase, %	Left	Right	Diff, %
Load response, %	Left	Right	Diff, %
Mid stance, %	Left	Right	Diff, %
Pre-swing, %	Left	Right	Diff, %
Swing phase, %	Left	Right	Diff, %
Double stance, %	Left	Right	Diff, %

Adjust settings of the selected report element.

Type: Phases

Draw difference: ☒

Difference formula: % of first value

Parameters

☒ Stance phase

☒ Load response

☒ Mid stance

☒ Pre-swing

☒ Swing phase

☒ Initial swing

☒ Mid swing

☒ Terminal swing

☒ Double stance

☒ Total flight

☒ Total contact

☒ Stance duration

☒ Load response duration

☒ Mid stance duration

☒ Pre-swing duration

☒ Swing duration

☒ Initial swing duration

☒ Mid swing duration

☒ Terminal swing duration

☒ Double stance duration

☒ Total flight duration

☒ Total contact duration

Cancel Ok

NEW

Real-Time Stance Biofeedback

- Weight Distribution Biofeedback
myoPRESSURE/Zebriis Stance Mode allows body weight to be normalized with biofeedback training of forces.
- Center of Pressure (CoP) Balance Biofeedback
The CoP can be used to perform real-time balance training.

2. Configure the platform

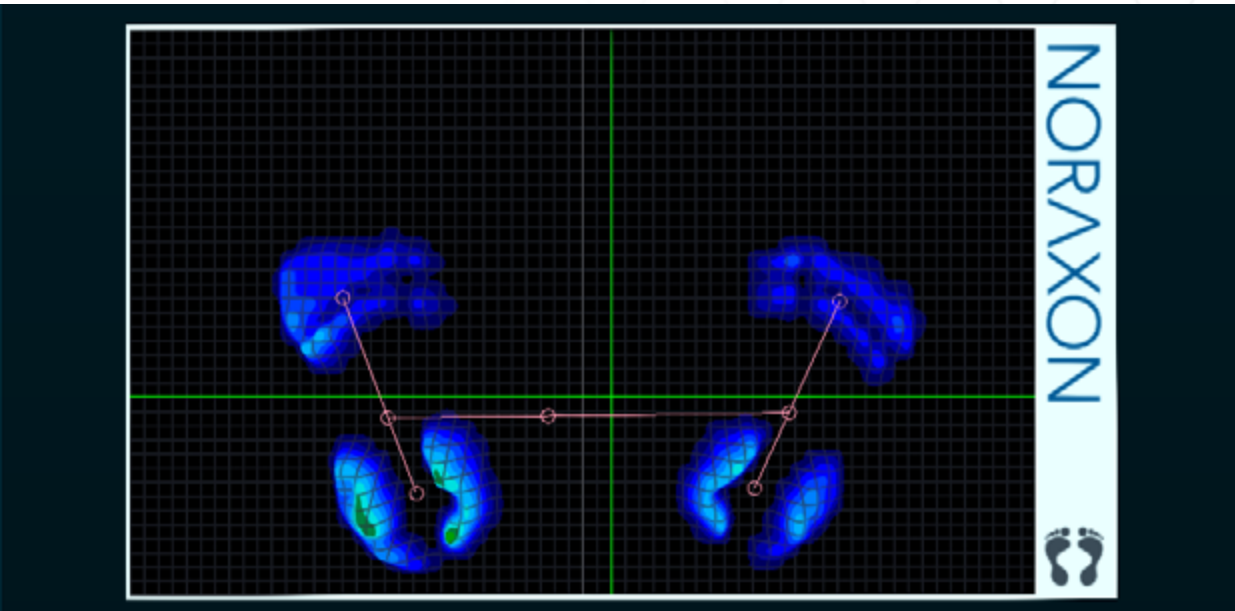
Select platform channels to be shown and recorded.

Mode: ☐ Gait mode ☒ Stance mode

Frequency: 100 Hz

Shows relative forces ☒

Option to show stance forces relative to body weight.

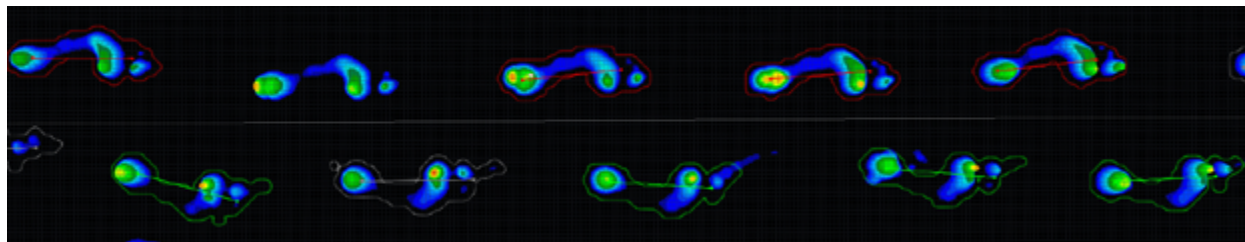


Center of Pressure trace biofeedback.

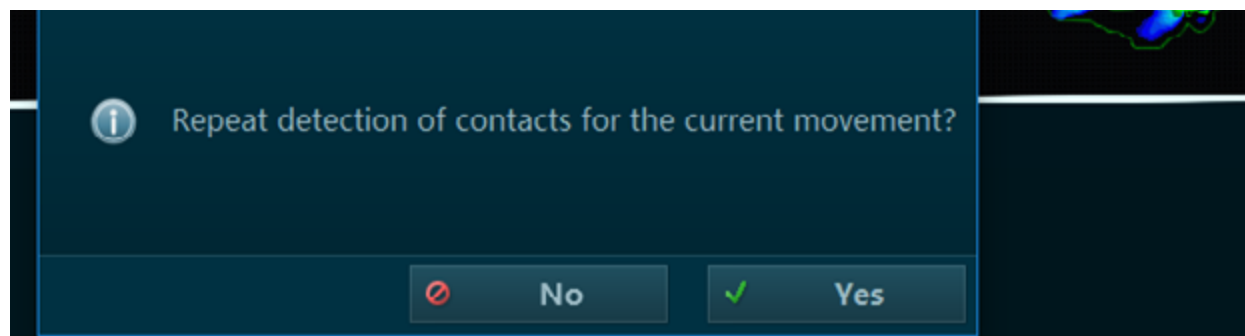
NEW

Improved Step Detection

- **More Robust Gait Analysis**
Improved step detection algorithms allow you to identify difficult gait patterns.
- **Re-track Old Records**
Old records can be re-tracked by clicking CTRLR Key plus Exchange Foot Sides Button.



Step Detection improvements.



Re-detect steps in prior measurement records.



myoFORCE™ Module

The myoFORCE module Jump Analysis was updated with new calculations and a test series time histogram that allows visualization of session progress.

- Time-Series Jump Analysis
- New Stiffness Parameter

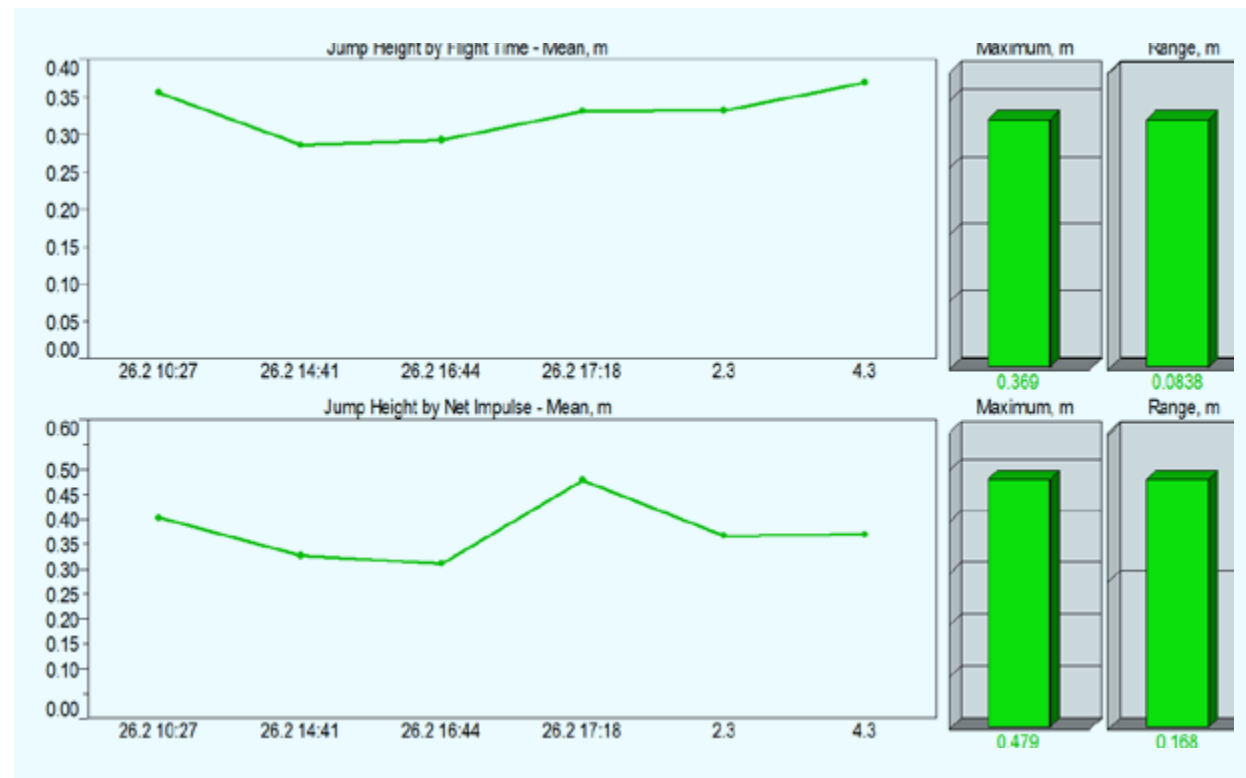


myo
FORCE™

NEW

Time-Series Jump Analysis

- **Data Over Time**
This feature allows you to create time/history graph over several tests of one subject
- **New Stiffness Parameter**
This metric allows users to understand the body's ability to absorb force during a jump landing.



Changes in data over time.





www.noraxon.com

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