



## **Independent Biomechanics Study**

### Changes in Mechanics Utilizing Blumaka Konnect Insoles

#### **Terms of Use**

The enclosed research study was completed by a professional performance biomechanics lab. The purpose was to understand the positive effects on the body's movement with Blumaka's Konnect insoles as the only independent variable. Konnect insoles demonstrated the ability to improve the overall performance of the body in core athletic movements, spanning across all sports. Blumaka has the right to use and distribute the data from this report. Blumaka does not have the right to share or endorse the name of the lab or participating athletes without prior consent.

#### **Date Prepared**

September 30, 2022

#### **Purpose**

The purpose of this research was to understand potential changes in kinematics and kinetics due to using Blumaka insoles within the player's turf shoes.

#### **Methodology**

190 trials were used for the purpose of this research, with 90 trials in the dataset being those recorded using the insoles. The collections were conducted as the first set being without insoles, and the second set with insoles. Intent was monitored throughout to attempt to preserve reliability. Full body movement and force data were collected using 3D marker-based motion capture with integrated force plates. Kinematics and kinetics were calculated for each trial using the Visual3D Pipeline. Research statistics were used to understand the effect of the insoles potential impact on mechanics. The metrics identified for comparisons are those thought to be potentially influenced by the insoles, and are often related to performance.



## Results

### Force Production:

- **Back Leg Overall Force Production**
  - Measured as the resultant, or total force, the drive leg produced
  - 7 out of 10 players saw an increase
- **Back Leg Drive Force Production**
  - Measured as linear directional force, generally the most valuable
  - 7 out of 10 players saw an increase
- **Lead Leg Overall Force Production**
  - Measured as the resultant, or total force, the lead leg produced
  - 8 out of 10 players saw an increase

### Speed:

- **Linear Body Velocity**
  - Measured as how quickly the player moves in a linear direction
  - 9 out of 10 players saw an increase
- **Stride Length Percentage**
  - Measured as a percentage of the player's height
  - 9 out of 10 players saw an increase

### Acceleration/Deceleration:

- **Linear Body Acceleration**
  - Measured as how quickly the player accelerates in a linear direction
  - 8 out of 10 players saw an increase
- **Lead Leg Braking Force Production**
  - Measured as linear directional force, generally the most valuable
  - 8 out of 10 players saw an increase
- **Linear Body Deceleration**
  - Measured as how quickly the player decelerates in a linear direction
  - 6 out of 10 players saw an increase

### Stability/Efficiency:

- **Front Knee Extension Velocity**
  - Measured as how quickly the front knee extends after landing
  - 7 out of 10 players saw an increase
- **Front Knee Instability**
  - Measured as how much the front knee collapses after landing
  - 8 out of 10 players saw an increase
  - This potentially suggests that there was a decrease in loss of energy (Ideally this energy is then continually distributed somewhere up the chain rather than simply being lost)



## **Conclusions**

It was expected that a majority of the metrics selected would see an improvement due to the Blumaka Insoles. Throughout all selected metrics, it was observed that a vast majority saw improvements potentially as a result of using the insoles. Furthermore, it was observed that settling time into the front side occurred earlier potentially as a result of the insoles, helping the foot not continue sliding forward into the end range of the shoe. On the subjective side of things, it was visually observed that less slippage was occurring inside of the shoe. Additionally, the player's feedback was very positive throughout, and felt they were sticking and braking better. The majority of players that were tested continued to use the Blumaka Insoles while playing in games.

## **Additional Notes**

Generally, it was observed that the insoles may need to be half sizes larger than that of the shoe size. The reasoning being, if the sole is even slightly smaller than the shoe, the sole actually slips inside of the shoe, so while the foot isn't slipping on the sole, the sole itself could be slipping inside of the shoe. Additionally, the sole must be the only thing inside of the shoe, there cannot be orthotics or another sole in the shoe at the same time or could potentially limit return, and generally makes the foot too tall or too tight inside of the shoe. With a majority seeing improvements in overall back leg force production, the remainder of the metrics could have been influenced by this change, and is harder to prove it was solely a result of the insoles. There is no evidence suggesting that the insoles potentially limit or decrease player performance. It is important to note, that statistically only linear body velocity and stride length percentage were found to be significant improvements as a result.

## **Potential Limiting Factors**

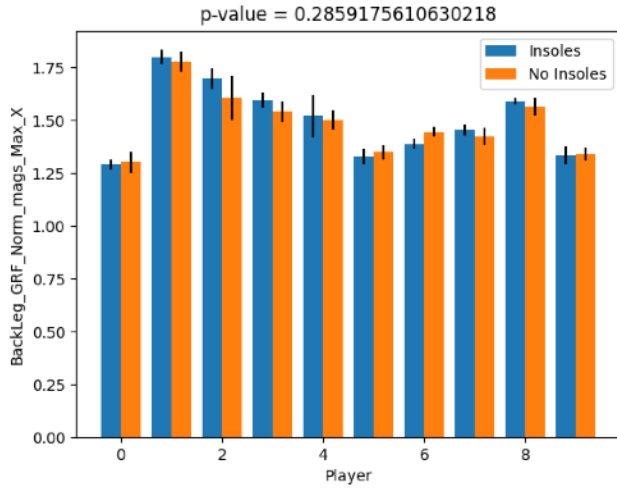
This test was performed on turf as opposed to dirt. Naturally, there is going to be more potential slippage on turf from the shoe than spikes on dirt and there could be some variability making finding general trends more difficult. In an attempt to combat this issue, turf shoes were required for this test.

## **Potential Follow up Testing**

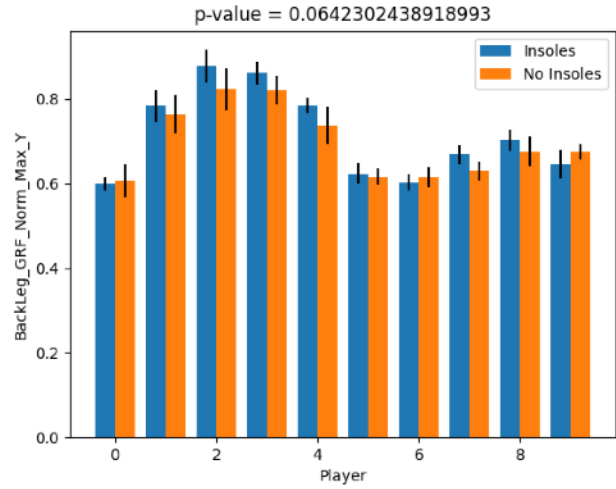
Monitoring in game changes in kinematics potentially as a result of the Blumaka Insoles by utilizing KinaTrax and observing any potential similar trends. Potentially creating customizable insoles for the player to ensure proper fitting within their shoe / cleat.



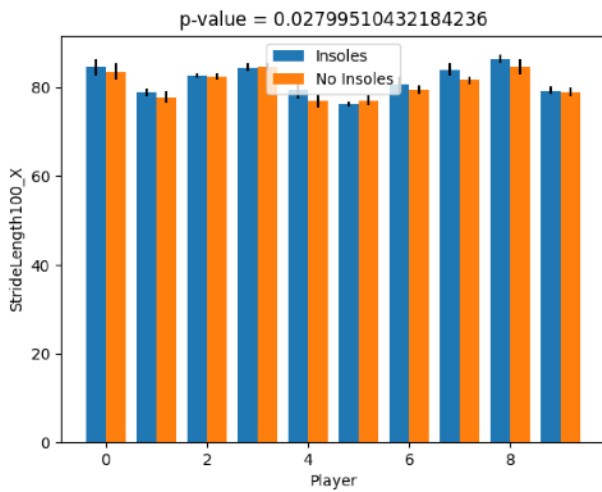
Lead Leg Braking Force Production



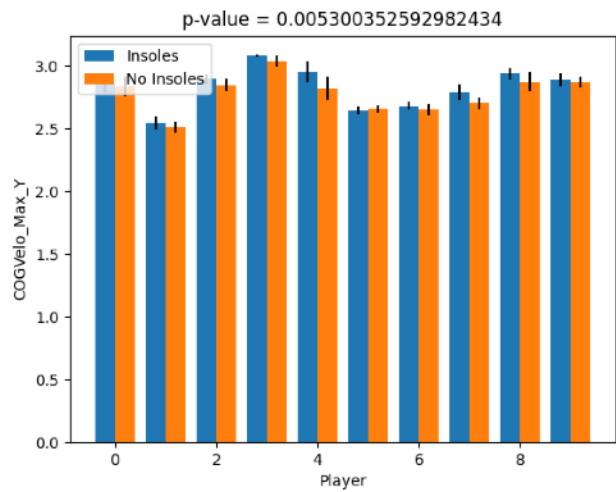
Linear Body Deceleration



Front Knee Extension Velocity



Front Knee Instability



Linear Body Acceleration

Lead Leg Overall Force Production

