TEAMBUILDR

FORCE PLATES FOR EVERYONE

A GUIDE TO IMPLEMENTING FORCE PLATES IN EVERY TRAINING SETTING

CHAD SMITH

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Force Plates for Everyone: A Practical Guide to Implementing Force Plates in Every Training Setting

Chad Smith

As strength and conditioning professionals, our dedication to enhancing our craft and optimizing training for athletes and clients has never been more achievable than it is now, thanks to advancements in technology and availability, such as force plates. If you're reading this, you've likely recently invested in force plates or are seriously considering it, seeking that extra edge. Rest assured, your investment will be immensely rewarding!

The increasing affordability and accessibility of force plates are revolutionizing how we approach strength and conditioning. By providing precise data on an athlete's kinetics and kinematics during movement, force plates empower us to tailor individualized training programs with unparalleled accuracy. Whether you're working with collegiate athletes, high school students, or clients in a private setting, integrating force plates into your regimen can yield remarkable benefits. From optimizing training protocols to pinpointing areas for improvement and tracking progress over time, the insights gleaned from force plate data enable us to elevate performance levels effectively.

By investing in force plates, you're not only embracing cutting-edge sports science but also demonstrating a commitment to delivering the highest standards of training excellence. This is an exciting time for strength and conditioning, and the incorporation of technology like force plates promises to revolutionize how we approach athletic development, fostering greater success for athletes and coaches alike.

When discussing Force Plate technology, the initial assumption is that it will be used as a Sport Performance Tool. However, I offer a different perspective – I see it as a tool with vast applicability across all populations; the context determines the outcome. Currently, I work in the private setting at Midtown Athletic Club, catering to a diverse client base spanning from young athletes to older individuals aiming to sustain a healthy lifestyle as they age. Integrating force plates into our program has proven transformative for individuals of varying ages, abilities, and goals. It has revolutionized my programming approach. While I acknowledge that I've only begun to scratch the surface of its potential, there's a wealth of untapped possibilities within the data it provides. If you're still reading, chances are you're seeking a foundational understanding of how this technology can benefit you. I aim to illustrate how I've successfully integrated it into my setting, in the hopes that you'll gain actionable insights to implement in your practice immediately.

Starting with data analysis can indeed feel overwhelming, with a plethora of information to absorb. It has taken me some time to grasp and effectively apply it, but with invaluable guidance from exceptional coaches and resources, I've begun piecing it all together. I recommend beginning modestly by selecting 2-3 Strategy, Output, and Driver metrics (as listed below), then delving deep into their significance within the context of a jump. As your comprehension grows, gradually expand the scope of metrics you track. Understand the nuances of these metrics and how they contribute to overall performance. Implement interventions in the weight room aimed at enhancing these metrics. It's crucial to take ownership of your data and its interpretation. Additionally, I highly recommend Daniel Bove's book, *"Takeoff: A Visual Guide to Training and Monitoring Lower Body Power."* This resource has been instrumental in refining my understanding of data analysis and its practical application. It's an invaluable asset that is sure to provide clarity and guidance as you navigate through your data-driven journey.

Strategy	**Driver**	**Outcome**
Counter Movement Depth	Braking Net Impulse	Jump Height
Time to Takeoff	Propulsive Net Impulse	Force at Minimum Displacement
Impulse Ratio		Braking RFD
		mRSI

If you're new to this technology, again, this can be a lot. So I will do what I can to define these in my terms and how I see them through my lens, and how it drives my programming. I think it's important to note that these definitions do not come from Hawkin Dynamics (the company I use) themselves. I'm making a concerted effort to avoid misrepresentation. Nevertheless, the team at Hawkin Dynamics, including Drake Berberet, Oliver Watson, Cat Moss, and Dr. Jason Lake has been incredibly supportive whenever I seek guidance. Their customer support is second to none! My understanding of these metrics has been shaped through insightful discussions with the Hawkin Dynamics team, Daniel Bove's book, and conversations with esteemed coaching peers like Jose Catano of Catano Performance, and Teofe Ziemnicki from Teambuildr. Their expertise has been invaluable, and I'm deeply grateful for their generous sharing of time and knowledge.

Disclaimer: As I delve deeper into understanding the capabilities of force plates, I've come to realize that context is key, and there's not always a clear-cut distinction between "good" and "bad" numbers. While I aim to provide definitions and break down these metrics in a meaningful and actionable way, you'll likely discover in your learning journey that each metric contributes to a larger narrative. Recently, I had a conversation with Dr. Jason Lake who aptly stated, "Biomechanics is a language that allows us to tell movement stories." I love that! Every metric we analyze tells a unique story, and as professionals, it's our responsibility to interpret that story and prescribe interventions to enhance it, much like an editor would for an author. It's worth noting that not every story requires "improvement" – sometimes, it's simply a matter of monitoring and making minor adjustments as needed.

Strategy Metrics:

Counter Movement Depth: Think of this as a runway at an airport. A longer runway (more depth), allows ease into takeoff and more time to generate higher forces. A shorter runway requires more acceleration to obtain the same takeoff velocity & high forces. This is a metric that can be looked at to identify fatigue levels as well. We can identify an individual's strategy with this metric as more depth than normal could be a result of soreness, fatigue, etc. Use this metric as well to help give context to a jump. For instance, if a client of yours has a faster Time to Take Off and a higher-than-normal Braking RFD, chances are they have a shallower depth. This should help you start to uncover an athlete's strategy for that day and if they are feeling fatigued, etc.

Time to Takeoff: First movement from the "quiet phase" to take off. The quiet phase is a brief period where you're standing still on the plates and it is measuring an individual's mass. A false start (not standing still during the quiet phase) can skew data like mRSI and readiness because time to take off is part of the equation. Time to takeoff can help Identify meaningful changes from the start of the movement (force over time) as a result of training. In most instances, more force applied in a faster time is beneficial. A nice tool I stole from Coach Daniel Bove is Peak Braking Velocity with a target number of -1.2m/s. An athlete feeling unmotivated or sore might demonstrate a slower velocity. This would impact their Time to Takeoff. Conversely, as we will talk about later, an athlete who cannot achieve this velocity might not physically be able to handle the forces at that velocity (which is where training interventions can come in handy).

Impulse Ratio: The Impulse Ratio refers to the ratio between Braking Net Impulse and Propulsive Net Impulse. In practice, I typically aim for a 2:1 ratio (propulsive to braking), although it's important to note that this is my approach and may not always align with best practices to set a specific numerical target. Depending on an individual's sport or position, a different ratio may be more desirable. Generally, I prioritize reducing time spent braking (while increasing force) and increasing an athlete's propulsive net impulse (Braking Net Impulse too). This metric offers insights into an individual's jumping strategy, indicating whether they dedicate more effort to braking or propulsion. Training can significantly influence this ratio, allowing us to monitor progress and adjust training accordingly. While I occasionally find myself drawn to specific numerical targets, it's crucial to consider the context with each client to determine the most appropriate approach for modifying their jumping strategy.

Driver Metrics:

Braking Net Impulse: Braking Net Impulse refers to your braking capacity, similar to the brakes on a vehicle. I often illustrate this concept to clients using the analogy of whether they possess the braking power to halt a semi-truck or merely a tricycle. Alternatively, it can be likened to the ignition of a rocket booster. Generating significant eccentric force primes the body to leverage elasticity for additional energy (utilizing the stretch-shortening cycle). Having more robust brakes can enhance jump performance and agility during changes of direction.

Propulsive Net Impulse: Consider This the size of your rocket booster. A larger impulse translates to higher takeoff velocity and ultimately greater jump height. Factors such as unweighting, eccentric yielding, high braking forces, and forces at zero velocity all influence the magnitude of the propulsive impulse. Facilitating an individual's ability to exert more force in less time enhances performance. Similarly, enhancing eccentric braking force in a shorter duration enhances the ignition of that rocket booster, burning faster and hotter. Improving the concentric or propulsive side of the equation essentially provides a larger rocket for the individual.

<u>Outcome Metrics:</u>

Jump Height: (KPI) The vertical jump serves as a measure of an athlete's capacity to accelerate their mass against gravity. While it's a useful tool for tracking improvement over time, it doesn't provide the complete picture. At a micro level, an athlete may demonstrate consistent concentric output (jump height), yet experience fatigue eccentrically. Assessing metrics such as braking, time to take off, mRSI, CMJ Depth, and Peak Braking Velocity in conjunction with Jump Height, offers a more comprehensive understanding of the athlete's condition on a given day, providing valuable context to their performance.

Force at Minimum Displacement: Essentially a result of the braking phase, this refers to the brief moment at the bottom of the Counter-Movement Jump (CMJ) that marks the transition between braking and propulsion. It represents the dynamic force an individual generates at the end range of motion. End range of motion in sports and change of direction (COD) movements are often where injuries occur. Based on my experience with the individuals I work with, the most proficient jumpers can produce 2.5 to 3.5 times their body weight in this position. I often illustrate this concept to my clients, with an analogy I borrowed from Coach Bove, by likening it to bouncing a basketball on different surfaces—a hard surface versus a sandpit. If an individual is weak at the bottom of the squat or CMJ (Force at Minimum Displacement), they resemble a basketball hitting the sandpit, with the energy dissipating and struggling to rebound. Conversely, clients or athletes with higher force capabilities in this position are similar to a basketball hitting a hardwood floor—they quickly rebound, setting themselves up for a higher Propulsive Impulse.

Braking RFD: Enhancing the braking rate of force development yields significant benefits for explosiveness, change of direction (COD), and jumping performance. This metric is particularly sensitive to fatigue and may vary considerably from one day to the next. I often describe it to my clients as their "ability to access the brakes they possess." Essentially, it measures how quickly they can engage their brake pads.

mRSI: or the ratio of Jump Height to time to take off, signifies the ability to generate substantial impulses within brief timeframes, which is advantageous for athletics. Its consideration of time makes it an excellent tool for monitoring readiness and fatigue levels.

Now that you have a basic understanding of some of the metrics (although there are many more), let's dive into our assessment process. We'll explore how we analyze metrics in conjunction with each other and use them to tailor programs for individual clients. In our setting, clients undergo a 30-minute testing session where we conduct the following tests: Countermovement Jump (CMJ) with arm swing, CMJ with hands on hips, Squat Jump, Isometric Belt Squat, and a 10-jump multi-rebound test. Additionally, we calculate their Dynamic Strength Index, derived from CMJ and Isometric testing, and their Eccentric

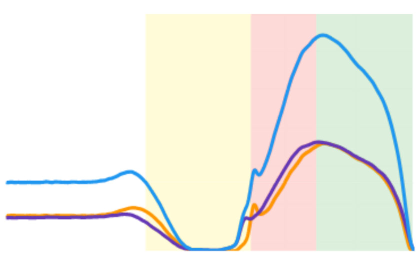
Utilization Ratio. You may use different tests, which is acceptable as long as you comprehend the purpose behind each test and what insights you aim to derive. These tests allow us to profile our clients, compare them to the testing population, and categorize them based on their specific needs or deficiencies. Each test contributes to a comprehensive understanding of the client's strategy, guiding us in identifying suitable interventions for optimal improvement. It's crucial to emphasize the importance of considering all tests collectively, rather than focusing solely on one, to gain a holistic understanding of the client and their requirements.

Peak Braking Velocity and "Deficiency Buckets:"

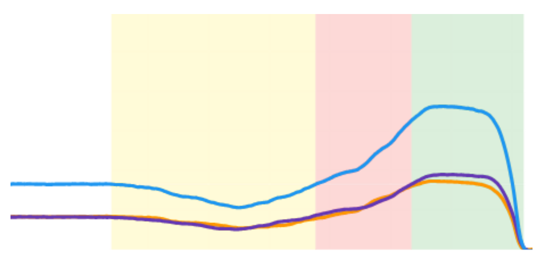
The initial focus of my assessment lies in analyzing the client's Braking Net Impulse alongside their Peak Braking Velocity. Coach Bove's book suggests using -1.2 m/s Peak Braking Velocity as a standard to evaluate jump quality. Ideally, in a healthy individual, they should achieve -1.2 m/s or faster during braking. Falling short of this benchmark prompts questions such as: Are they lacking motivation? Are they experiencing soreness or fatigue? Could there be an underlying injury or weakness? It's evident that the ability to swiftly unweight and apply substantial braking force positively impacts jump performance. It's important to acknowledge that -1.2m/s is a benchmark I've adopted from Coach Bove's recommendation, primarily used in high-performance settings (I'm not saying it's not used elsewhere). While some of my younger and middle-aged clients can achieve this benchmark, it may not be achievable for some older clients. For instance, in my over-65 group, the best observed Peak Braking Velocity typically hovers around -0.80 m/s. I'm actively researching within my demographic to establish if there is a more appropriate target Peak Braking Velocity for optimal assessment.

Research indicates that individuals capable of unweighting and exhibiting a higher Eccentric Yielding Rate of Force Development (RFD) are primed for a potent braking phase. Therefore, if a client fails to achieve -1.2 m/s, as mentioned earlier, it usually raises a red flag for me. A closer examination of their force-time curve often reveals a slow, gradual ascent, suggesting a difficulty in unweighting and rapidly applying force. I categorize these individuals into my "Braking Deficient" group for targeted training.

Good Unweighting and Braking RFD



Poor Unweighting and Braking RFD



Observing the force-time curves within my population of the two groups mentioned above, I often notice distinct differences. The group characterized by poor unweighting and braking abilities tends to exhibit the following limitations:

- Failing to achieve a Peak Braking Velocity of -1.2 m/s.

- Generally not surpassing 2 times their Body Weight in Force at Minimum Displacement (at the bottom of CMJ).
- Typically unable to exceed 2 times BW in Average Braking Force.
- Demonstrating a lower Braking Rate of Force Development (Braking RFD).

Previously, I utilized a method to identify my "Braking Deficient" group by implementing a minimum threshold of 100N.s, but I've since abandoned this approach after some research and discussion. This method seemed to have its limitations as it could unfairly penalize individuals with lower mass or very large mass. The calculation for Braking Net Impulse involves dividing the "System Weight" by 9.8 to determine the Mass (in KG), then multiplying it by 1.2 (Peak Braking Velocity) to obtain the "Braking Net Impulse."

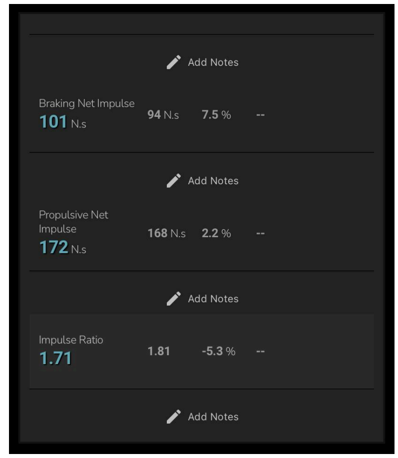
For instance, consider Athlete A with a system weight of 479N (107lbs). According to the formula, their Braking Net Impulse should be 58N.s. Upon closer examination, Athlete A had a Braking Net Impulse of 53 N.s due to a slightly slower Peak Braking Velocity of -1.09 m/s instead of the standard -1.2 m/s. Based on the 100N.s threshold, they would be labeled as "Braking Deficient" by my previous standards. But is this designation accurate? This discrepancy illustrates why setting a standard of 100N.s can be unjust for lighter athletes. The slower-than-standard Peak Braking Velocity is what would cause me to look deeper into this athlete to determine their deficiency. From a contextual standpoint, I also would look at age within my population. An older adult that can hit -1.09 m/s in Peak Braking Velocity is doing really well!

Looking at the other side of this demonstration, if I were to consider a heavier athlete weighing 1694N (380lbs) with a Peak Braking Velocity of - .80, this athlete would yield a Braking Net Impulse of 138N.s. With a threshold set at 100 N.s, this athlete would demonstrate proficiency in Braking Impulse; nevertheless, I would categorize them as Braking Deficient due to their inability to reach the Peak Braking Velocity Threshold. This illustrates the significance of comprehending the broader context and its implications for individual athletes. The ability to interpret and take ownership of one's data is crucial for enhancing athlete performance and tailoring interventions effectively.

Looking deeper for context with other metrics alongside Braking Net Impulse, Athlete A demonstrates a Force at Minimum Displacement of 2.1 times their body weight. In my experience, the most efficient jumpers typically achieve 2.5 to 3.5 times their body weight. Because they fall short of this benchmark, along with the inability to achieve a Peak Braking Impulse of -1.2m/s, I would bucket Athlete A in my "Braking Deficient" due to their relative weakness, particularly at the bottom of the squat. Additionally, we would focus on unweighting exercises as well as strength and power exercises focused on maintaining proficiency in the propulsive phase - they already have a respectable Impulse Ratio of 2.09.

As mentioned earlier, adhering to a standardized Impulse Ratio of 2.0 may not always be the best approach. While it may suit one athlete and their specific sport, such as in the case mentioned above, it might not be ideal for another athlete in a different sport. For instance, if we consider a hockey player with a similar Impulse Ratio, it could be more beneficial to aim for a lower ratio - maybe. This potential adjustment is because hockey requires the ability to generate higher braking forces. With that said, it might be just as beneficial to implement another test for that sport like using a drop landing on 1 leg to identify any deficiency specific to their sport, and track their progress in that test as they train. This example underscores the significance of context and emphasizes that a one-size-fits-all approach isn't always applicable. I trust that this example has illuminated the importance of context and provided valuable insights into what factors to consider when evaluating athletes.

Within my population, unless I'm working with someone who plays a sport that warrants a different approach, I will typically stay with the 2.0 Impulse Ratio. If I have established that a client can hit the threshold of -1.2 m/s for Peak Braking Velocity and they can obtain a sufficient Braking Net Impulse, I will then look at their Impulse Ratio to determine if they might be lacking on the propulsive side of the equation. If they are, I will then bucket them into my "Propulsive Deficient" group and prescribe interventions aimed at improving that deficit. This is demonstrated in the aside photo where the client meets the threshold for braking but has an Impulse Ratio under 2.0. I would aim to improve this client's propulsive net impulse.



When addressing what I term the "Braking Deficient" group, my approach centers on the necessity for strength enhancement. I frequently incorporate exercises emphasizing time under tension (TUT) and activities aimed at bolstering force production and force at minimum displacement capabilities. In my observation, individuals in this group often struggle with unweighting due to inadequate force capacity to arrest their movement. I believe there is a subconscious uncertainty or hesitation during unweighting, likely stemming from their underlying weakness. Consequently, it's imperative to prioritize the establishment of a solid foundation of strength.

One of the strategies I find highly effective with this group is prescribing percentages based on their Max Isometric Pull test. The formula I use is:

"Peak Force" - "System Weight" x 0.2248 = Force (in pounds).

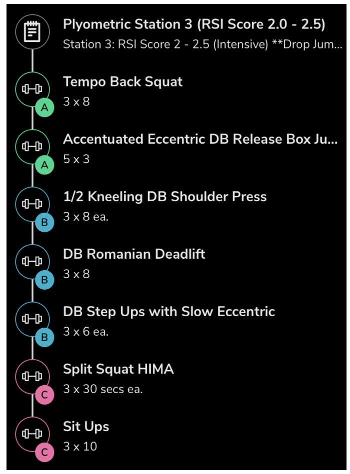
For example, if they pull 2262 N of force and their system weight is 1047 N, the resulting force is 1215 N. By multiplying this by 0.2248 (to convert to pounds), we get a weight of 273.13 lbs. Depending on factors such as training age, I typically prescribe Tempo Squats between 15-45% to enhance skill and capacity, and for muscular strength, between 50-85%. This approach has yielded significant progress for our clients.

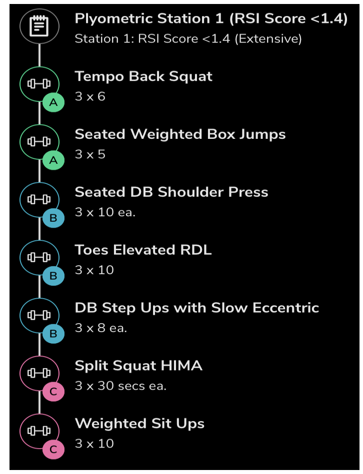
Some other things I like to incorporate into my "Braking Deficient" group are:

- Supramaximal Eccentrics, both heavy and light concentric options (eccentric and concentric strength)
- Positional Pulses (Contract and Relax and Braking RFD)
- KB Drop and Catch (Unweighting, Braking RFD, Force at Zero Velocity)
- Weighted Jumps (Braking Impulse)
- Accentuated Eccentric Jumps (Braking Impulse)

DB Accentuated Eccentric Jumps

“Braking Deficient” Example Programming



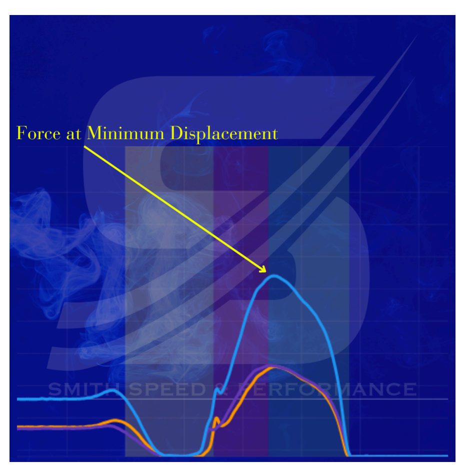


For my “Propulsive Deficient” group I like to utilize the following interventions:

- Box Squatting (for Power) *Hold for 1-3 seconds at the bottom while maintaining tension
- Seated Box Jumping (BW or Light Weight) (Propulsive Power, RFD)
- Accommodating Resistance (Band or Chains) (Braking RFD, Force at Zero Velocity, Propulsive Force, Acceleration)
- Clean and Snatch Variations (RFD, Propulsive Force, Propulsive Power)
- Weighted Step Up Variations (Propulsive Force and Propulsive Power)
- Explosive Step Ups (Propulsive Force and Propulsive Power)

The Transition:

Regardless of Braking or Propulsive Deficiencies, as I like to call them, it's essential to consider the transition between these two phases and address it if necessary. In my experience, everyone can improve their ability to produce force in their transition. This transition is indicated by the Force at Zero Velocity, equivalent to the bottom of the squat in the CMJ. As previously mentioned, top performers within my population typically achieve 2.5 - 3.5 times their body weight with this metric. Anything less indicates an area for improvement in my experience. Even if they fall within those parameters, reducing their energy leaks by improving force in this position will help them improve their performance and potentially help reduce the likelihood of injury. Oftentimes injury in sport occurs at this end range of motion. Improving force qualities can be extremely beneficial!



To enhance Force at Zero Velocity, interventions involving high force output at zero velocity are ideal. This is where both Yielding and Overcoming Isometrics come into play. I've adopted the terms HIMA (Holding Isometric Muscle Action) and PIMA (Pushing Isometric Muscle Action) from Coach Bove’s book, which are equivalent to Yielding and Overcoming Isometrics, respectively. The ability to have a strong isometric contraction at the bottom of the CMJ is essentially the springboard to a strong propulsive impulse. Some of my favorite HIMA and PIMA's I like to implement are:

- Split Squat HIMA (30 seconds and longer) (Progress to holding weight)
- The Traditional Wall Sit (30 seconds and longer) (Progress to holding weight)
- Split Squat PIMA (4-6 seconds pushing against an immovable object)
- ¼ Squat PIMA (4-6 seconds pushing against a squat rack)

<u>Dynamic Strength Index (DSI):</u>

As you can see, the CMJ is enough to keep you busy for quite some time! With that said, we can gain more insight into the client's abilities and deficiencies if we look at more tests to provide added insight. Following the CMJ, I examine their Isometric test results next and assess the indication provided by their Dynamic Strength Index (DSI). While there is abundant literature available on the DSI, I won't delve into its details here. In essence, the DSI offers a ratio between a client's CMJ Peak Force and their Isometric Test Peak Force, providing valuable insights into their strength characteristics.

Clients with a score of:

>.8	Need more Max Strength Work
.6 to .8	Need Concurrent Strength Work
<. 6	Need Ballistic Strength Work

The dynamic strength index serves as a tool to determine whether the athlete would benefit from maximal strength training, ballistic strength training, or a combination of both in their program. It represents the percentage of maximal strength potential that remains untapped during a specific motor task, such as a jump. Essentially, it gauges the athlete's capacity to harness their full force potential in ballistic exercises like a CMJ. Therefore, an athlete achieving a DSI score of 1 demonstrates their ability to fully utilize their force potential. Furthermore, a higher DSI indicates greater proficiency in utilizing force potential during ballistic exercises.

Conversely, a lower DSI suggests a diminished ability to harness force potential during ballistic exercises. A higher DSI implies a need for more focus on maximal strength development (i.e., force production), while a lower DSI suggests a greater emphasis on enhancing Rate of Force Development (RFD) through ballistic strength training methods.

Eccentric Utilization Ratio (EUR):

Next, I examine their Squat Jump test. By conducting both the CMJ and Squat Jump tests, we can derive their Eccentric Utilization Ratio Report, which I refer to as their "ability to use their internal spring." Essentially, this metric measures how effectively an individual utilizes their stretch-shortening cycle (SSC). During jumping tasks, we typically initiate movement by lowering our center of mass first to generate momentum and store energy—basically, the unweighting phase leading into the braking phase of the CMJ. Generally, I look for the CMJ to be 10% greater than the Squat Jump. This is typically a 1.0 for a test score.

In theory, one should achieve a greater jump height in the countermovement jump compared to the squat jump, owing to their ability to leverage stored energy. In my population, we prioritize strategies to prevent physical decline and maintain vitality, and I see improving the SSC as one of those ways to keep us further away from becoming decrepit. In my view, aiding individuals in developing a robust SSC rarely leads them astray. However, it's important to consider again that context matters. In sports such as wrestling, where staying low and executing takedowns is essential, it may be more beneficial to have a score that is more balanced, or even leaning more "in favor" of the squat jump, as depicted in the photo above. Conversely, when working with a basketball team, aiming for at least a 10% difference between the countermovement jump and squat jump scores would be ideal - in favor of the CMJ.

The Muli-Rebound (RSI Test):

Finally, what insights does their multi-rebound test offer? This test provides us with their Reactive Strength Index (RSI). Similar to the DSI, there is extensive information available on this metric, so I won't delve too deeply into it here. However, a client's score on this test provides valuable information about their reactive capabilities. As with everything, context is key! For instance, if an athlete is a 100m sprinter and scores a 1.8, it indicates a need to focus on developing stiffness in their Achilles and ankle complex. Generally, the higher the RSI score (e.g., 3 - 3.5), the faster the athlete and the higher they can jump. In my experience, I've never encountered an athlete running at 22 mph with an RSI score of 1.2.

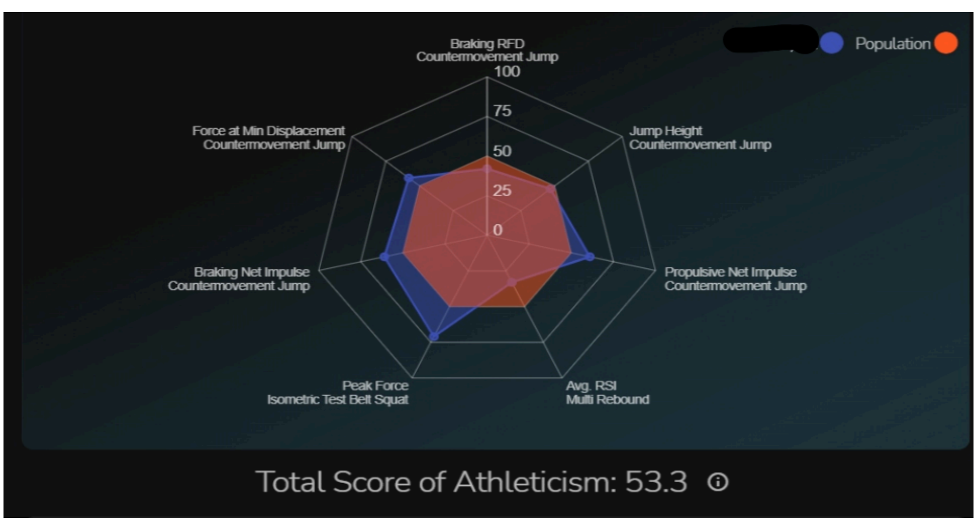
We can categorize clients based on their RSI score, a concept I borrowed from Jose Catano, whose work I greatly admire. He's truly at the forefront of this field! Below, you can see how we organize these groups.

Station 1: RSI Score <1.4 (Extensive)	Station 3: RSI Score 2 - 2.5 (Intensive) **Drop Jumps**
3 x 10 Pogo Jumps with 5lbs or 10lbs Med Ball	3 x 4 Depth Drop to Box Jump
3 x 10 Lateral Pogo	3 x 4 Depth Drop to Broad Jump
3 x 10 SL Pogo Jumps	3 x 4 Depth Drop to Lateral Hurdle Jump
Station 2: RSI Score 1.5 - 2 (Intensive) **GTC <250**	Station 4: RSI Score 2.5+
3 x 5 High Knee Tucks	3 x 4 Weighted Depth Drop to Box Jumps (with Med Ball)
3 x 4 Med Height Hurdle Jumps (GTC <250)	3 x 4 Single Leg Bounds
2 x 4 Alternate Bounding	3 x 4 Single Leg Depth Drop to Box Jump (Land on 2 feet on box)

I will instruct the client to perform this 2-3 times per week immediately after their warm-up, before their main workout. Once a client has advanced their score to the next "station," we transition them to the next category and continue to progress them at their individual pace. These categories are not rigidly defined, so feel free to customize the movements as needed. However, it's important to note how they progress from extensive (lower intensity) to intensive (higher intensity) exercises as they move through the stations. Ensuring clients start in the appropriate grouping based on their score is vital for minimizing injury risk. Therefore, avoid including intensive plyometric exercises like depth drop jumps in station 1, as clients may not be ready for that level of intensity.

Once we've gathered all the scores and data, we can then assess the client holistically and tailor interventions accordingly. The report provides insight into how the client compares to the population and where they may be deficient in comparison. While this offers a useful snapshot of their standing within the group, it's essential to delve deeper into the specific metrics we discussed earlier and understand the individual needs of your client or athlete.

For example, although a client may excel in their Peak Force Isometric Belt Squat test compared to the population, their DSI, Braking, and Impulse Ratio scores may indicate a need for more maximal strength work, and perhaps even some eccentric training or time under tension (TUT) exercises. It's crucial to consider all factors comprehensively.



Bringing It All Together:

By now, I trust you're still following along, and I'm confident you now grasp how to pinpoint an individual's deficiencies and devise interventions to manipulate their force-time curve. The key here lies in translating this data to a diverse group of individuals, each with unique backgrounds and training experiences, to enhance their performance - that's the art of coaching! Ultimately, it's essential to remember that they're athletes first and foremost, they aren't training to become Olympic lifters. Olympic lifting is just a tool to help improve their performance.

Categorizing your athletes into distinct groups has proven to be the most effective approach in my experience. While everyone requires some form of squatting, the specific type of squat should be tailored to their individual needs, deficiencies, and any physical limitations they may have, rather than adhering strictly to predetermined norms. I rely on data as my guiding tool, much like a GPS, to ensure I reach the desired destination. Although I recall navigating without GPS using a compass and a map, if I can achieve my goals more efficiently with GPS assistance, it only makes sense to utilize it. Let the data serve as your compass, guiding your adjustments as necessary.

When looking at a training session for a week, I will have multiple versions of the same program taking place at the same time. First by grouping them into their RSI (Reactive Strength Index) groups. Like I said before, I typically have the clients do this after their dynamic warm-up and before their lift - it can take them 5-7 minutes once they figure it out. From there, I program the same workout but differentiate based on deficiencies (See example below).

Braking Deficient Group Ex. Workout

Monday	Tuesday	Wednesday	Thursday	Friday
RSI Stations	Zone 2 Cardio	Altitude Landings	Zone 3 Cardio	RSI Stations
Tempo Sq.@ 20% of Max Iso Pull		DB Bench Press		Quad PIMA
Seated Box Jumps		Lat. MB Throw		Trap Bar DL (Slow Ecc.)
½ Kneeling DB Shoulder Press		Lateral Lunge		Accentuated Eccentric DB Box Jumps
DB RDL		Pull Ups		BW Split Squat (3 pulses at the bottom)
Step Up w/ Controlled Eccentric		Tri. Pushdown		Chest Supported Row
Split Sq. HIMA (30 Sec).		Push Up HIMA (20 sec.)		Trap Bar Iso Hold (30 sec.)

Propulsive Deficient Group Ex. Workout

Monday	Tuesday	Wednesday	Thursday	Friday
RSI Stations	Zone 2 Cardio	Altitude Landings	Zone 3 Cardio	RSI Stations
Box Sq. vs Bands		DB Bench Press		Quad PIMA
Seated Box Jumps		Lat. MB Throw		Trap Bar DL
½ Kneeling DB Shoulder Press		Lateral Lunge		DB Squat Jumps @ 25% BW
DB RDL		Pull Ups		Explosive Split Squat
Explosive Step Up		Tri. Pushdown		Chest Supported Row
Split Sq. HIMA (30 Sec).		Push Up HIMA (20 sec.)		Trap Bar Iso Hold (30 sec.)

In certain instances, you may encounter athletes within your sphere who fall into the "Balanced" category, with an impulse ratio hovering around 2.0. For these individuals, I guide them toward the direction that aligns best with their sport or position for optimal benefit. In my private setting, I typically maintain a target ratio of 2.0. However, when collaborating with high school and college teams, I tailor this approach based on the specific demands of the sport. For instance, if I train a basketball player with a 2.0 impulse ratio, it might be advantageous to nudge their impulse ratio to 2.5, prioritizing the propulsive aspect. Conversely, for hockey players, adjusting the ratio closer to 1.5 in favor of braking could be more beneficial. This underscores the importance of considering both position and sport to maximize performance carryover. Regardless of the scenario, proficiency in braking remains a consistent factor among these athletes.

You may observe that in the two distinct workouts described above, there are notable similarities with subtle adjustments tailored to address the specific requirements of athletes grouped accordingly. It's important to note that with the RSI stations, there are four groups, and each athlete commences at their designated station based on their score. Following this, athletes transition into their lifting routines aimed at enhancing the desired qualities. I advocate for simplicity with slight modifications to accommodate individual needs, particularly when managing a weight room with 40 or more athletes. Simplification proves advantageous in such scenarios. For instance, half of the racks might focus on box squats while the remainder concentrate on tempo squats. Assistance exercises may appear similar, but there are nuanced differences to emphasize either braking or propulsive actions, such as variations in step-ups or split squats.

In those instances as well, the training regimen spans only three days a week. However, it's worth considering that you might find a four-day schedule more suitable, especially during off-season training, which is a strategy I often employ when working with high school or college athletes. Whether this setup works for you or if you require additional training days depends on your specific needs. Moreover, when working with athletes, I prefer to structure the days differently rather than label them as "cardio days." For example, before our Monday squat session (following dynamic warm-up and plyometric stations), we might incorporate 200-yard linear sprints with adequate recovery between sets. Tuesdays could be designated as "agility" days, while Wednesdays serve as recovery days. Thursdays might involve hill sprints with full recovery and approximately 100 yards of volume. Finally, Fridays may focus on Tempo Run sessions aimed at enhancing aerobic capacity for power athletes.

4 Day/ Week with Propulsive Deficient Group Ex. Workout

Monday	Tuesday	Wednesday	Thursday	Friday
RSI Stations	Altitude Landings	Recovery Day	RSI Stations	Jumping/Landing Work
Max Velo. Sprints (200 yards total - full recovery b/w reps)	Agility Stations (“The Grid”, hurdle work, tag games, etc.)		Hill Sprints (100 Yards of Volume -full recovery b/w reps)	Tempo Runs (10-110’s. Skills are 20 sec. 60 Sec. Recovery)
Box Sq. vs Bands	DB Bench Press		Speed Squats between 1-1.3m/s	Quad PIMA
Seated Box Jumps	Lat. MB Throw		DB Accentuated Eccentric Box Jumps	Trap Bar Jump or Hang Cleans
½ Kneeling DB Shoulder Press	Lateral Lunge		Cable Face Pull	DB Squat Jumps @ 25% BW
DB RDL	Pull Ups		Band Assisted Nordics	Explosive Split Squat
Explosive Step Up	Tri. Pushdown		Lat. Pull Down	Chest Supported Row
Split Sq. HIMA (30 Sec).	Push Up HIMA (20 sec.)		Split Squat PIMA	Trap Bar Iso Hold (30 sec.)

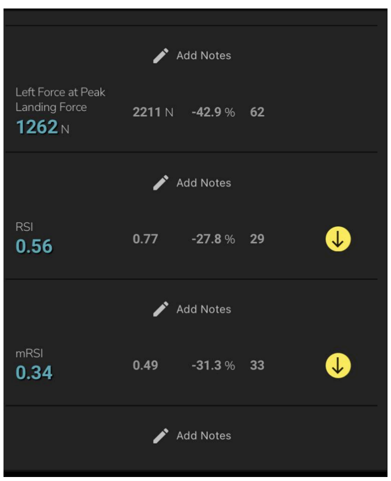
You may also notice that I still prioritize having athletes engage in activities they excel at. Simply because an individual shows a deficiency in braking doesn't imply they should solely focus on braking movements and neglect propulsive movements. It's crucial to maintain or enhance their strengths while concurrently addressing areas of improvement. This principle can similarly be applied to the Dynamic Strength Index. Even if an athlete's score indicates a need to enhance explosive strength while demonstrating proficiency in strength work, completely omitting maximal strength exercises would, in my view, be a misstep. Therefore, I prefer to incorporate a heavier training day earlier in the week and reserve a day for explosive training, typically on Thursdays after they have had at least 48 hours of recovery from a heavy day. We can incorporate explosive training into their assistance work as well - it doesn’t just have to be a main lift. However, this template may not necessarily fit every situation, and I encourage flexibility in its application. I intend to convey the rationale behind this approach, but I acknowledge that your specific setting and circumstances may warrant a different strategy.

Monitoring Fatigue:

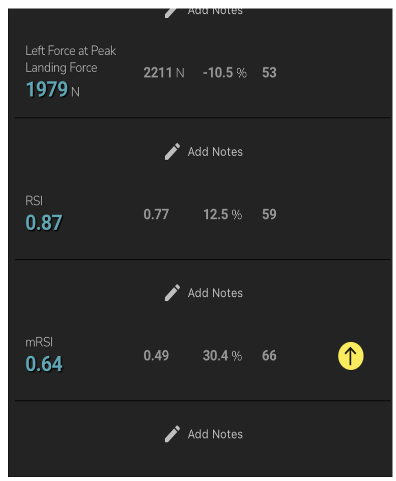
Finally, incorporating daily adjustments to your workouts based on fatigue is another way that force plates can elevate your training program. Before utilizing force plates, I relied on jump mats and body weight measurements to gauge athlete fatigue. We would assess body weight and jump height and input these data points into Seyer's formula for power output. This approach was inspired by Teofe Ziemnicki at Teambuildr, who discussed this concept and its implementation in his article *"Jumping to Conclusions: Workout Selection Based on 1 Simple Test."* This concept is invaluable because as strength and conditioning professionals, our primary role is the development and management of the athlete. The ability to modify workouts in response to neural fatigue is essential for optimizing performance and mitigating the risk of overtraining. If you review his article, you can fully understand how to apply this concept to the team setting and make adjustments to training daily. This concept utilizing power output from Seyer's formula is a great option if you don't have force plates.

If you have access to force plates, you could certainly make full use of Peak Propulsive Power; however, the literature strongly advocates for the utilization of the Modified Reactive Strength Index (mRSI). If you recall from the descriptions of various metrics, this is one that I emphasized. mRSI is calculated as the ratio between jump height and time to takeoff. There are instances where an athlete may achieve the same jump height, but their time to takeoff is slower. Or, maybe their jump height is down. This could signal fatigue, and the protocol outlined in Teofe's article would guide potential modifications for the day's workout.

Athlete Potentially Under Fatigue



Athlete with Good Readiness Score



What's remarkable about the Hawkin Dynamics platform is its built-in Green Light, Yellow Light, and Red Light system. Within the software, yellow arrows pointing up or down indicate when an athlete is between 1-2 standard deviations away from their normal performance level for that day. Conversely, a green arrow pointing up or a red arrow pointing down signifies when an athlete deviates at least 2 standard deviations from their norm. A green arrow pointing up suggests it's an opportune day for maximal velocity sprints and heavy squats. Conversely, a red arrow pointing down suggests that adjusting the intensity and volume for the athlete on that particular day may be prudent. For more detailed insights, you can delve into Teofe's article, which offers a comprehensive exploration of this concept.

I hope you now have a deeper appreciation for the advantages that integrating force plate technology into your program can offer. Personally, it has provided me with invaluable insights into the factors influencing an athlete's performance. The ability to pinpoint areas for improvement has allowed me to positively impact numerous individuals. Currently, I work in an environment where my efforts directly affect an individual's quality of life—a responsibility I hold with great reverence. While it may not be a matter of life or death, our capacity to harness this technology and tailor it to our environment could very well be the catalyst for enhancing the performance and success rates of the athletes we train, providing them with a competitive edge over their peers.

References

Bove, D. (2023). *Takeoff: A visual guide to training and monitoring lower body power* (D. Berberet, Ed.). Athlete Framework.