DIAMOND SPORTS

Developing Your Swing From The Ground Up

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Balance, Direction, and Timing

DIAMOND SPORTS

Development and Design of the first ever biomechanically corrective baseball and softball footwear. The players will be specifically fit for the shoe based upon their LSHSC Profile that has been clinically proven to improve performance.

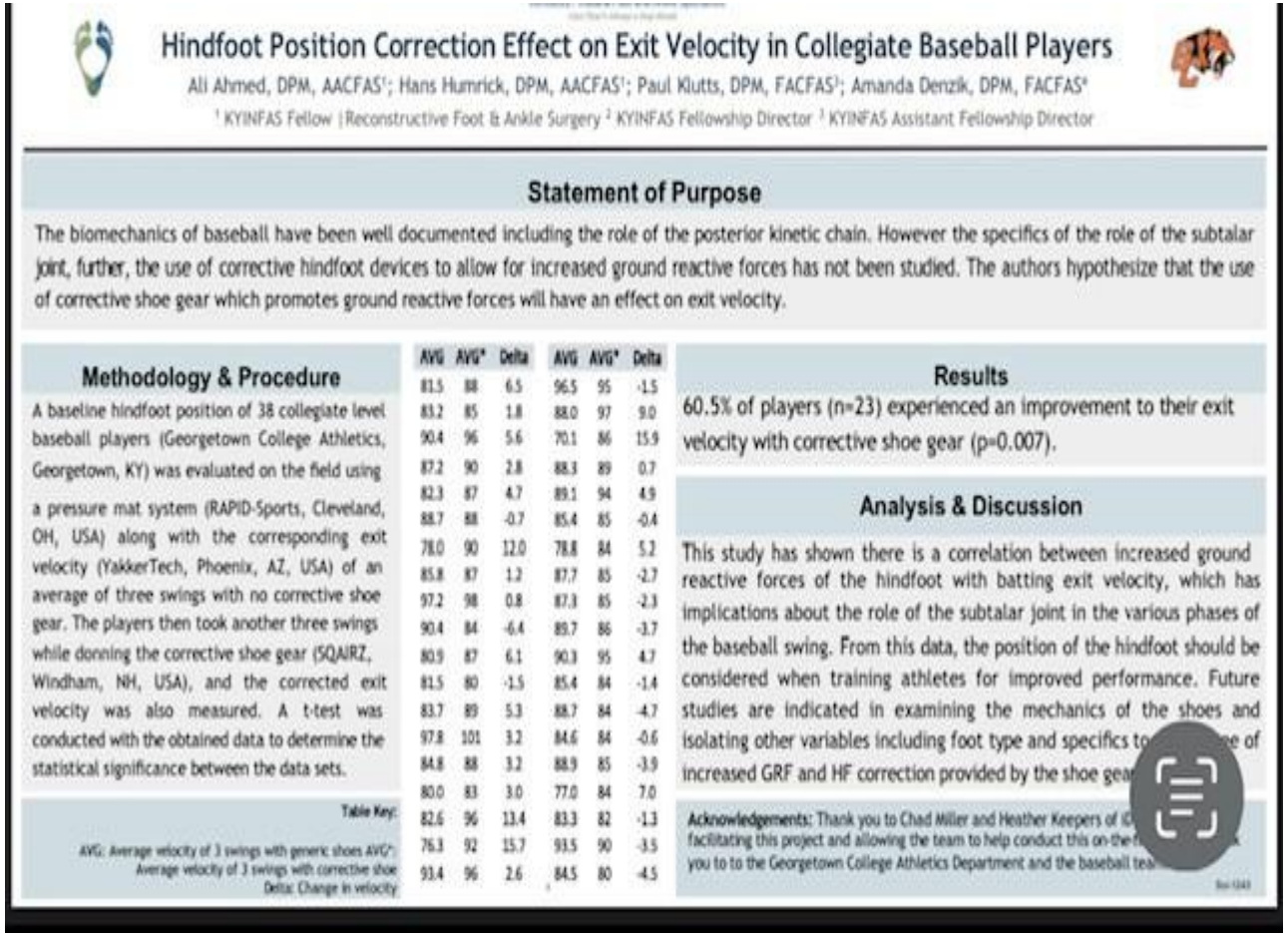
What the data shows:

Professional Hitters	**5.1 mph**
Collegiate Hitters	**4.3 mph**
High School Hitters	**3.5 mph**

DIAMOND SPORTS

ACFAS Study

- Sqairz is the first ever baseball performance shoe to be presented at the American College of Foot and Ankle Surgeons Annual Scientific Conference.
- **60.5%** of the players that put the shoe on without any additional coaching or instruction saw an increase in exit velocity.
- This increase in exit velocity was attributed to the players being able to establish better balance and stability due to the construction and design of the shoe.



Hindfoot Position Correction Effect on Exit Velocity in Collegiate Baseball Players

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Statement of Purpose

The biomechanics of baseball have been well documented including the role of the posterior kinetic chain. However the specifics of the role of the subtalar joint, further, the use of corrective hindfoot devices to allow for increased ground reactive forces has not been studied. The authors hypothesize that the use of corrective shoe gear which promotes ground reactive forces will have an effect on exit velocity.

Methodology & Procedure

A baseline hindfoot position of 38 collegiate level baseball players (Georgetown College Athletics, Georgetown, KY) was evaluated on the field using a pressure mat system (RAPID-Sports, Cleveland, OH, USA) along with the corresponding exit velocity (YakkerTech, Phoenix, AZ, USA) of an average of three swings with no corrective shoe gear. The players then took another three swings while donning the corrective shoe gear (SQAIRZ, Windham, NH, USA), and the corrected exit velocity was also measured. A t-test was conducted with the obtained data to determine the statistical significance between the data sets.

Table Key:

AVG: Average velocity of 3 swings with generic shoes AVG*: Average velocity of 3 swings with corrective shoe Delta: Change in velocity

AVG	AVG*	Delta	AVG	AVG*	Delta
81.5	88	6.5	96.5	95	-1.5
83.2	85	1.8	88.0	97	9.0
90.4	96	5.6	70.1	86	15.9
87.2	90	2.8	88.3	89	0.7
82.3	87	4.7	89.1	94	4.9
88.7	88	-0.7	85.4	85	-0.4
78.0	90	12.0	78.8	84	5.2
85.8	87	1.2	87.7	85	-2.7
97.2	98	0.8	87.3	85	-2.3
90.4	84	-6.4	89.7	86	-3.7
80.9	87	6.1	90.3	95	4.7
81.5	80	-1.5	85.4	84	-1.4
83.7	89	5.3	88.7	84	-4.7
97.8	101	3.2	84.6	84	-0.6
84.8	88	3.2	88.9	85	-3.9
80.0	83	3.0	77.0	84	7.0
82.6	96	13.4	83.3	82	-1.3
76.3	92	15.7	93.5	90	-3.5
93.4	96	2.6	84.5	80	-4.5

Results

60.5% of players (n=23) experienced an improvement to their exit velocity with corrective shoe gear (p=0.007).

Analysis & Discussion

This study has shown there is a correlation between increased ground reactive forces of the hindfoot with batting exit velocity, which has implications about the role of the subtalar joint in the various phases of the baseball swing. From this data, the position of the hindfoot should be considered when training athletes for improved performance. Future studies are indicated in examining the mechanics of the shoes and isolating other variables including foot type and specifics to [illegible] of increased GRF and HF correction provided by the shoe gear.

Acknowledgements: Thank you to Chad Miller and Heather Keepers of [illegible] facilitating this project and allowing the team to help conduct this on-the-[illegible] you to to the Georgetown College Athletics Department and the baseball team.

Overview

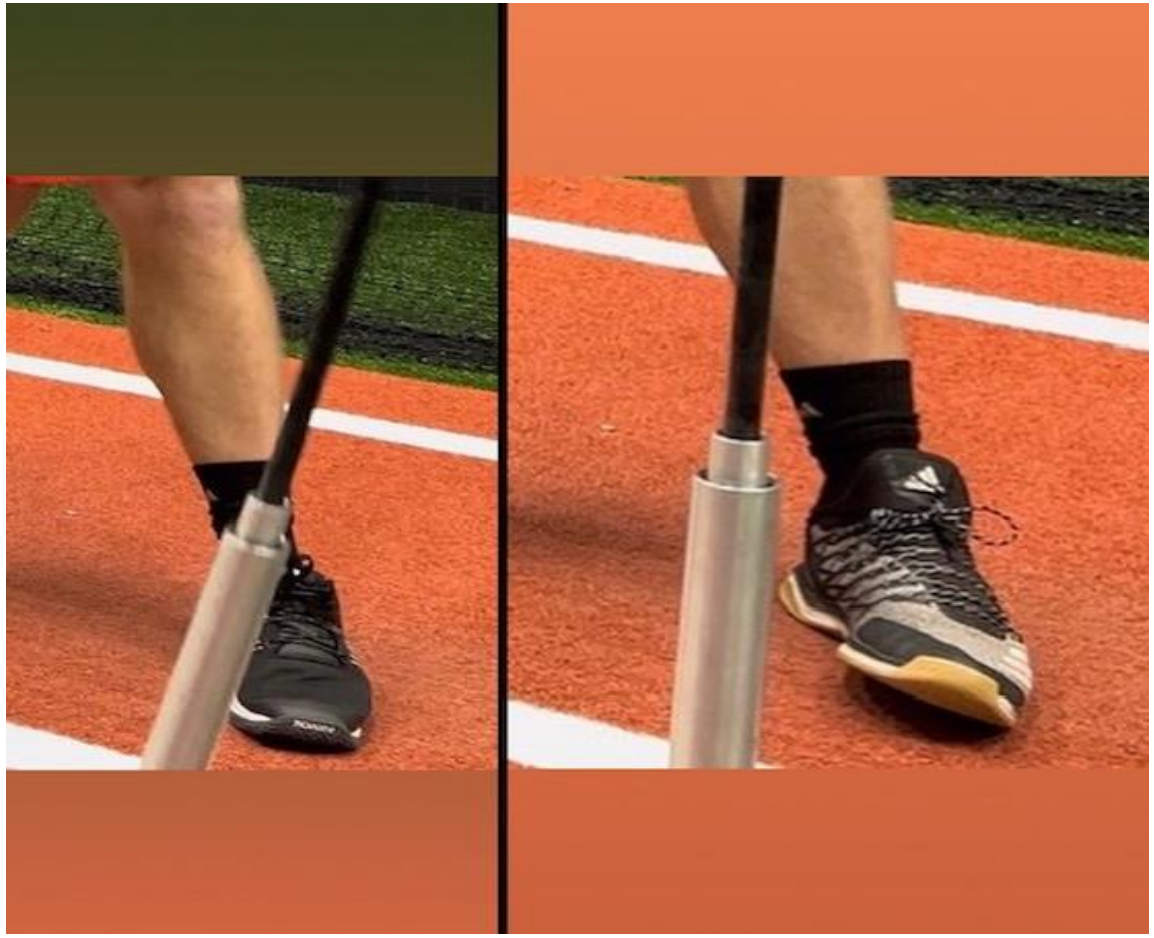
→ **Sqairz has quickly become the leader in scientifically designed sports footwear. Through the initial launch to the latest release of baseball and softball ground force optimizing shoes, Sqairz has cornered the market through patented technology to maximize athlete's performance.**

→ **Athletes can lose up to 11% of Kinetic Energy Transfer on the back foot and up to 8% of energy through the front foot.**

→ **If an athlete does not have proper balance and stability they will spend the majority of the time during their swing compensating to get back on balance.**

→ **Balance establishes Direction, Direction establishes Timing!**

96 mph vs. 86 mph



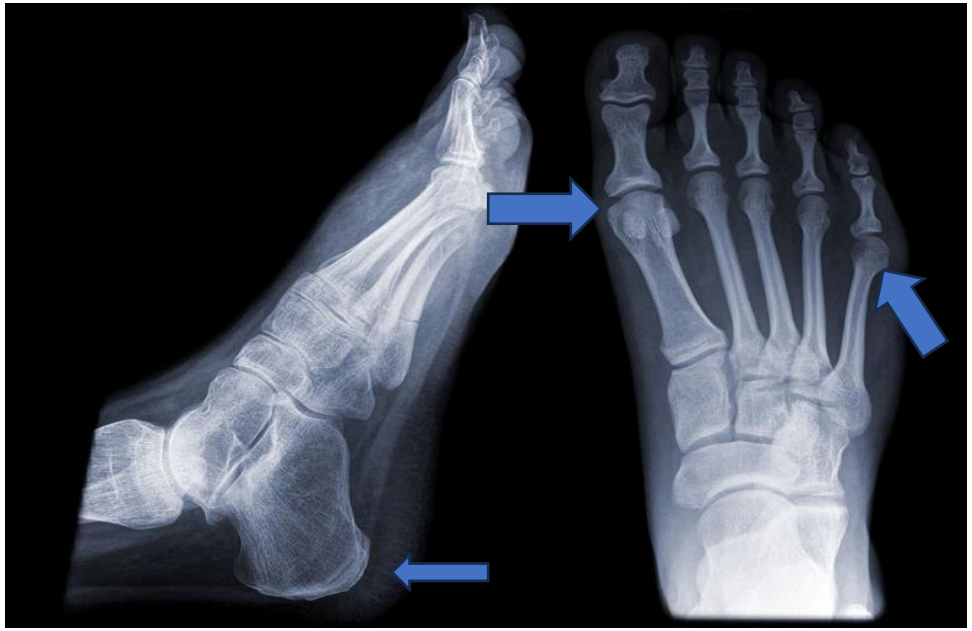
How the Shoes Work

- Assist the player in creating a neutral foot profile and establish three points of contact with the ground.
- Align the back side leg into a properly stacked position to create recoil and load into the glute.
- Reduce medial drift and create a solid center of rotational axis.
- Create a solid and firm front side by the reduction of supination of the front foot.
- Help the player eliminate kinetic and biomechanical inefficiencies.

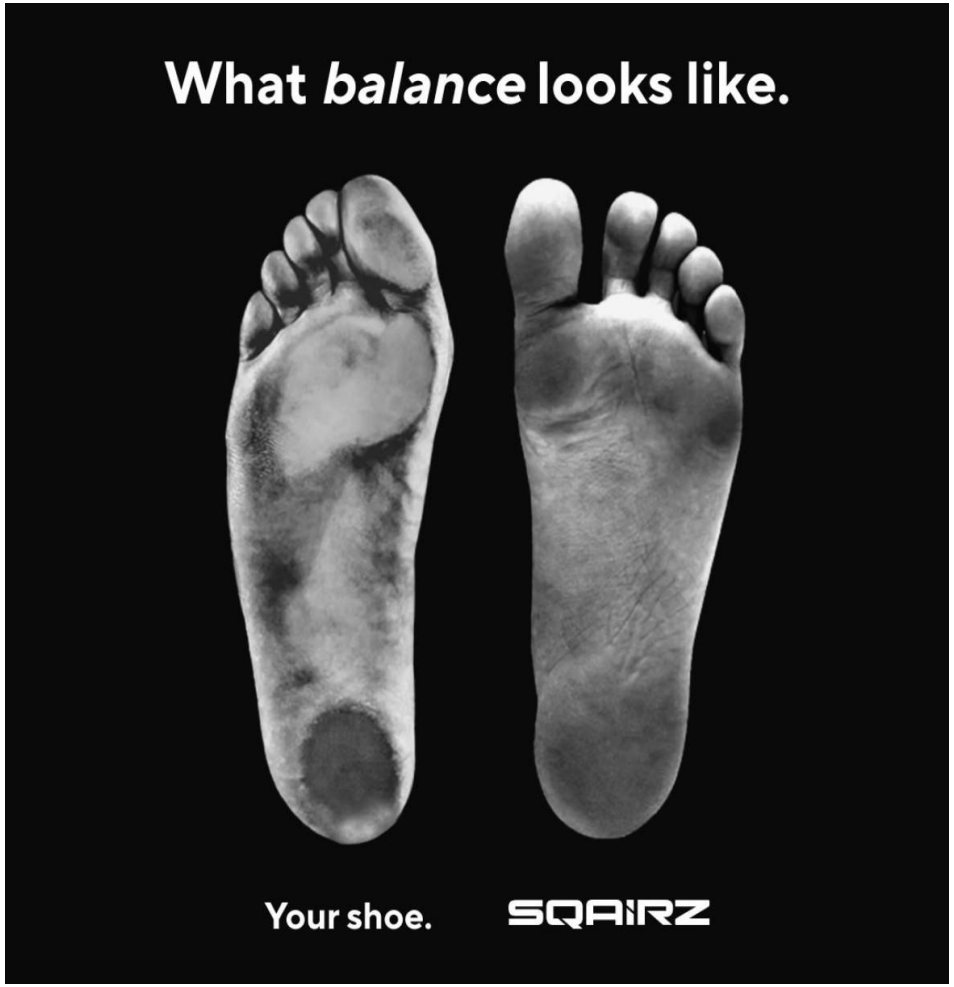
How Your Foot Works

Your foot is biomechanically a three-legged stool. The stools contact points are:

- ***The First Metatarsal Head (Big Toe)***
- ***The Calcaneus (Heel)***
- ***Fifth Metatarsal (Pinky Toe)***

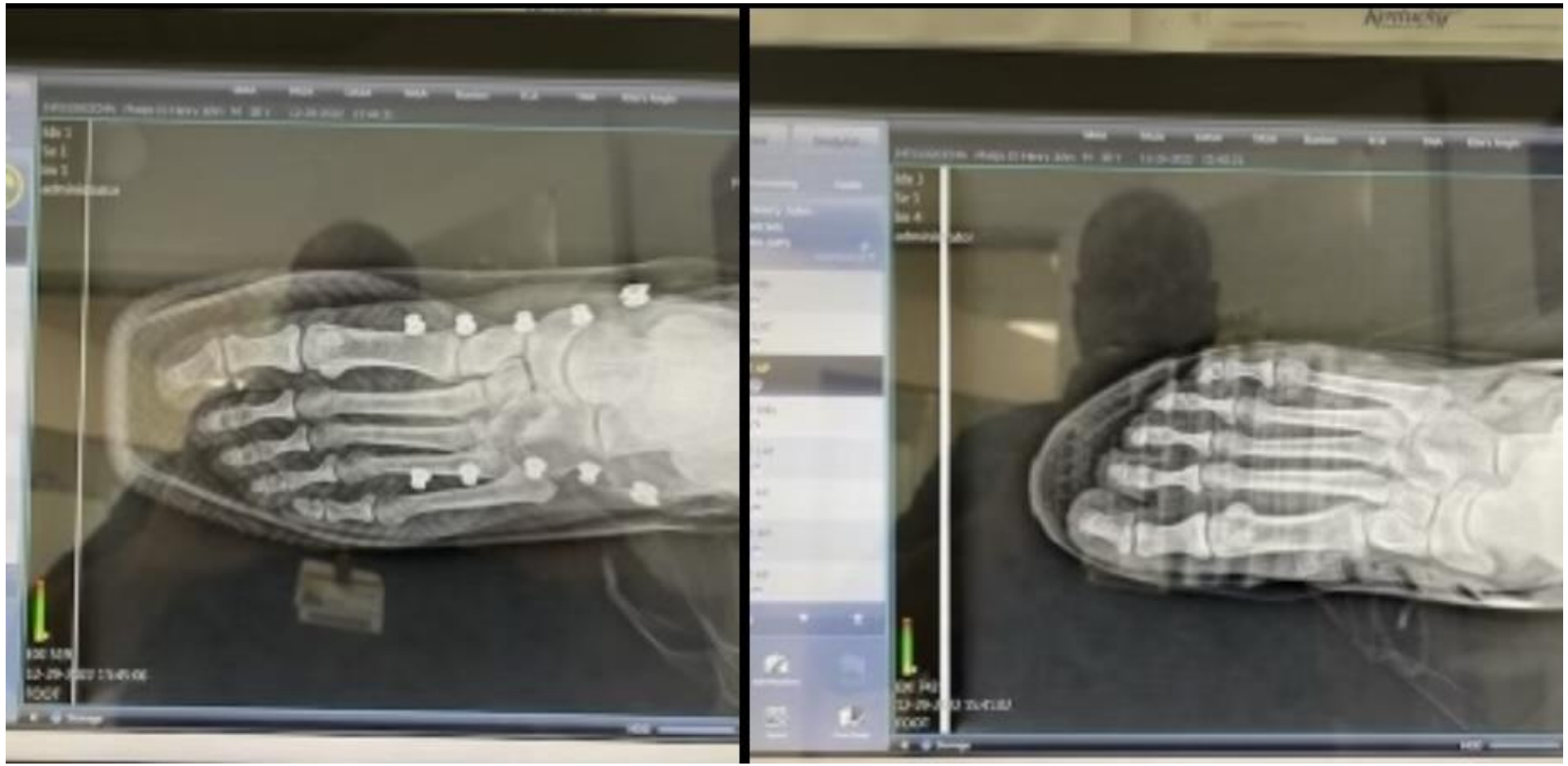


How and Why Toe Splay Works

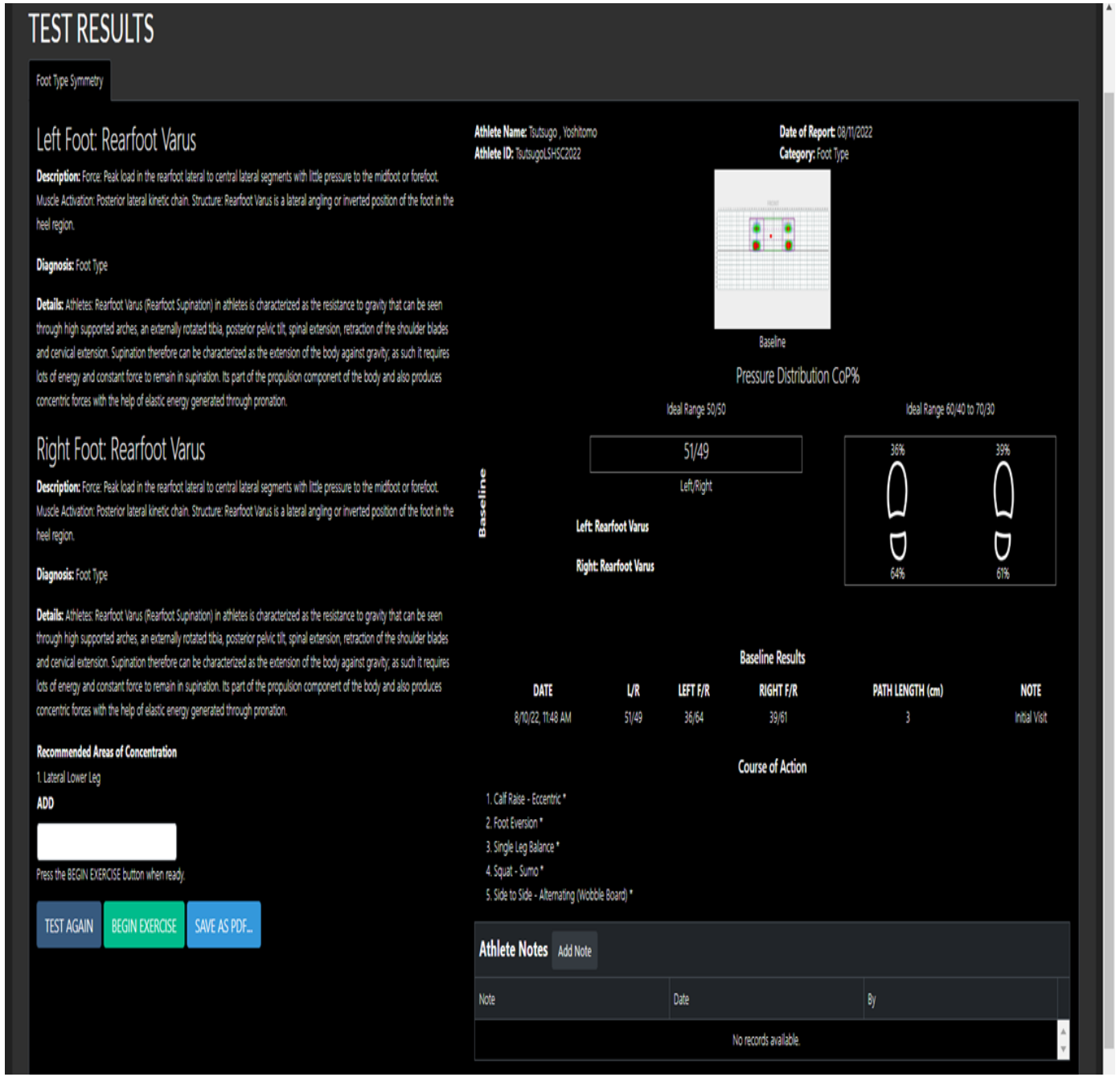


- **Establishing a Base** - When we accept weight onto the entire foot during the gait cycle, which is called midstance, the foot has to pronate in order to absorb shock. Now, I can hear some of you saying, "I heard pronation is bad for you!" Note, although we need foot and ankle pronation in order to walk, many people experience excessive pronation, which is not helpful. As the foot pronates to absorb shock in midstance, the metatarsal bones will splay, which triggers the deep transverse metatarsal ligament (DTML) that runs across the metatarsal heads that proprioceptively tells the foot to tell the brain "We're about to push off!" When this happens, the foot will then supinate to become a rigid lever to propel us forward.
- **Stability -** The plantar fascia, which attaches to the calcaneus (heel), the plantar plates, and the DTML, becomes rigid when the forefoot splays, so you're not only getting horizontal stability of the foot from toe splay, but you're also getting vertical stability from the plantar fascia. This all helps the foot become a rigid lever needed for push off with when walking and running.
- **Speed -** Most shoes are going to compress the toes together, which basically trains the foot to be slower and disconnected from the sensory trigger of the DTML. This can cause issues such as neuromas, plantar fasciitis, stress fractures, delayed stabilization at push off, and decreased force output of the foot. The intrinsic muscles of the foot – the muscles that originate and end in the foot – will basically shut down and your foot isn't going to be able to absorb shock. This will overwork the extrinsic muscles of the foot – the muscles like the calves that start in the lower leg and end in the foot – and it can also create stress fractures in the foot as well as in the tibia, or shin bone.
- **Increased Surface Area -** Fashion dictates shoe shape, unfortunately. But if you wear shoes that are as close to barefoot as possible, ones with a wide toe box, over time, you'll notice that your forefoot will actually spread out! When your foot is given the chance to be itself, it will take the space it can get. Some of you may say that you don't need a shoe with a wide toe box because you always buy shoes in "wide." However, podiatrist Dr Emily Splichal states that a "wide" shoe and a shoe with a wide toe box are two completely different entities. The last, or sole of the shoe, is very expensive to change for shoe companies, so what they do instead is change the depth of the sole, so it feels like there's more room widthwise, but there really isn't. In order to be able to splay the toes, or forefoot, you need a shoe with a wide toe box.
- **Sensory Output -** Better sensory input develops better motor output, so if you want better function from your feet, you have to use them and introduce them to different experiences, which develops new pathways to the brain. Wearing restricted footwear that squishes the toes together actually shuts down these pathways to the brain. Here are simple ways you can start gaining forefoot splay today:

Sqairz vs. New Balance

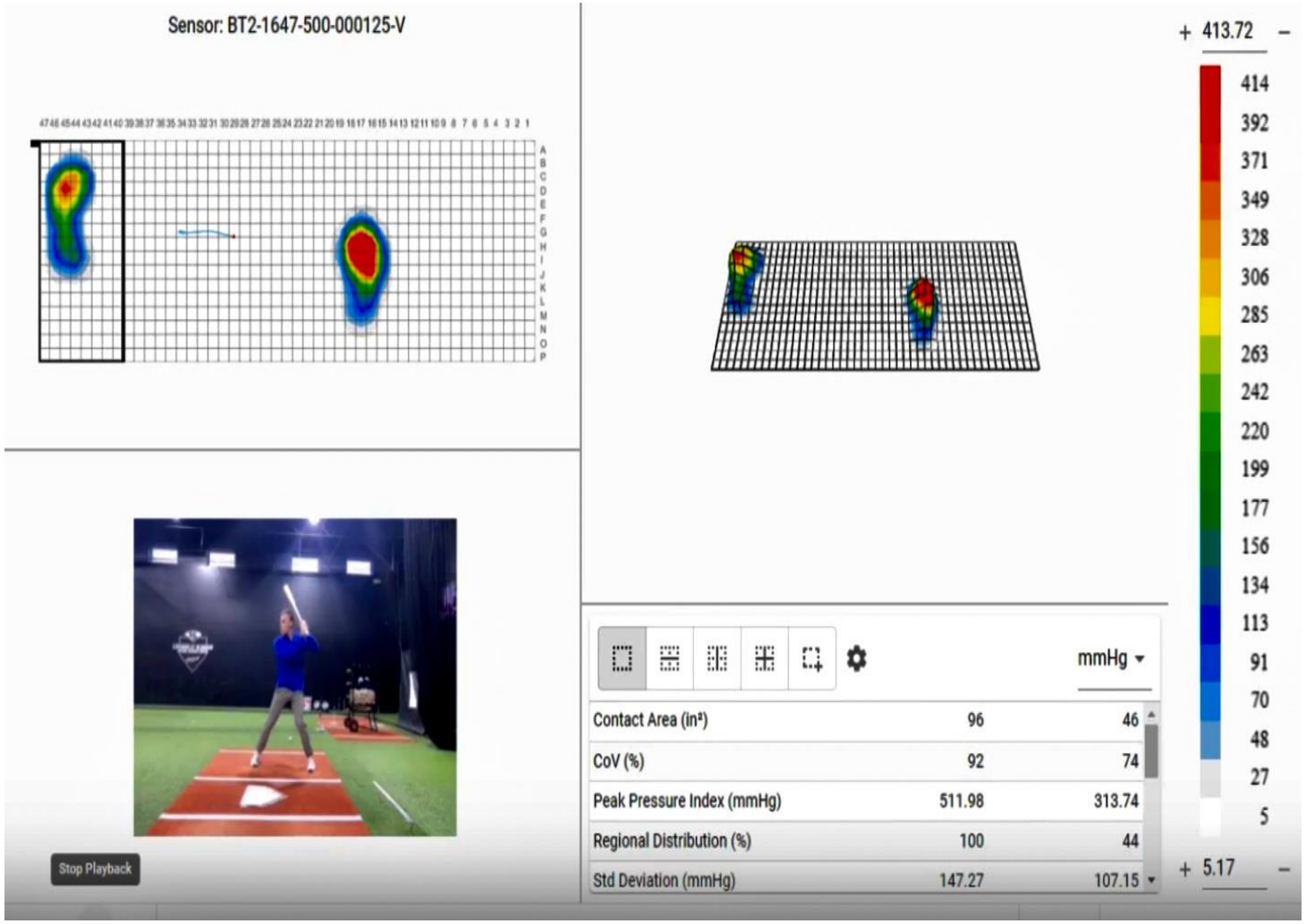


Biomechanical Assessment



Addressing the Leak Points

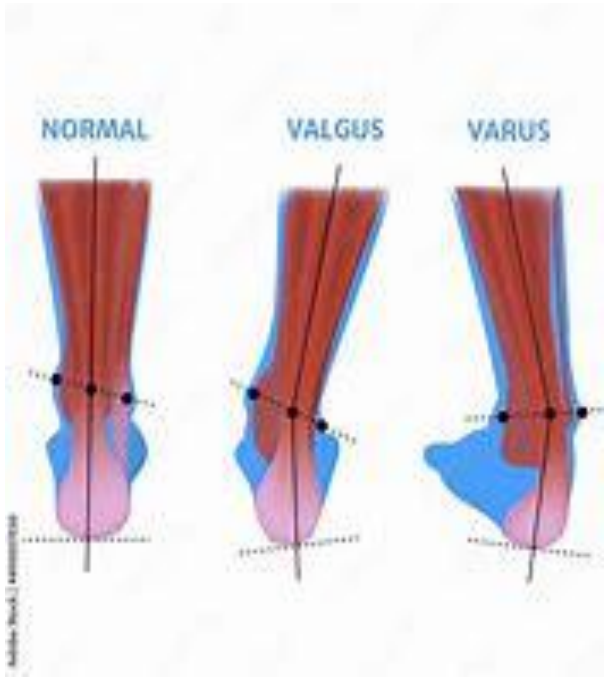
- In a 2022 Study, over 350 athletes were tested at the Louisville Slugger Hitting Science Center. The following leak points were consistently addressed in the swing:
- - Up to 11% of Kinetic Energy is lost through inefficient back leg loading patterns
- Up to 8% of Kinetic Energy is lost through an unstable front foot.

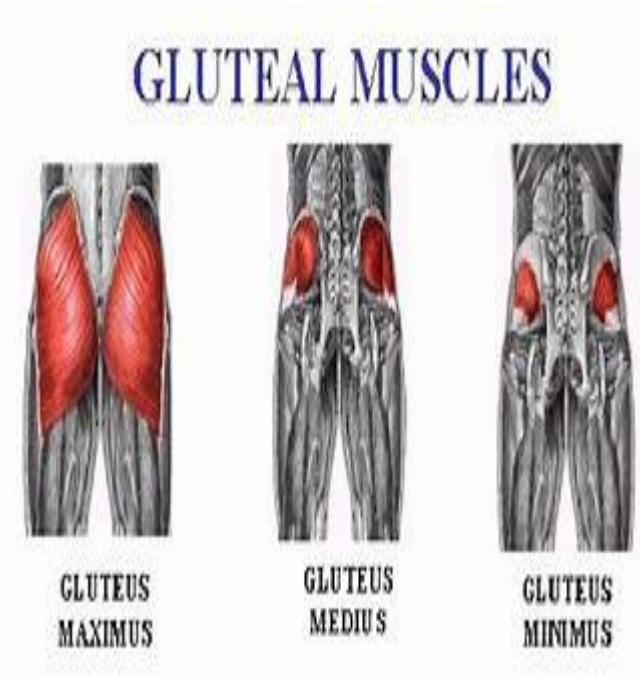


Translation into Baseball

Muscle Engagement and Imbalances

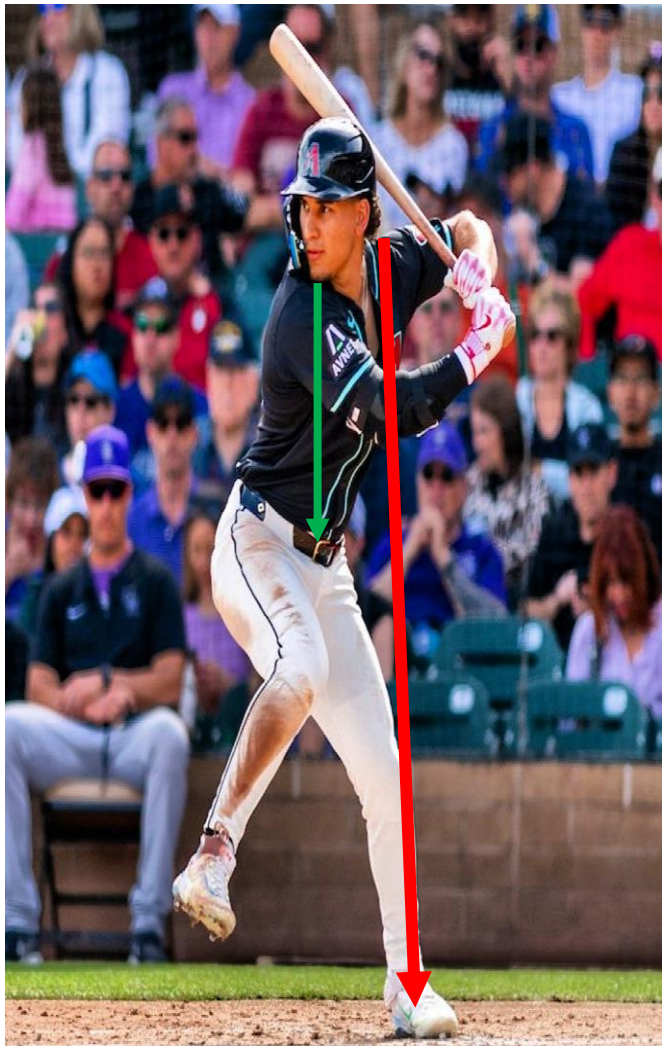
- **Valgus back foot** = Gluteus Minimus Engagement
- **Varus back foot** = Gluteus Medius Engagement
- **Neutral back foot** = Gluteus Maximus Engagement





Load – Creation of Power through Stability

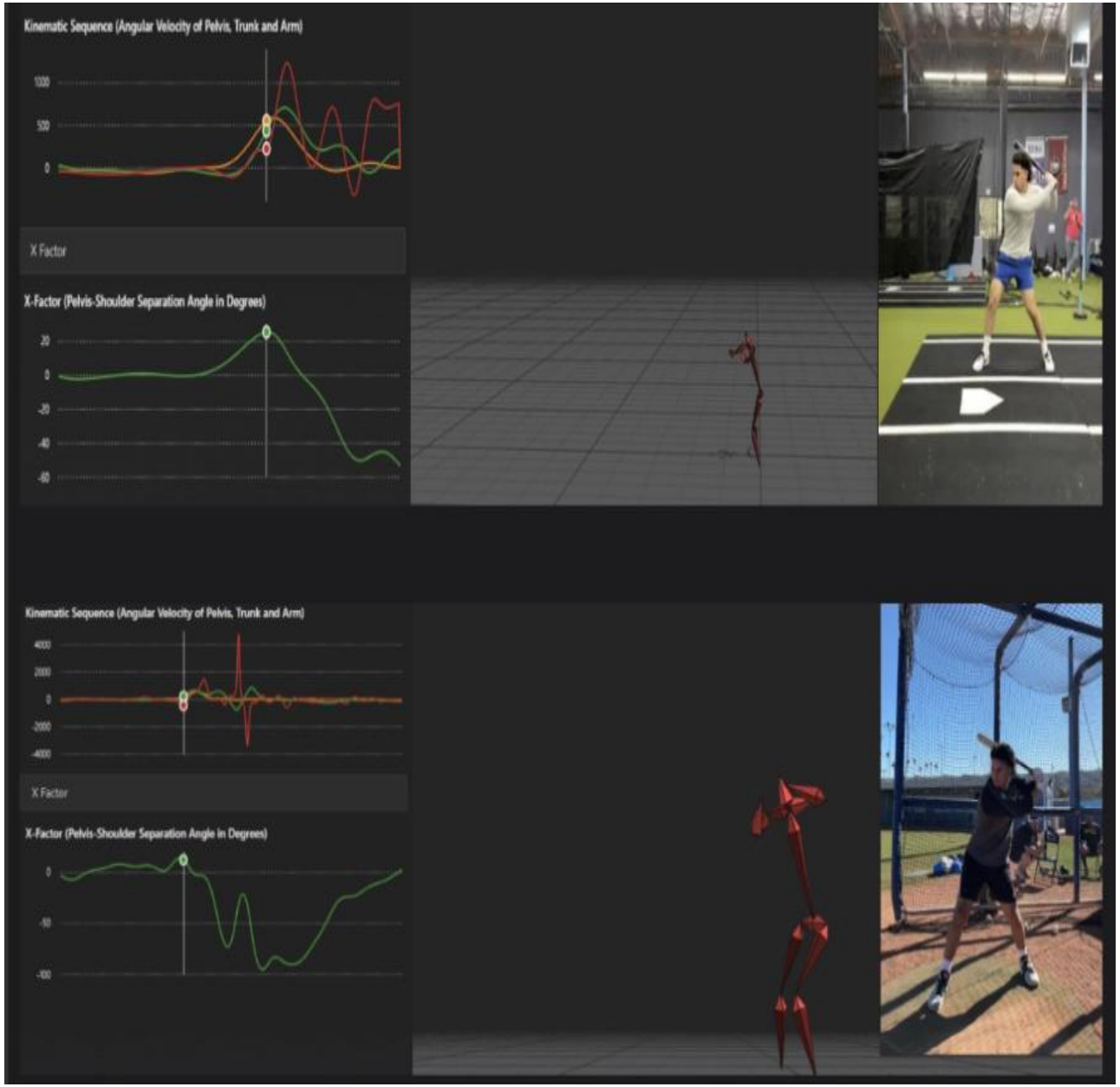
- Creation of Recoil to Load the Glute
- Establishing Stack
  - Shoulder above Hip
  - Hip above Knee
  - Knee above Ankle
- “Hard Butt vs. Squishy Butt”
- Chin above the Belly Button in an Athletic Position
- Creation of the Center of Rotational Axis (CORA)



Launch – Establishing the Optimized Athletic Position

- Balance in the front foot and back foot.
- Maintaining of Stack in the Core.
- Engagement of the left and right Glute Muscle Groups.
- Hands in a Cocked Position.
- Establishment of a strong CORA.
- Eyes in a set Field of Gaize

Kinematic Sequencing and Kinetic Energy Analysis



Attack and Contact

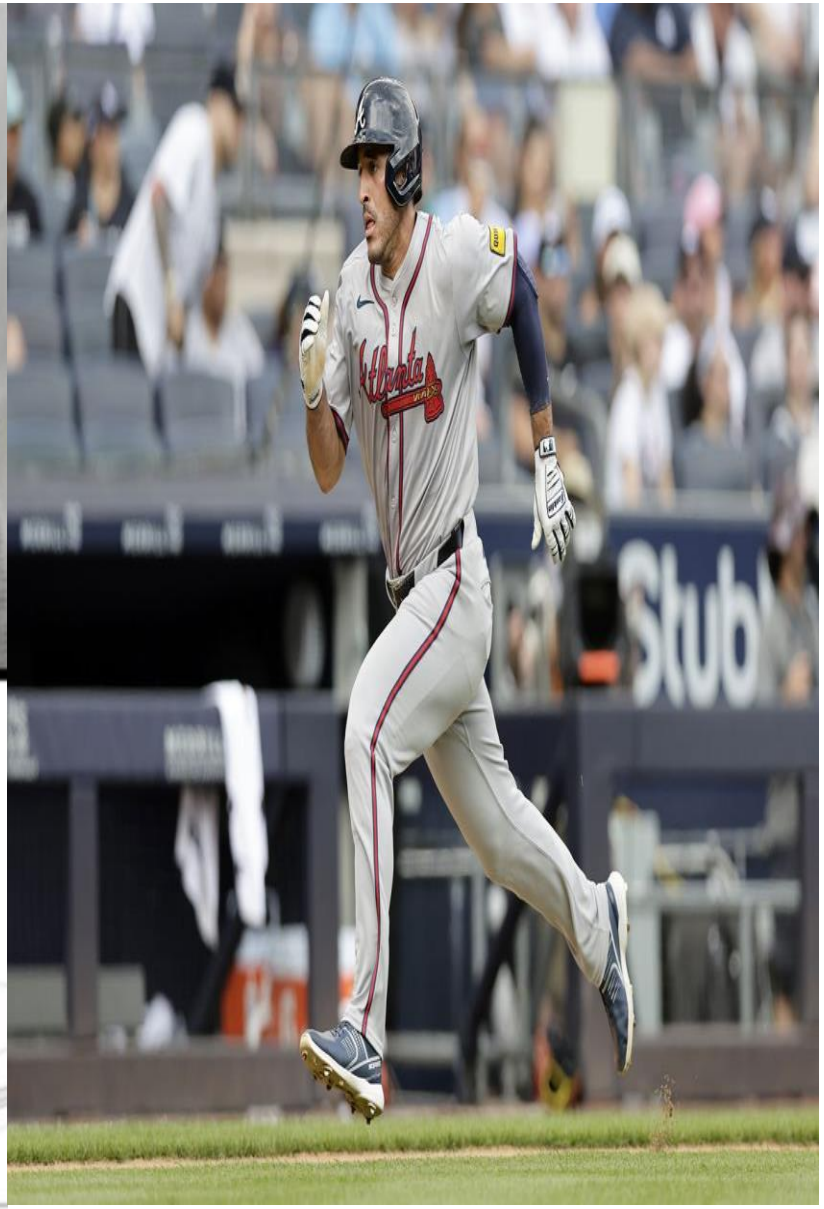
- Optimization of the Kinematic Sequence (Hips, Shoulders, and Hands)
- Front Foot in a Stable Position and Firm Front Side.
- Optimization of the Zone of Contact.
- “Efficient Transfer of Energy”

Proper Habits in the Weightroom and Cages

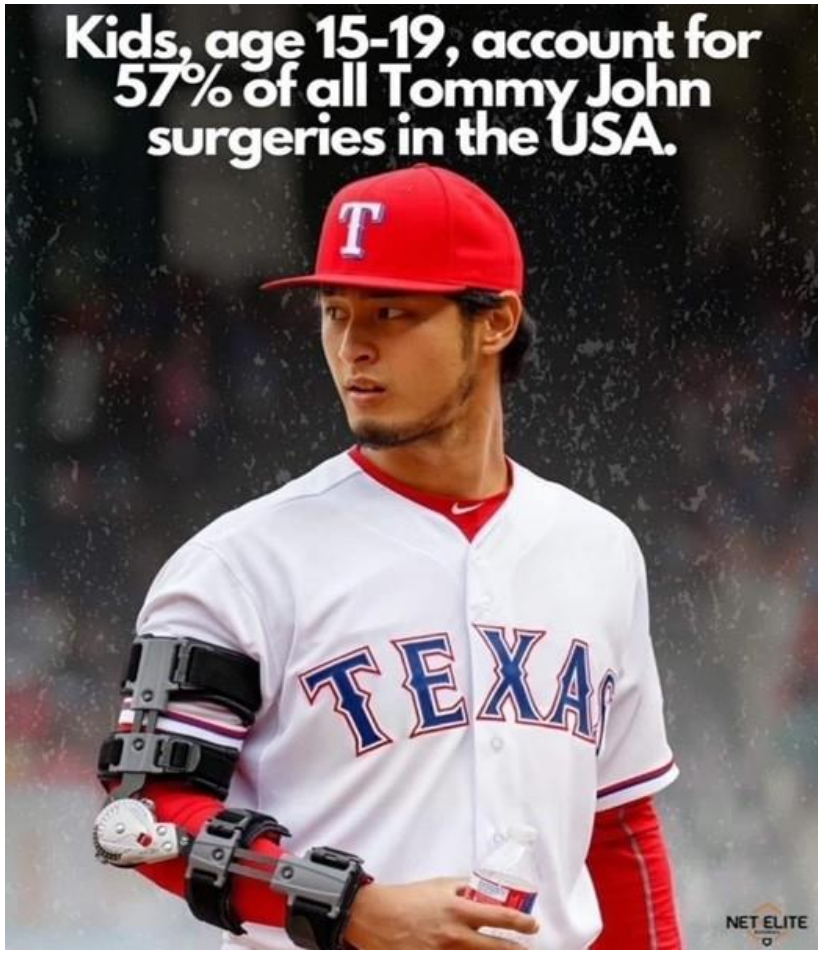
- The Sqairz Baseball GFP Training System teaches the athlete how to feel proper connection with the ground to optimize ground force production. Athletes also benefit from the Sqairz Baseball GFP Training System in the weightroom especially in such exercises as squats, deadlifts, split squats, and single leg movements to establish proper balance.
- By learning how to interact with the ground, players are able to properly stack in the weightroom setting as well as in the cage.
- As players choose to move into different types of footwear they develop a new sense of ground force awareness and Interaction.

"Learning through proprioception and feel!"

Where We Are Heading



Not only optimization, but also prevention!



The Direct Correlation between Varus Throwing Side Foot Varus Foot Profile and Ulnar Collateral Ligament and Nerve Injuries

Chad Miller
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February 13, 2024

Overview

The study of pitcher's biomechanical foot profile is an emerging space in the baseball market. Coaches are striving to help players achieve optimal throwing velocity numbers and teaching new techniques to achieve the desired results. However, many players struggle to establish a consistent balance point in their center of rotational axis which leads to a lack of stability and initial balance. This leaves the players chasing their CORA throughout their delivery and will ultimately lead to either sacrificing mechanics to be on time at the release point or they will simply be late and miss their desired target. In either scenario players can be put in compromised positions and the rate of elbow and shoulder injuries tend to increase.

The important point to realize is that these negative results are very easy to prevent and resolve. Many coaches are learning and teaching a technique that is called hinging. Hinging occurs when the player is trying to load the glute muscle group to generate recoil from the ground and store the energy in the Gluteus Maximus. The main issue with this teaching cue is that if the player has a Varus throwing side foot profile and they go into the sit position of the delivery that the first metatarsal will be elevated at the hip hinge due to the anterior tibialis tendon engaging as the weight distribution changes through the kinetic movement pattern of the act of the "Hinge" This will result in the player losing posture and they will then have to reestablish a balance point. Unfortunately, now in the delivery the pitcher is going to start his/ her positive move down the mound and towards the target.

At the time of landing of the front foot and due in part to the throwing side knee often drifting out over the pinky toe the player will lose the proper kinematic sequence and their shoulder rotation will jump forward in the sequence. This will result in the front side top half to get very extended and slow the rotational velocities. At this point the player will often use the head as a counterbalance due to the throwing arm dragging behind. This will result in the fulcrum point of the throwing arm to become the elbow. If the throwing side of the torso has contracted due to the lack of balance the fingers on the ball will slide under the ball and increasing the tension and force at the fulcrum point which is directly at the ulnar humeral joint (Elbow) and the Ulnar Collateral Ligament.

As pitchers throw over time in this condition players will suffer inflammation, tearing, and potential Ulnar Nerve Entrapments. All these issues can be not only fixed, but most importantly prevented.

Prevention

The simplest way of preventing the situation above is to teach the player get into a neutral position with their throwing side foot in the "Sit" position of their delivery. The neutral position of the foot is described as the First Metatarsal Head, Fifth Metatarsal Head, and Calcaneus is in contact with the ground at the same time. If the foot is evenly balanced, then each of these three points has even weight distribution. This will result in the player being able to create recoil into the ground and be able to produce the optimal amount of kinetic energy into the gluteus group of muscles. Ideally the player can store that energy in their Gluteus Maximus and then send that energy efficiently up the Kinetic Chain. When the player can do this efficiently, they will see their ability to create force optimized because they can accelerate and generate a tremendous amount of rotational velocity. The other by product of establishing balance is that the player can consistently keep their fingers behind the ball to maintain mass and a connection point for energy transfer.

Points of Correction

1. Initial Biomechanical Foot Profile Screening – Explain and coach the player on the importance of a neutral foot to enhance athletic performance through establishing a stack (Knee over Ankle, Hip over Knee, and Shoulder over Hip).
2. Establish a stable Center of Rotational Axis (Chin over Belly Button).
3. Educate the player on the importance of keeping a compact and athletic top half to improve on rotational velocities.
4. Explain the importance of being on time at release to reduce Ulnar Collateral Ligament load and strain.
5. Implement rotational power and speed training to make the players movement patterns more efficient.

Summary

Ulnar Collateral Ligament and Nerve issues can be dramatically reduced by proper balance and stability training. The process of injury prevention and maintenance starts by proper screening prior to throwing programs. Additional corrections can be made in the weight room and training room and not necessarily in the pitching lab. Further research will be conducted to confirm the theories discussed in this paper.

For more information about these topics please visit www.idevolution.com.

Improve your vision through your stability!

Kinetisense

Direct Correlation Between Swing and Miss Rate and Balance
Study of Balance Over Time and Field of Gaze

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June 17, 2024

Overview

Workload management in the baseball industry has been a popular topic of conversation over the past five years. In many situations, teams and organizations are utilizing technology such as Catapult, Whoop, and Polar Straps. Sports Medicine Experts have recently gone to Microdosing prescriptive workouts to mitigate any injuries and attempt to maintain strength.

Recent studies have shown that Microdosing is more detrimental than traditional four day a week in season programming. Strength degradation occurs as early as three days and athletes on microdosing programs have also been shown to have a higher rate of oblique and hamstring issues under higher stress situations. Due to these findings of higher rates of injury due to lack of endurance of the athletes there is a need to fully understand the causality of the injuries in these muscle groups.

By conducting a brief Risk of Fall and Gait study when the athlete arrives in the facility prior to activity the athlete can target and focus on deficiencies to optimize their performance that day. Coaches and trainers can be more aware of the athlete's daily status and objectively observing the athlete's profile over subjectively gaining information. This analysis of how to utilize the Pro Screen AI platform powered by Kinetisense will be the springboard for several new studies on individualized athlete optimization.

Method

This white paper will look at 20 college baseball players that are evaluated in a balance and gait motion capture study utilizing the Pro Screen AI platform powered by Kinetisense. The athletes were measured in a fall risk and gait study prior to participating in performance training session at 7:15 am and then measured again post workout at 12:00 pm. The athletes were then re-revaluated at 4:00 pm after the baseball technique training session.

Observations

Over the course of the study the participating athletes demonstrated a 29% increase in risk of fall and compromised gait between the initial 7:15 am scan the 12:00 pm scan. The athletes then increased an additional 8% of fall risk at the 4:00 pm scan. The total fall risk and gait score increased by a total of 37% over the course of the three scans on average. This means that the athletes participating in this study displayed 37% higher instability scores. The athletes also showed a 2.3 degree variance of eye tilt from the first to the last screening. The athletes also displayed a tendency to tilt to the dominant eye side on the eye level angulation.

Impact on the Athlete

These findings are very important on numerous fronts. The first area that impacts the athlete is that imbalance is one of the leading causes of lower extremity, abdominal, and lower lumbar injuries and days on the disabled list at the professional level. These imbalances can be from numerous reasons, however with the use of the Pro Screen AI platform powered by Kinetisense these issues can be identified early.

The second impact on rotational athletes is the loss of the Center of Rotational Axis (C.O.R.A.). When an athlete loses their C.O.R.A they lose their ability to optimize their rotational velocity throughout the hips, shoulders, and hands. The sequencing of these segments of the body is called the Kinematic Sequence. The Kinematic Sequence is the order of operations of how the body generates and delivers kinetic energy throughout a movement pattern. The establishment C.O.R.A is essential in being able to have a center point or an axis for the body to rotate around. If the body loses that center of rotation, then the body must compensate to regain balance to prevent the athlete as they rotate from falling or completing the activity at hand. This can lead to the athletes putting themselves in a position of vulnerability during the activity and lead to an increase in injury and poor performance. During this initial study the athletes were first tested in balance during gait. When they exhibited an increase in risk of fall they were then analyzed for their efficiency of the Kinematic Sequence. The Kinematic Sequencing study also showed that there is a decrease in efficiency of optimal rotational velocities when the athlete is fatigued.

The third and final area of impact that the Pro Screen AI platform powered by Kinetisense can impact particularly baseball and softball through the understanding of individual balance profiles surround susceptibility of the hitter to off speed pitches with shape later in the game. Hitters that showed display of fatigue tend to have eye level tilt towards their dominant side of 2.3 degrees on average. This is a significant finding due in part to the special recognition and depth perception of a pitch. For example, if a pitcher is throwing a breaking ball with 14 inches of vertical break and the hitter tilts their head by two degrees as the pitch is being delivered this can cause a perceptional miscalculation of an estimated two inches at the point of contact. This is even more apparent in right-hand hitters with right eye dominance and left-hand hitters with left eye dominance because the dominant eye is farther away from the pitcher at the point of release.

Target Markets

Listed in order of priority

- Travel Baseball
- High School Baseball
- College Baseball
- Professional Baseball
- Travel Softball
- High School Softball
- Adult Slow Pitch Softball

Retail Strategic Partner

Current College Partnerships

Current Travel Organization Partnerships

DIAMOND ALLEGIANCE

BBF

ROCHESTER Brewers

PDP

PIONEER *YOUTH BASEBALL*

Professional Players and Organizations (Organizations and Teams that are utilizing Sqairz in the systems)

Questions

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