

Pressure Mapping Technology for Biomechanics Research

A General Overview of Applications to Optimize Movement, Function, and Predict Consequences of Intervention

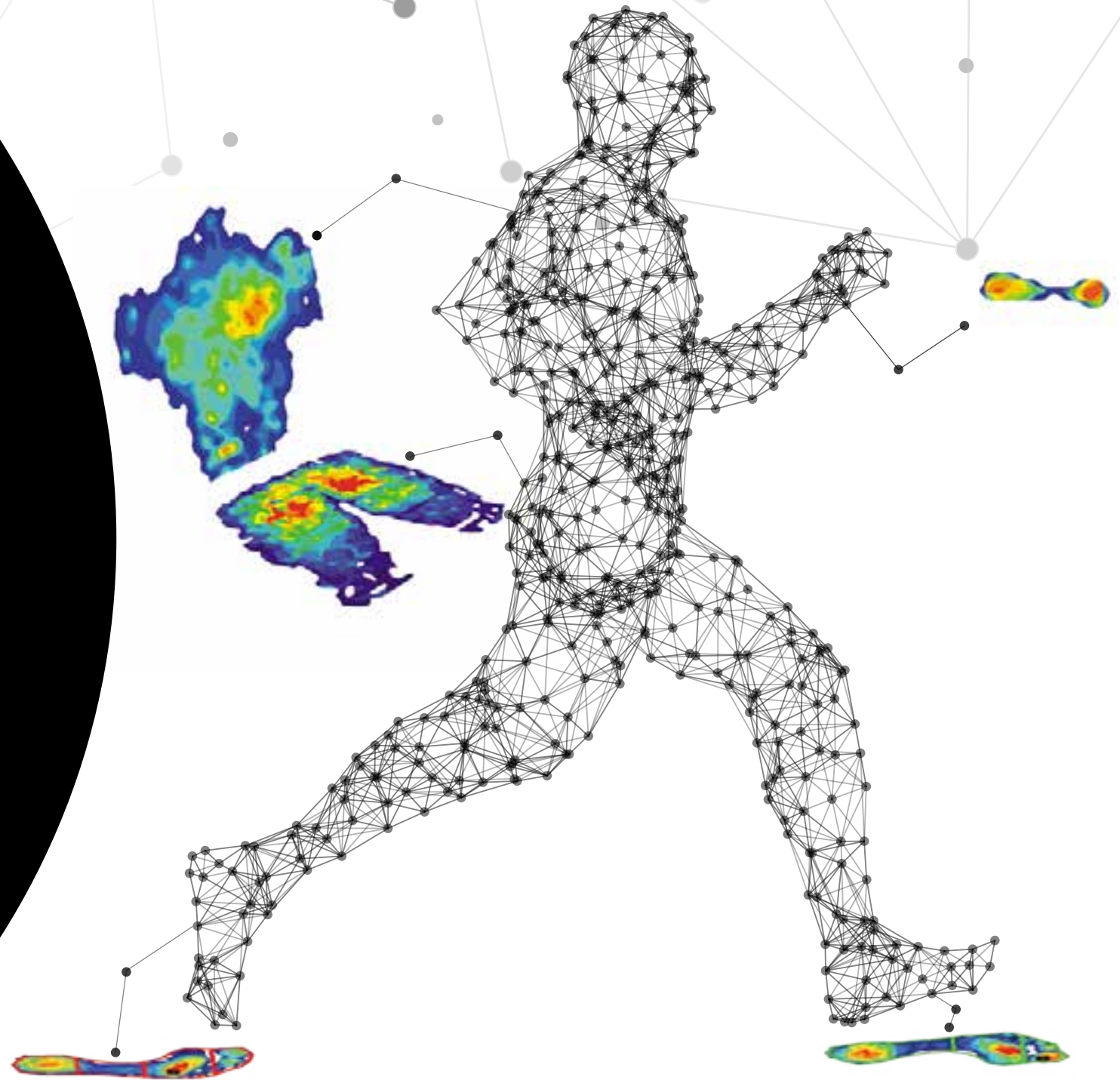


Table of Contents

- 3 Objective Biomechanical Data + Third-Party Validation = Informed Research Decisions
- 4 Biomechanical Application Groups for Pressure Mapping Technology
- 5 Human Gait Analysis - In-Shoe
- 6 Human Gait Analysis - Platform
- 7 Animal Gait Analysis
- 8 Pressure Offloading
- 9 Seating & Positioning
- 10 Joint Analysis
- 11 Balance & Stability
- 12 Footwear R&D
- 13 Retail Foot Mapping
- 14 How Can Your Field of Study Benefit from Actionable Pressure Mapping Technology?

INTRODUCTION

Objective Biomechanical Data + Third-Party Validation = Informed Research Decisions

Biomechanics research exists to optimize movement, function, and predict the consequences of intervention (e.g., surgery and assistive devices). It is a vast field of study that calls for advanced technologies to obtain objective data on variables that can influence clinical choices.

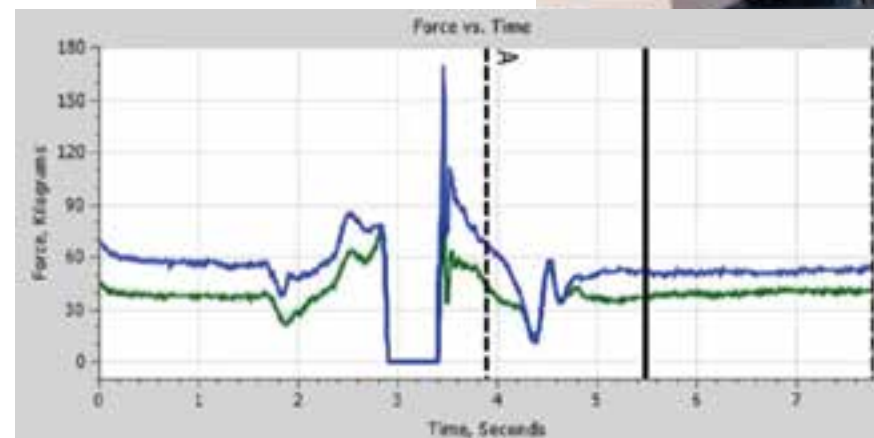
Fortunately for you, over the last several decades, biomechanical researchers around the world have incorporated pressure mapping technology as an important research tool in their repertoire. These application-specific systems incorporate an ultra-thin, minimally-invasive pressure sensor to measure relative pressure and force distribution in real time, at high-resolutions, and at different scanning speeds.

By analyzing movements, forces, and plantar pressure exerted by lower extremities, you are presented with objective data that visual assessments cannot provide.

This eBook will provide a deep overview of our complete portfolio of pressure

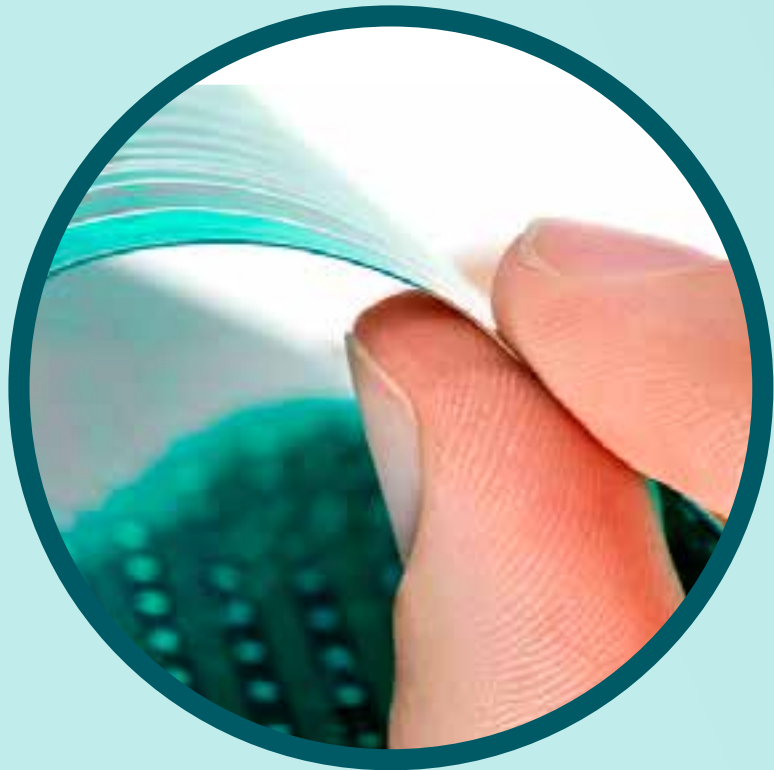
mapping technologies for biomechanics research, and some of the many ways they can and have been used by researchers to:

- Easily detect asymmetries
- Develop injury prevention protocols
- Optimize sports performance
- Improve surgical techniques
- Confirm fitting of prosthetics
- Assist in rehabilitative programs, and much more.



Comparison of left and right foot asymmetries in a jumping experiment.





THIN, CONFORMABLE PRESSURE SENSORS CAPTURE VITAL DATA FOR YOUR RESEARCH

The next several pages will share more information on how pressure mapping technology can serve these diverse biomechanics research topics. Feel free to click off of any of the many hyperlinks embedded in this eBook to explore these technologies and research articles further.



Human Gait



Animal Gait



Pressure Offloading



Seating & Positioning



Joint Analysis



Balance & Stability



Footwear R&D

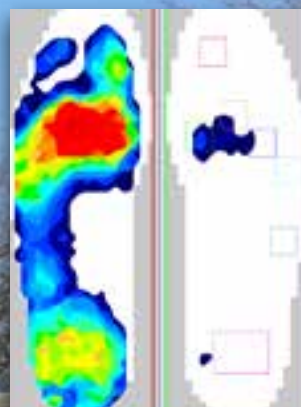


Retail Foot Mapping



HUMAN GAIT ANALYSIS - IN-SHOE

QUESTIONS: Are you seeking gait data specific to foot function? Or, do you want to capture data in changing environments?



F-Scan offers the freedom to capture dynamic in-shoe pressure data from virtually any testing location.

Your Solution Could be

F-Scan™ [Learn More!](#)

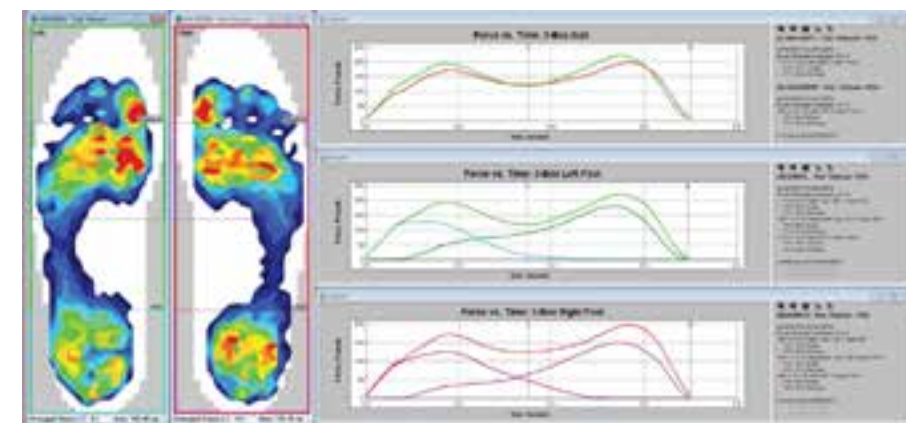
In-Shoe Pressure Measurement System

F-Scan is a best-in-class tool for profiling anatomical locations on a plantar surface. This data reveals what's happening inside the shoe during the **phases of gait**.

- Capture temporal parameters, in addition to pressure and force
- Display force vs. time graphs and pressure profiles in real time
- Measure gait data in true-to-life testing environments outside your gait lab
- Automatically generate reports to compare data sets



F-Scan sensors are flexible and trimmable to fit into most any shoe size or style.



Generate table of gait parameters including step, stride, stance, and swing times.

RECENT HUMAN GAIT ANALYSIS RESEARCH WITH F-SCAN:

- [How do elderly individuals with weaker foot function navigate obstacles?](#)
- [Which landing technique demonstrates safer mechanics, greater jumping performance, and enhanced muscle activation?](#)
- [How does reduced body weight affect plantar pressure during running?](#)



HUMAN GAIT ANALYSIS – PLATFORM

QUESTIONS: Are you seeking objective information on plantar pressure, plus temporal (time), spatial (distance), and kinetic (movement) parameters? Or, do you wish to identify asymmetries or gait dysfunctions over several strides?

Your Solution Could be

Strideway™

Learn More!

Modular Gait Analysis Platform

Strideway is the first truly modular gait analysis platform in the industry. Each system is customizable for different sensor resolutions, and with system lengths up to 6.5 m (21.3 ft) long.

- The modular platform captures multiple footsteps in a single pass, allowing you to choose the system sensing area and sensor resolution.
- Integrates with other gait lab technologies, including EMG and motion capture systems
- Automatically detects foot strikes with labels for left or right, and number of stances from first to last
- Low profile reduces risk of tripping, minimizing gait changes
- Wider platform accommodates walkers, canes, and other assistive devices.

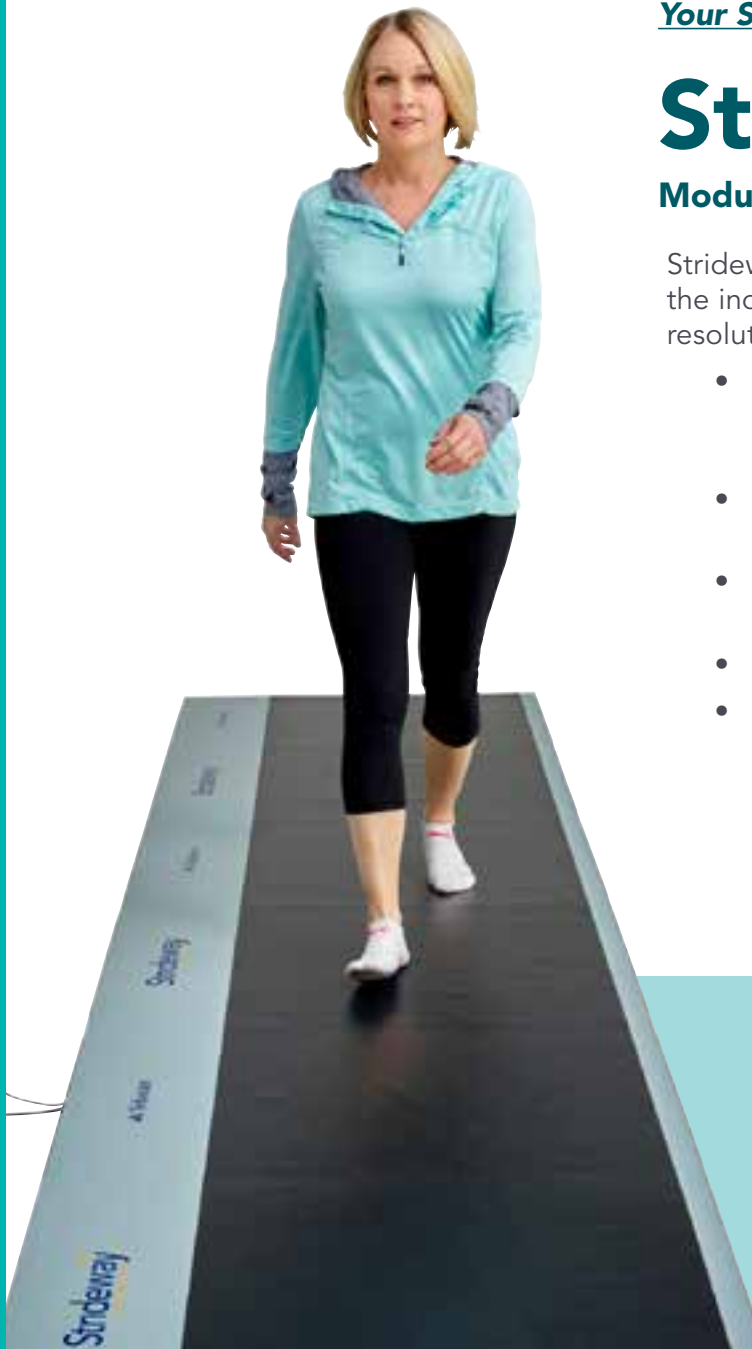


Strideway offers the ability to omit assistive devices like walkers and canes, improving the validity of your data collection.

RECENT HUMAN GAIT ANALYSIS RESEARCH WITH STRIDEWAY:

- [How does Strideway compare against force plate technology?](#)
- [How does Strideway compare to an In-Shoe system?](#)
- [How can carrying shopping bags contribute to lower back pain, strains, and sprains?*](#)

*This specific study used an earlier generation of the Strideway system called the "Walkway."





QUESTION: Are you seeking a solution to capture essential parameters for identifying animal lameness beyond visual observation?

Your Solutions Could be

Animal Strideway™ Modular Gait Analysis Platform



[Learn More!](#)

Are you evaluating dogs, cats, and similar sized animals, and need a **low-profile, quick-setup, and adjustable walkway system**? Consider the Animal Strideway

- Evaluates pressure and force per limb
- Provides automated calculation of an array of gait parameters

High Resolution Animal Walkway™ Low-Profile Floor System



[Learn More!](#)

Do you need a system with greater sensing resolutions to capture animals of all sizes -- **from rodents and birds, to hooved animals**? Consider the High Resolution Animal Walkway

- Offered in a variety of standard sizes to allow for multiple paw/hoof/talon strikes.

Hoof™ System In-Shoe Pressure Measurement



[Learn More!](#)

Are you specifically conducting research on **equine or large animal gait and ambulatory function**? Consider the Hoof System.

- Offers instant data at every critical gait phase, providing objective, quantifiable feedback to treat lameness, hoof, shoeing, and other disorders.
- Scanning speed of up to 100 Hz

RECENT ANIMAL GAIT ANALYSIS RESEARCH WITH TEKSCAN TECHNOLOGY:

- [Is visual observation telling you the complete story of gait dysfunction in dogs, and other quadrupeds?](#)
- [How does hoof trimming affect hoof kinetics and kinematics?](#)
- [How can gait analysis technology provide quantifiable data on the effects of animal pharmacology testing?](#)
- [Can jump tests provide evidence of animals suffering from orthopedic conditions?](#)



PRESSURE OFFLOADING

QUESTIONS: Are you seeking a method to identify & analyze function pathologies, and how they coincide with pressure & timing? Or, are you seeking a method to compare pre- and post-treatments, including validation of orthotic treatments?

Your Solution Could be

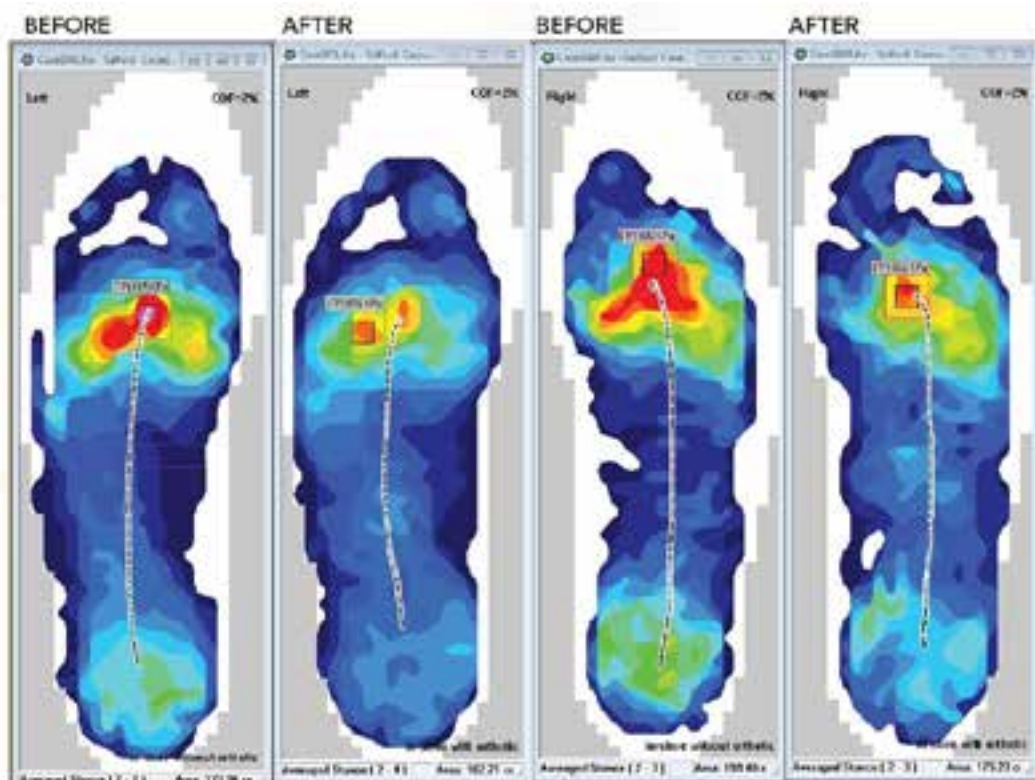
F-Scan™ In-Shoe Pressure Measurement System

[Learn More!](#)



Any podiatrist will tell you: There is no such thing as a one-size-fits-all method for orthotic selection. Nevertheless, F-Scan is a proven method to help optimize orthotics, and educate your subjects on plantar pressure distribution.

- Profile pressure distribution before and after orthotics are inserted
- Identify potential pressure “hot spots” within the shoe that could cause further complications
- Determine pressure is being off-loaded properly, and whether adjustments to the orthotic may be necessary
- Identify whether the orthotic changes behavior while the subject pivots, runs, jumps, or makes other dynamic movements



Screenshot from F-Scan software displaying pressure distribution in a trainer type shoe “before” and “after” an orthotic device was inserted. Red colors indicate areas of high pressure.

RECENT PRESSURE OFFLOADING RESEARCH WITH F-SCAN:

- [Is it possible to quantify plantar flexor strength in people with diabetic neuropathy?](#)
- [Can you measure the durability of plantar padding in reducing forefoot plantar pressure?](#)
- [Can you assess pressure redistribution of individuals before and after in-sole therapy?](#)



SEATING & POSITIONING

QUESTION: Are you seeking a method to measure pressure distribution and Center of Force (CoF) trajectory to develop an optimal seating and positioning design?



Your Solution Could be

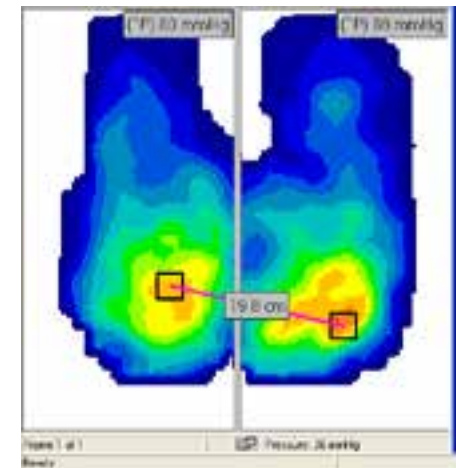
CONFORMat™

[Learn More!](#)

Body Pressure Measurement System

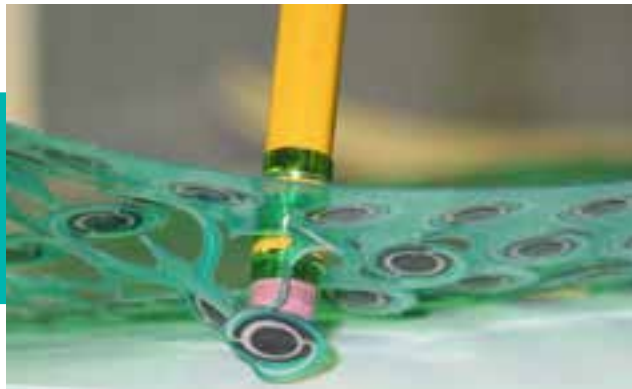
CONFORMat is an effective tool to measure and screen for high pressure areas that may be at increased risk for sores, ulcers, and wounds. A simple pressure mapping exam from CONFORMat can help prevent complications by providing objective documentation for treatment selections.

- Captures pressure magnitude readings at areas of highest loading and at the most complex curvature
- Validate materials for cushion design and supports
- Ultra-thin, flexible sensor design contains 2,000 sensing elements that can move independently from each other, providing the most accurate interface pressure measurements



CONFORMat identifies high-pressure areas and shows the effect of positioning changes.

The CONFORMat sensor is a matrix of individual sensing cells that effectively conform to the shape of the seat and subject.

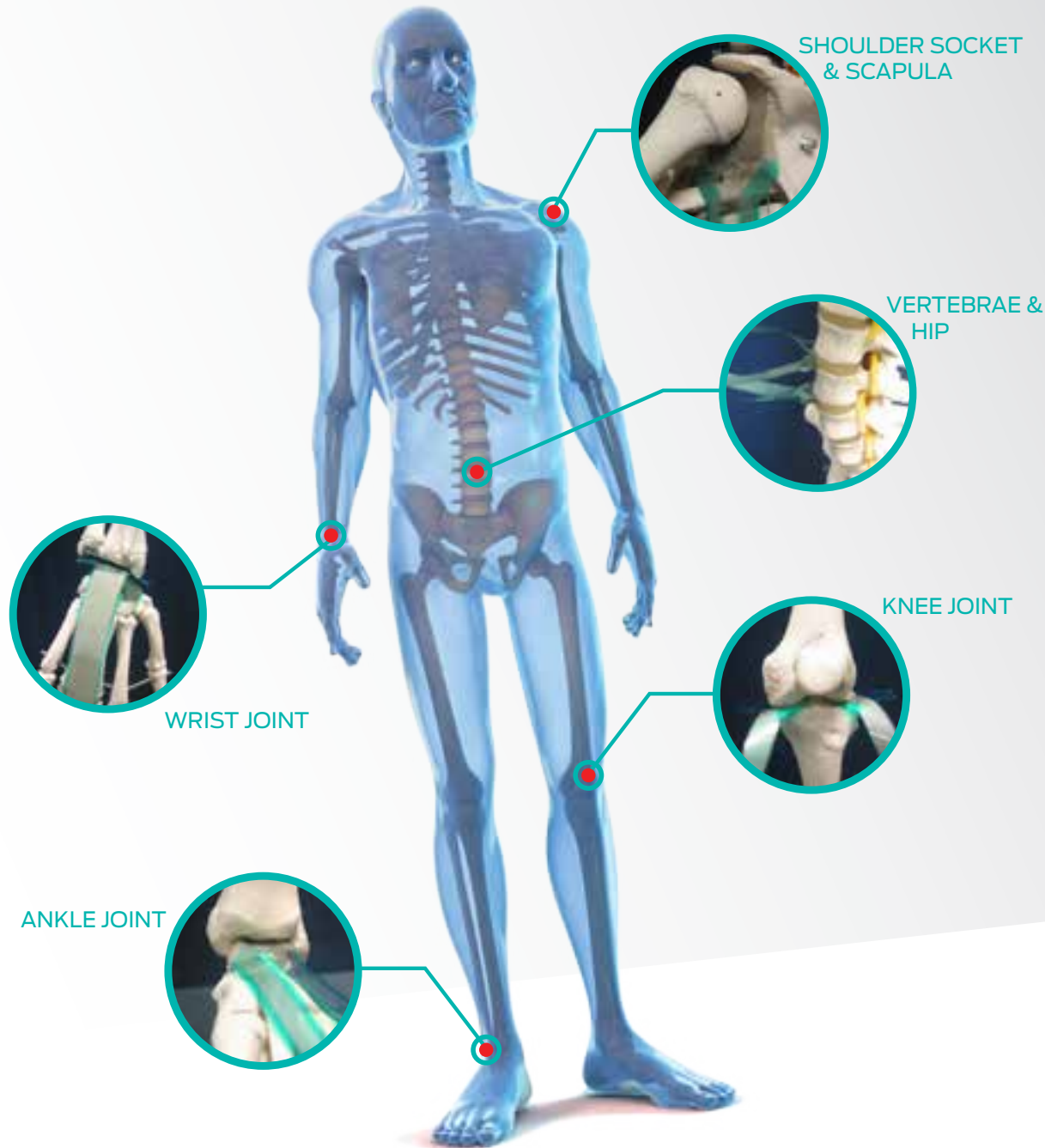


RECENT SEATING & POSITIONING RESEARCH WITH CONFORMat:

- [How can you measure the effectiveness of a physical therapy treatments of patients suffering from spinal cord injuries?](#)
- [What are the relations between sitting, balance, and functional recovery of stroke patients?](#)



QUESTION: Are you conducting cadaver studies to assess the loading and off-loading of articulating joints?



Your Solution Could be

K-Scan™ [Learn More!](#)

Joint Analysis System

K-Scan is used by researchers in cadaver studies to capture objective and quantifiable joint analysis data for both humans and animals. The system measures pressure, force, and contact area between adjacent articulating bones to provide a better understanding of how they are functioning, articulating, and loading.

- Multiple sensor designs offer the freedom to capture pressure data between nearly any two articulating surfaces
- View and assess the impact of various compartment geometries
- Assess the design and evaluate the function of artificial joints
- Provide data for finite stress analysis

RECENT JOINT ANALYSIS RESEARCH WITH K-SCAN:

- [What are the biomechanical effects of lateral bending position on performing cervical spinal manipulation for cervical disc herniation?](#)
- [What are the force transmissions through the pelvic joints during total hip arthroplasty?](#)
- [Which suture anchor-based techniques produce better contact pressure for shoulder surgery recovery?](#)



QUESTION: Are you seeking quantifiable data to conduct sway and postural stability, fall-risk, or concussion assessments?



MobileMat is a simple, convenient platform to perform in-depth analysis on balance, plantar pressure profile asymmetries, and dynamic weight transfer information that may be missed by visual observation.

Your Solution Could be

MobileMat™

[Learn More!](#)

Portable Pressure-Sensitive Platform

MobileMat is a lightweight, easy-to-transport, powerful pressure mat for static and dynamic assessments from virtually any testing location. This helps you obtain weight bearing information in an instant, while monitoring progress of your subjects.



- Conduct a wide range of objective balance tests, including single-leg, tandem, squatting, and foot function evaluations
- Measure sway and center of force over time
- Manage subject/patient pre- and post-treatment
- Develop advanced protocols for injury-recovery and goal-driven rehabilitative programs

RECENT BALANCE & STABILITY RESEARCH WITH MOBILEMAT:

- [What are the postural control deficits after repetitive soccer heading?](#)
- [Can balance be an assessment of health-related quality of life in people living with the HIV virus?*](#)
- [How does MobileMat compare to force plates in measuring balance and center of pressure \(CoP\)?†](#)

*This specific study used an earlier generation of the MobileMat system called the "MatScan."

†This specific study used a similar, higher-resolution platform system called "HR Mat."



QUESTION: *Are you seeking data to optimize the function of footwear design?*

Your Solutions Could be

F-Scan™ [Learn More!](#)

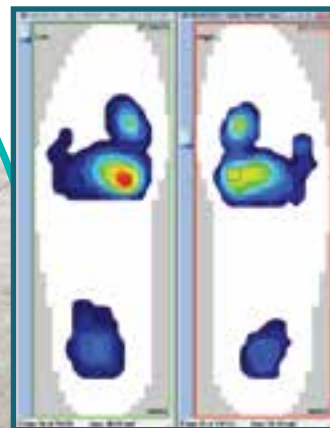
In-Shoe Pressure Measurement System

F-Scan is a useful method to develop the effects of footwear design by identifying areas of high pressure, giving warning to potential sources of discomfort to the user.

[This article](#) shares more detail on how shoe footwear manufacturers and shoe designers can use F-Scan in-shoe data to improve function and performance.

SIMILAR RESEARCH:

- [Can athletic shoe designs influence injury risk?](#)
- [Can traction performance be a measurable aspect in shoe design?](#)



F-Scan data shows the subject appears to apply more pressure to her left foot while walking.

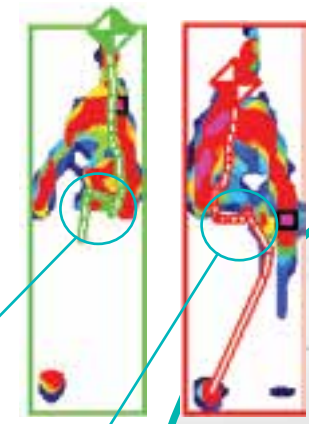
Strideway™ [Learn More!](#)

Modular Gait Analysis Platform

Because Strideway can measure plantar pressure, plus temporal (time), spatial (distance), and kinetic (movement) parameters, designers can obtain interesting insights on how a subject walks in different shoe types.

In fact, this [case study](#) shares a unique application where Strideway was used to compare center of force trajectories of a subject walking in different heel heights.

OR



Notice the shift in center of force as the subject must regain balance while walking with stilettos.





RETAIL FOOT MAPPING

QUESTION: Are you seeking an educational and engaging experience for your customers?

Your Solution Could be

Presto-Scan™ [Learn More!](#)

Foot Function Assessment Platform

Presto-Scan has the ability to measure foot pressure distribution while walking or standing. The system is independent of footwear or insole manufacturers/distributors, allowing you to stock any product and guide your recommendations accordingly. The simple user interface at an affordable price helps you focus on serving your customers.

- Gather objective insights to recommend or build custom orthotics tailored to address the specific pathologies of clients.
- Identify customer foot type, foot function, and weight distribution, guiding your customer to the ideal footwear for their needs
- Store client information on foot type and footwear preferences, helping you in your target marketing efforts.

The Dr. Scholl's® Custom Fit™ Orthotics Kiosk embodies a similar concept to the Presto-Scan platform. Retailers work with Tekscan to customize their system with any branding or data-capturing features they wish.



Presto-Scan employs a low-profile pressure measurement platform paired with engaging software to guide customers toward their ideal shoe or orthotics.

CONCLUSION

How Can Your Field of Study Benefit from Actionable Pressure Mapping Technology?

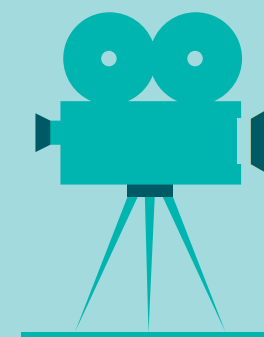
No matter your research goals, pressure mapping technology provides objective data for quantified analysis that delivers results. Unique insights from these systems help researchers identify asymmetries and abnormalities that may otherwise go undetected by visual observation.

For more ways Tekscan technologies have been used in human and veterinary research, review our extensive [up-to-date bibliography](#).

Let's start a conversation.

We at Tekscan understand the challenges researchers have when it comes to obtaining actionable joint pressure and contact data. Our representatives are standing by with tools to help you capture insights that will make your research a game-changer.

Visit www.tekscan.com/medical or call 1.617.464.4282 for more information.



Visit the
Tekscan Medical
YouTube Channel



CLICK HERE!