The Sole of Running: How Your Shoes Affect Your Performance

The Problem:

An athlete wanted to find the optimal running shoe that would maximize her running performance and reduce the risk of injury. She was interested in finding out how a shoe's weight, structure, and support affected her ability to achieve an optimal running style. To help her select the right running shoe, ViMove+ was used.

ViMove+ Running Assessment:

Using the ViMove+ Running Module, the athlete ran on a treadmill for two minutes in three different types of running shoes.

- Shoe 1: had a lot of structure and support
- Shoe 2: was a neutral shoe
- Shoe 3: was a lightweight racing shoe

During her treadmill run the athlete ran at 10mph and the data was recorded using the ViMove+ Live Training assessment.

Results:

After the athlete performed a ViMove+ Running assessment with each shoe, the data was collected and analyzed.

The table to the right lists the results of the athlete's ViMove+ Running assessment.

SHOE	CADENCE	ASI*a*	MEAN GRF*b*	IPA*c* (LEFT/RIGHT)	GCT*d*
Shoe 1	171sp/m	10%	1590N	5g/7g	231ms
Shoe 2	173sp/m	3%	1663N	6g/6g	226ms
Shoe 3	177sp/m	5%	1622N	6g/7g	225ms

GLOSSARY
a Absolute Symmetry Index: Percentage of asymmetry between GRF values of left and right legs.
b Ground Reaction Force: Average vertical force applied to the ground during the mid-stance phase of the gait cycle.
c Initial Peak Acceleration: Vertical acceleration and loading rate through the tibia when the foot strikes the ground at initial contact.
d Ground Contact Time: Period of time that the subject's foot is in contact with the ground between initial contact and toe-off phases of the gait cycle.

Discussion:

As the runner changed from a structure and support running shoe (Shoe 1) to a lightweight racing shoe (Shoe 3), her cadence increased and her biomechanics improved.

As cadence increased, her tibia landed more vertically producing a mid/forefoot landing as opposed to a heel strike pattern. Furthermore, her ground contact time reduced slightly.

This indicates an improvement in running mechanics as she is making better use of stiffness in the lower limb and elastic recoil mechanism of the soft tissue to help increase her speed.

Of particular interest was the athlete's feedback; her preferred shoe was that which produced the most symmetrical running patterns according to the ASI results (Shoe 2).

However, the preferred shoe produced the highest average GRF values compared to the lightweight racing show (Shoe 3), which indicates more loading force on the lower limb.

This may have been due to an improvement in gait efficiency produced by wearing the lightweight racing shoe over the preferred shoe.

Conclusion:

ViMove+ wearable sensor technology is able to identify sensitive changes in running symmetry, GRF, IPA, cadence, and ground contact time during an individual's run.
This information is crucial for runners who want to improve technique, maximize performance and reduce the risk of injury from running.