



The Technique Triad Theory

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ABSTRACT

A common theme that has been recently perpetuated through the medical community is the oversimplification of injury science to the equation of load versus capacity and the disregard for the influence of movement quality. The Adaptation Model is based on the belief that one can recover and/or adapt to any stimulus or stress that is gradually applied as long as it does not breach the system's capacity; and that, as humans, we can infinitely become better suited to our environment regardless of what this environment may entail. Many who support this hypothesis reject the importance of biomechanics, technique, and movement proficiency in regard to injury prevention and rather promote this idea of adaptation in isolation. Building capacity through many repetitions gradually involves neurophysiological adaptations that improve skill acquisition, neuromuscular efficiency, and technique. Therefore the "adaptation model" inherently involves an element of "technique" in itself. "Load" and "Capacity" play a key role in one's ability to adapt, grow and perform at their best. However, this duality is incomplete without the 3rd pillar - technique. In order to maintain ideal movement proficiency and drive physiological adaptations, we must increase the load within the context of what our skill and technique will allow. Although technique quality is described often on a sliding spectrum-like scale, as requiring sufficient competency within certain fundamentals as a prerequisite to increasing load allows you to improve skill without increasing the risk of breaching your tissue tolerances. Increase load too quickly, and you risk sporadic and uncontrolled migration of forces onto parts of your body or tissue systems that do not yet have the required capacity to handle such stress. With the proper movement patterns ingrained and the appropriate dosage or load progressively challenging the capacity, the programming now reflects the intensity of such stimuli based on the athlete's ability to recover from the fatigue debt created in training. As the programming progresses and the load is increased, capacity requires technique and the ability to move proficiently through the sport-specific movement. 1) Technique permits load because load requires technique, 2) Load challenges capacity because capacity dictates load and 3) Capacity requires technique because technique protects and maximizes capacity.

Keywords: Technique, Load, Capacity, Adaptation, Injury

INTRODUCTION

A common theme that has been recently perpetuated through the rehabilitation and medical community is the oversimplification of injury science to the equation of load versus capacity and the disregard for the influence of movement quality. Simply put, many believe technique

quality when lifting is not a key factor in injury risk, but rather, your body can adapt to any movement given enough time for adaptation. This theory (justly called the “adaptation model”) has led many to abandon fundamental biomechanical principles rooted in decades of literature. The purpose of this paper is not to dismiss the “adaptation model” but rather to provide a clear framework of how movement quality and the fundamental principles of “load” and “capacity” coexist and influence the injury process. For this purpose, we will be presenting a new working model called “The Technique Triad Theory” that integrates current data, the opinions of the world's top clinicians and athletes, as well as traditional high-quality lost research principles.

WHAT IS THE “ADAPTATION MODEL”?

Adaptation: the process of change by which an organism or species becomes better suited to its environment.

The Adaptation Model is based on the belief that one can recover and/or adapt to any stimulus or stress that is gradually applied as long as it does not breach the system's capacity; and that, as humans, we can infinitely become better suited to our environment regardless of what this environment may entail. Many who adopt this way of thinking don't deny that poor movement can cause the unwanted migration of force throughout the body - they just believe the body has the ability to adapt (given sufficient management of load and recovery) without rising injury risk regardless of the quality of movement [1]. This model has become more prevalent over recent years; however, it is missing some key fundamentals that will be addressed in this paper.

LOAD AND CAPACITY

Capacity is defined by the ability to endure, withstand and recover from an induced stressor, stimuli, or accumulated fatigue. This capacity is likely not a set point but one that indeed changes based on many factors [2]. One's current state of capacity is likely closely related to fatigue management, recovery, and performance outcomes, all of which are influenced by poor sleep, nutrition, and dehydration [3 - 4].

While productive types of stress such as exercise, movement, and resistance training can stimulate growth, non-productive stressors impact and tax your body negatively, causing a reduction in performance and inability to recover. Every tissue in your body has a specific capacity [5].

When a load is applied to a tissue much greater than its current capacity, there is an increased risk of breakdown and injury. Imagine walking into a gym for the first time and attempting to squat 500 pounds. For most people, this is a recipe for disaster; many tissues within the body will be pushed past their biological capacity tipping point, increasing the risk of injury. However, if increasing loads are gradually applied over time, our body's tissues can recover and adapt to become stronger. To return to our squat example, this would be equivalent to a person following a periodized program that began with a light load and gradually increased the weight over many months and years. This method allows our bodies to develop stronger muscles, denser bones, and more resilient tendons [14 - 15].

In the world of sports performance, “load” is frequently used as a proxy for the total “dosage” of whatever stressor you are applying based on the training for that sport. For instance, a marathon runner may increase total training “load” by increasing their run time, while a

powerlifter may increase total weight or volume or training days [5]. If the total dosage of load applied to your body exceeds your capacity, we are likely to see some negative side effects - this can be a breakdown in mood, morale, technique, and tissue tolerance (yes, your classic injury). Without enough load, we don't accumulate enough stimulus to gain strength and progress; however, too much will violate the laws of recovery by exceeding one's capacity. The ability to control the variable of load within the context of your workout is called "load management." The basic premise is that we don't want to apply a load on the body quicker than it can adapt [6].

The key takeaway from this "adaption model" is that stress on the body is neither good nor bad; it simply requires context. If you load too light, your body will never gain strength and capacity. If you move too quickly, you risk injuring yourself. However, if you gradually increase the load and give your body time to recover, it will adapt by increasing its capacity.

While many injuries can be related to this load and capacity relationship, there are a few weak links with this approach that need to be addressed.

Movement Quality Dictates How the Load is Migrated Amongst Tissues [8 - 9]

A recent clinical trial in 2021 enrolled 26 healthy participants who performed "maximal lifts" while maintaining three lumbar postures. Changes in their movement and position shifted the location of the force. They discovered that increased lumbar flexion caused less load to be distributed on the active musculature and shifted more load to the spine's passive structures. In his conclusion, the author wrote, "The increased recruitment of posterior passive structures increases the likelihood of high anterior shear forces and, if repeated, creep on the lower lumbar spine" [8]. The quality of one's movement has a direct impact on how the load is distributed and migrated to different tissues within the body and, therefore, has the potential to overload the capacity of tissues, increasing the risk of injury.

Not All Tissues Adapt the Same to Load [7]

The article "Does a Temporary Increase in Glycosaminoglycan (GAG) Indicate Positive Intervertebral Disc Adaptation?" by Horschig et al. (2022) outlines how injury to the outer annulus portion of the intervertebral disc has shown to result in granulation tissue with only the outer few millimeters bridged by scar tissue, likely causing the disc to never fully heal and never return to pre-injury status - thus leading to the differentiation of "healing" vs "positive adapting". Due to its avascular nature, it's likely a tear in the AF does not adapt or remodel in the same manner other tissues of the spine (including bone and muscle) would [21]. Instead, structural changes are potentially irreversible as research has also shown adult discs have limited healing potential [23]. Research suggests that the collagen turnover time in articular cartilage is approximately 100 years, and it may be even longer in the annulus fibrosus [22 - 23]. Based on this information, we cannot oversimplify injury science to only "load" and "capacity", as not all tissues within the body have the same adaptive capabilities.

Quality Training Matters More Than Just Training Load [10], [17 - 19]

A 2015 study examined the fitness and movement adaptations of 52 firefighters in response to two different training methods. Participants were randomly assigned to one of three groups:

- 1) Movement-guided fitness (which received coaching on technique quality)

- 2) Conventional fitness (which received training programming but without coaching on technique)
- 3) A control group (that did not perform the exercise intervention)

Before and after the 12-week intervention, the researchers looked at five “whole-body tasks” that were NOT included in any part of the training intervention (box deadlift, squat, lunge, split-stance 1-arm cable press, and split-stance 1-arm cable row) with the goal of evaluating how well the interventions transferred into these movements. The group that was provided technique coaching showed significant positive improvements across the board and was the only group to show improvements in spine and frontal plane knee motion control. The authors concluded: “Being physically fit may play a role in the prevention of future injury, but alone it is likely insufficient for this purpose, given that the way in which movements are coordinated and controlled influences musculoskeletal loading.” [10]. Simply put, quality training matters more than just being physically fit.

THE IMPORTANCE OF TECHNIQUE

Biomechanics is the study of structure, function, and motion. Research in this field deepens our understanding of human movement, giving us greater insight into possible methods of enhancing performance and strategies to mitigate injury risk [16].

Every time you move, force is distributed throughout your body (through bones to joints, via muscle tissue, tendons, ligaments, and fascia systems), and opting for the path of least resistance. The direction of force is determined by how you move under load, which in turn influences how parts of your body respond to the amount of load you've placed on it. Inefficient movement or a lack of technical ability can result in the sporadic and uncontrolled migration of force onto parts of your body or tissue systems that may not yet have the required capacity to handle such stress (increasing the risk of passing the tissues' biological “tipping point” and increasing the risk of injury).

In fact, a 2009 research review concluded that dynamic balance, body awareness, core, and trunk control are all important components of a training program needed for reducing ACL injury risk factors (risk factors such as valgus knee moments, inefficient muscle activation, and landing forces) [24]. This is because the mechanics of how, when, and why an athlete moves within the context of sports performance is often governed by their neuromuscular proprioceptive ability to control motion and maintain stability efficiently, as movement modulates the tolerance of our tissue systems; this is supported by Nessler et al. (2017), Donnell-Fink et al. (2015), Hewett et al. (2005) & Bradsell & Frank (2022) with Mehl et al. (2017) concluding

“Screening, identification, and correction of endangering movement patterns like the dynamic valgus are the first crucial steps in order to prevent knee and ACL injuries in athletes.” [29 - 33].

Furthermore, according to a 2010 study published in the British Journal of Sports Medicine, 88% of coaches thought a 6-week “evidence-informed injury prevention program” for netballers saw improved technique with their athletes along with a reduced risk of injury [27].

Biomechanics professor Roger Bartlett, writer of the article “Future Trends in Sports Biomechanics - Reducing Injury Risk or Improving Performance? states:

“To understand fully why injuries, occur, we need to know not only the loads on the bones and soft tissues but also the tissue biomechanical (or material) properties - the tissue load-deformation or stress-strain characteristics. We also need to establish how these are affected by the frequency and timescale of loading.” [28].

Prioritizing technique is one way to achieve greater consistency in how the load is applied to tissues and ensure greater control over the forces the body is exposed to during training. This increases movement regularity and, as a result, the uniformity of load and stimulus. The ability to initiate and maintain appropriate co-contractions to increase movement proficiency and safety is one of many key strategies under the broad term “technique.” With repetition, practice, and proper education, your ability to move “better” under load improves, including your ability to breathe, brace and create incredible stiffness when required. Proximal stiffness is, notably, one of the more known principles of “proper technique.” In fact, McGill discovered in 2010 and 2016 that torso/proximal stiffness resulted in more efficient power transfer from the hips and improved distal limb performance [25 - 26]. Creating the appropriate level of core stiffness when under high loads allows the lifter to predetermine the destination of force as it travels through the body.

Dr. Stuart McGill describes it:

“You’re trying to find a way to lift to minimize stress concentration. A stress concentration somewhere in the body will eventually tip the balance between building the body and tearing it down” [20].

To avoid such a situation, one can maximize their movement proficiency to reliably and consistently ensure the load is distributed upon the proper structures, causing consistent, controlled, premeditated adaptations which over time build resilience and high levels of skill acquisition [17-19].

According to the founder of NeuroHAB and neurosurgeon Dr. David Johnson, “movement proficiency” can absolutely play a key role in performance, pain, injury, and injury prevention [12].

Ed Coan, the greatest powerlifter of all time, puts it best...

“Everyone can train hard, but you’re going to have to train smart. And then, you got to find the right position for your body to be in, for how you’re built, to get the most out of it.” [13]

IF WE CAN ADAPT, WHY DO WE NEED TECHNIQUE?

It is no secret that the more you do something, the “better” you become. In that context, how you define “better” makes or breaks the “Adaptation Model.” It is becoming increasingly popular nowadays to claim that “how” you move does not “really matter that much” in the grand scheme of things. Prominent figures in the medical and physical rehabilitation communities have gone on record stating this - but how could this be?

As we know, the primary components that one needs to consider when “adapting” from training are LOAD and CAPACITY. Unfortunately, many would leave it there, believing that as long as your load isn’t exceeding your capacity, you will simply adapt all the time, every time.

But is it really that simple?

Many reject the importance of biomechanics, technique, or movement proficiency in regard to injury prevention and rather promote this idea of adaptation in isolation. However, it is our opinion that movement proficiency is a part of the “adaptation model.” The very act of taking a slow, methodical approach to building capacity through many repetitions gradually involves neurophysiological adaptations that improve skill acquisition, neuromuscular efficiency, and, therefore technique. Thus, the “adaptation model” inherently involves an element of “technique” in itself.

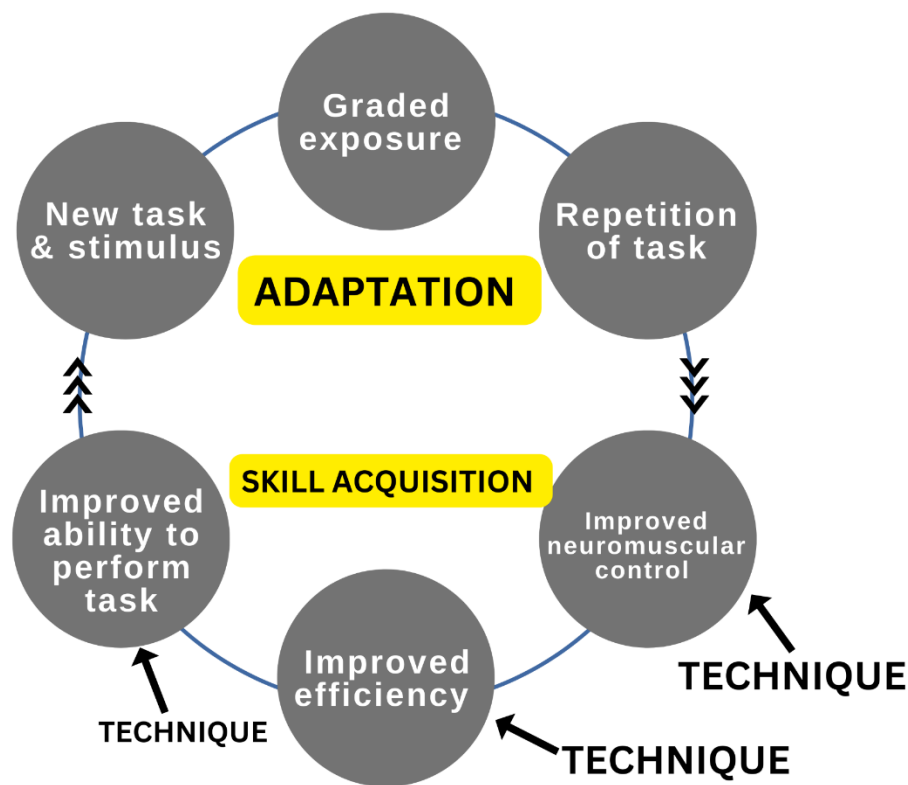


Figure 1: The Adaptation-Technique Cycle

THE TECHNIQUE TRIAD THEORY

It is not the purpose of this paper to say that “load” and “capacity” do not matter. They absolutely do! These two principles play a key role in one’s ability to adapt, grow and perform at their best. However, this duality is incomplete without the 3rd pillar - technique. As displayed in the triad below, technique plays a key role in allowing and maximizing the other two principles. Technique permits increasing load, load challenges capacity, and capacity requires technique. In order to maintain ideal movement proficiency and drive physiological adaptations we must increase the load within the context of what our skill and technique will allow. Although technique quality is described often on a sliding spectrum-like scale, requiring sufficient competency within certain fundamentals as a prerequisite to increasing load allows you to improve skill without increasing the risk of breaching your tissue tolerances. Increase

load too quickly and you risk sporadic and uncontrolled migration of forces onto parts of your body or tissue systems that do not yet have the required capacity to handle such stress.

As technical ability improves so can the load. Depending on your sport, this is your opportunity to start ramping up the dosage or intensity in your programming and periodizing consistent increases into your sessions. In the context of strength sports, this often means the green light to load more “weight” on the bar - the exciting part for most. More than likely due to the prerequisite of proper technique, the load is now appropriate to challenge one’s capacity and not exceed or breach it resulting in the technical breakdown, migrated stress through the body, and possibly injury. Within this context, capacity now takes precedence as the key data point of how we drive the program forward, this is because capacity dictates load, but remember load requires technique.

With the proper movement patterns ingrained and the appropriate dosage or load progressively challenging the capacity, the programming now reflects the intensity of such stimuli based on the athlete’s ability to recover from the fatigue debt created in training. As the programming progresses and the load is increased, capacity requires technique and the ability to move proficiently through the sport-specific movement or under the barbell as a means to maximize total training capacity. Poor movement at this point creates force leaks in the system under load, altering the process placement and migration of stressors throughout the body, overloading areas and tissue systems that may not be able to handle it. Placing the load on the appropriate structures and major contributors to compound movement allows the athlete to build strength, resiliency, and capacity throughout the tissue systems that need it.

THE TECHNIQUE TRIAD THEORY

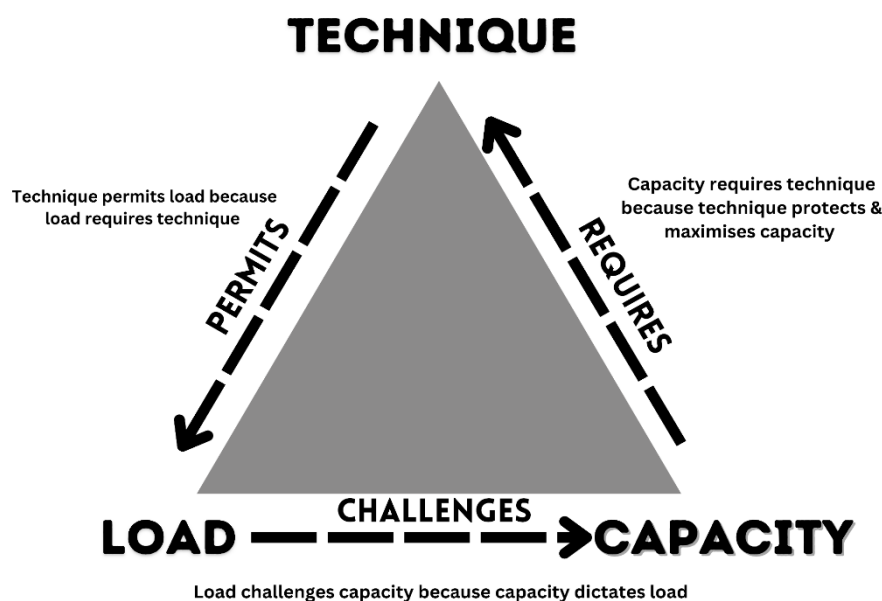


Figure 2: The Technique Triad Theory Triangle

CONCLUSION

Technique permits load because load requires technique. Load challenges capacity because capacity dictates load. Capacity requires technique because technique protects and maximizes capacity.

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