

# Engineering Winning Volleyball

*A Methodology for Training Robust Volleyball Athletes*

Tim Doyle – Head Volleyball Coach, *William & Mary*  
Alex Brodjiski – Athletics Performance Coach (Volleyball), *William & Mary*

## Contents

Authors .....	2
Contributions.....	2
Introduction .....	3
Why? .....	5
The Role of the NCAA.....	6
The Data.....	7
External Load .....	7
Internal Load .....	11
Measuring Load .....	12
Global Load.....	12
Acute:Chronic Workload Ratio.....	16
The High-Low Model.....	18
Basic Guidelines.....	18
An Exception.....	23
Practical Application.....	26
Return-to-Play Schedules.....	26
2-week return-to-play .....	29
4-week return-to-play .....	32
6-week return-to-play .....	36
Planning Practices.....	40
Scheduling Matches .....	43
Resources.....	44
Team Drills .....	44
Individual Training Plans & Position Specific Recommendations .....	48
Sources.....	53

# Authors

Tim Doyle – Head Volleyball Coach, *William & Mary*

Alex Brodjieski – Athletics Performance Coach (Volleyball), *William & Mary*

# Contributions

Special thanks to:

*Incarnate Word Volleyball* – Samantha Thomas & Evan Case

*Iowa State Volleyball* – Christy Johnson Lynch & Jessica Klein

*Middle Tennessee State Volleyball* – Chuck Crawford & Jenna Orner

*William & Mary Volleyball* – David Nguyen, Janelle Sykes, & Thea Lucas

# Introduction

Not long after I was hired in late January of 2018, William & Mary Athletics added a key member to our newly titled “High Performance” department, Dr. Erik Korem. Korem’s hiring signaled our department leadership’s commitment to a new, holistic approach to providing the care, support, and resources our student-athletes and teams needed to excel. His vast experience in the field — time spent in the NFL, with several Division I schools, impressive consultation resume, and worldwide connections — chartered a new course for sports performance at W&M. This new direction required a paradigm shift away from “what’s always been done” towards “what should be done,” demanding a more fact-based, nuanced methodology from coaching staffs in an effort to offer the most comprehensive performance plan for our teams.

In one of our first conversations, Korem asked about the “biomotor and bioenergetic” demands of volleyball.

Sorry...what?

Essentially, he boiled it down to a few questions:

- How long was a typical rally?
- How much rest between plays/rallies did the athlete get?
- How many jumps and swings would an athlete take on competition day?
- How did our practice plans train them for these physical loads?

The answers to these questions contain important insights into exactly what our players experience on the court and how our staff should structure training. The problem was, I didn’t know firm answers. It was a humbling moment. Considering coaching volleyball is my full-time job, I felt embarrassed I couldn’t respond with definitive numbers about how many jumps my middles were taking in a game...How long an average rally was...How warm-up influenced the total load on a player on match day. Most importantly, if I didn’t know what physically constituted a match, how could I expect to adequately train our team for *consistent* performance? What performance criteria were we attempting to meet?

Fast forward two years and we have completed, with the exhaustive help of a handful of programs across the country in various conferences, a thorough research project exploring the exact answers to the questions above. This project tracked the number of jumps and swings taken by starting rosters from 5 teams in 5 different conferences, each using a 10-match sample\* to gather totals and averages. These teams also timed every rally over the 10-match sample to produce an extremely accurate portrait of rally length and time demands of our sport.

In light of the recent global pandemic and subsequent alteration of normal training plans - including the cancelation of summer school, potential delayed starts, shortened pre-seasons, and rushed preparation to compete - this data reaches even further. With time at a premium, our condensed training blocks must be sensible, practicable, and preparatory for what our athletes

will soon face on the court. The output from this research allows us to accurately plan and design phased training that:

1. Prepares our athletes for upcoming competitions in a safe, scaled manner.
2. Prevents unnecessary soft-tissue, non-contact injury.
3. Provides modeling for appropriate practice design and sequencing.

Furthermore, if this pandemic currently affords our volleyball community one thing, it's time. Using that time to critically assess and understand our sport grants us, as coaches, the ability to return to our programs armed with better information we can employ to influence the next evolution of how we train and prepare our athletes.

We aim to:

- Offer practicable return-to-play guidelines, whether you have the advantage of time (6 weeks), hardly any time (2 weeks), or fall somewhere in between (4 weeks).
- Provide easy-to-use constructs for measuring the loads your athletes undergo on any given training day/week.
- Share insight on scheduling and practice planning for the season.
- Pass along sample practice plans for high- and low-intensity practices, as well as recommendations for running positional drills.
- Propose a framework to deploy the above training guidelines.

The information and insight shared here is a result of the fall 2019 data study along with comprehensive research studying injuries, training, performance, and human adaptation.

\*One team only completed 5 matches, resulting in a 45-match total sample

## Why?

It is well established that the highest injury rates occur during pre-season training and other transition periods following spells of unmonitored or minimal training<sup>1 2</sup>, i.e. summer or winter breaks. Sudden spikes in practice volume and intensity are associated with injury<sup>3 4 5 6</sup>, along with training fatigue resulting from inadequate preparation leading up to this “ramp up.” An athlete’s first three weeks back in the gym are, by far, the most dangerous in terms of injury risk<sup>1</sup>. Excessive workloads in this three-week span contribute to putting our athletes in harm’s way. Even overdoing it for one week increases an athlete’s risk of injury 2-4 times in the next 7 days<sup>3</sup>.

In volleyball, 75% of injuries take place in practice and 30% of injuries stem from overuse. A majority of these injuries occur from jumping. As the season progresses, injury rates decrease. The pre-season training block suffers from double the injury rate of the regular season, and triple the rate of the post-season. This places even more emphasis on responsible planning for the pre-season. In the current training culture, teams practice two or three times every day of pre-season, radically spiking the amount of jumps, swings, and overall workload a player undergoes. This fact, combined with a plan that may not account for the number of jumps and swings a player will take in a match, neglects appropriate scaling and can cause training to take on a hazardous form.<sup>2</sup>

With some athletes coming back in great shape, others in average shape, and those returning with minimal to no work done, this poses a training dilemma. How do you prepare for your season with so much variance in fitness levels among your team? Essentially, you must plan with the lowest common denominator in mind. If you’re not sure what your athletes have done - or due to NCAA compliance rules you *can’t* know what they’ve done - then you plan with the assumption you’re starting at “square one.” To advance past this level knowing a group of athletes is unprepared to meet the demands of two- or three-a-days is counterproductive for their individual health and the team’s performance.

Research shows that decreased fitness + increased load = higher susceptibility to injury<sup>1</sup>. It also tells us that teams with less injury days finish higher in their leagues; that teams with decreased injury rates & severity have a better chance of team *improvement*. Whether you’re turning a new program around or keeping one at the top, doing *more* early on in your season isn’t the recipe for consistent success.<sup>7 8 9</sup>

Athletes nationwide suffered from spring seasons abruptly cut short due to COVID-19. The time off from volleyball, physical activity, and regularity of training poses unique challenges for return-to-play protocol, as these acute spikes in intensity and volume must be carefully managed. Eagerness to return to play and abridged pre-season training schedules compound this problem, as players and coaches alike want to return to form and compete as quickly as possible.

Recently, in light of conditioning tragedies in college sports, the NCAA has weighed in on the issue and made recommendations, further prompting more diligent training planning.

## The Role of the NCAA

Organizing team practice based on vetted training principles, with clear sight of our sport's demands, comes at a critical time. The NCAA's recent publication, *NCAA Interassociation Recommendations: Preventing Catastrophic Injury and Death in Collegiate Athletes*, makes several recommendations (which, in reality, should be considered precursors to eventual rule additions rather than mere suggestions):

- All practices and strength and conditioning sessions adhere to established scientific principles of acclimatization and conditioning.
- Conditioning periods are phased in gradually and progressively to encourage proper exercise acclimatization and to minimize the risk of adverse effects on health.
- The first seven days of any new conditioning cycle are considered a transition period and a time of physiologic vulnerability for athletes.
- Components of the workout plan include volume, intensity, mode and duration.
- Training and conditioning sessions are appropriately calibrated and include limitations on total volume and intensity of activity, especially during the first four days of transition periods.
- All workouts have a written plan that is exercise science-based, physiologically sport-specific, and tailored to the individual.

We are in need of a structured, evidence-based, volleyball-specific guide to accommodate these recommendations while still preparing our athletes for competition in a manner that teaches team tactics, budgets time for technical instruction, and allows for competitive roster evaluation.

The purpose behind this manual is to provide that volleyball-specific guide, marrying physiologic science with the art of coaching. As we learn from a critical review of our game, we are presented with the opportunity to advance our sport and evolve as coaches.

Some of the material below is most certainly a departure from normal for lots of coaches. Our intent is to offer alternatives to "how things have always been done" in an effort to answer the NCAA's propositions, simultaneously using data to construct a more professional approach to training from which all levels of the sport can benefit.

During these unprecedented times, it's imperative we collaborate with each person in our department or school connected with our athletes to pool resources and knowledge. Sport coaches, sports medicine professionals, and strength and conditioning & athletic performance coaches all have a role to play in creating a comprehensive plan that mitigates injury and catastrophic events. No matter the spectrum, from coaching alone to overseeing a large staff and program, you'll find a plan you can enact and manage with ease.

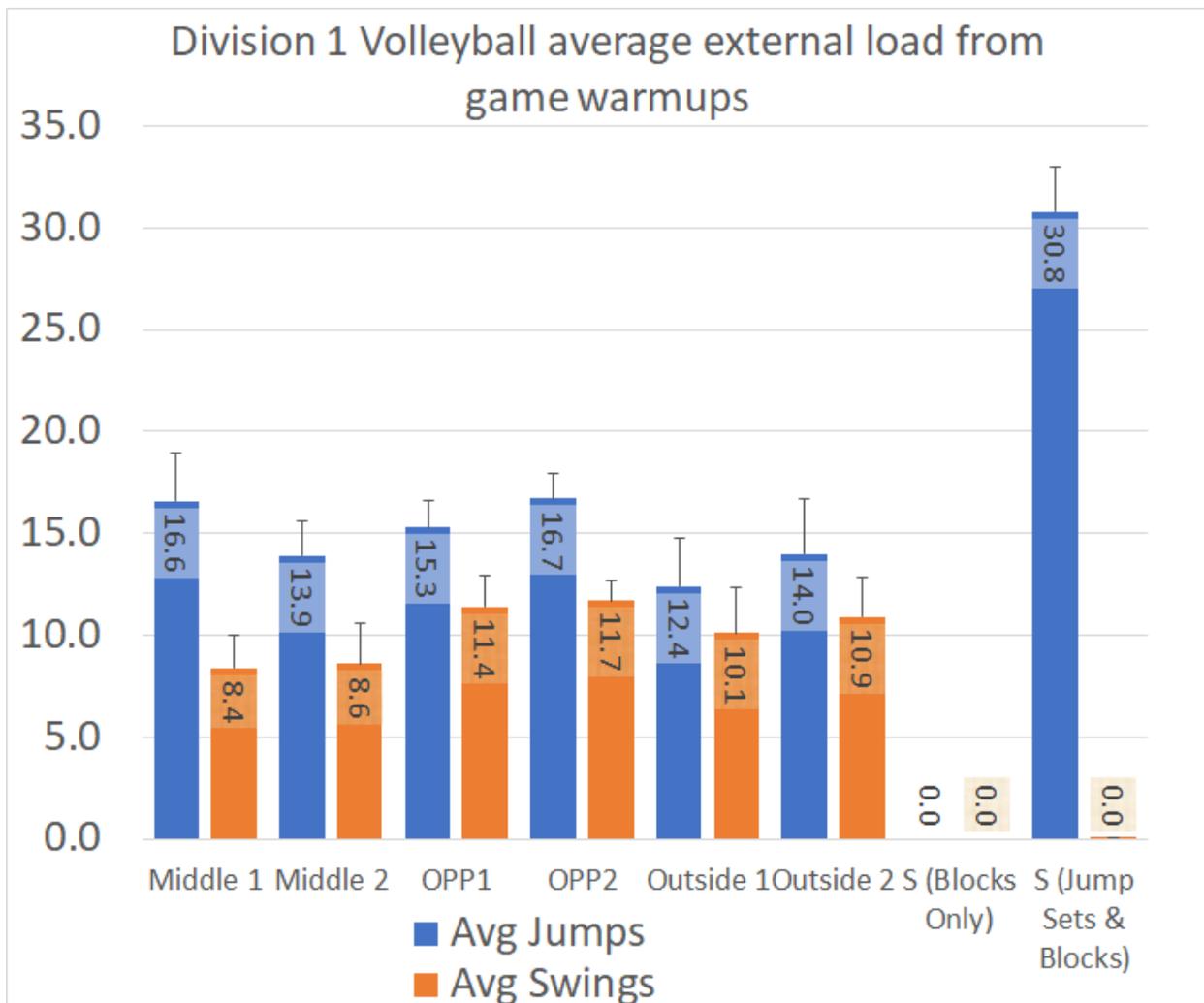
# The Data

## External Load

Before we manage how long practice runs and how intense it is, we must first understand our desired end state and work backward. Our goal is to prepare athletes to win matches. How should we physically prepare our players to do so? *Train them to meet match demands.*

Based on the 45-match fall season study mentioned above, the diagrams below display, by position, what those demands are.

Here are jumps and swings taken during the match **warm-up period**:



And the physical demands of each position **per set**:

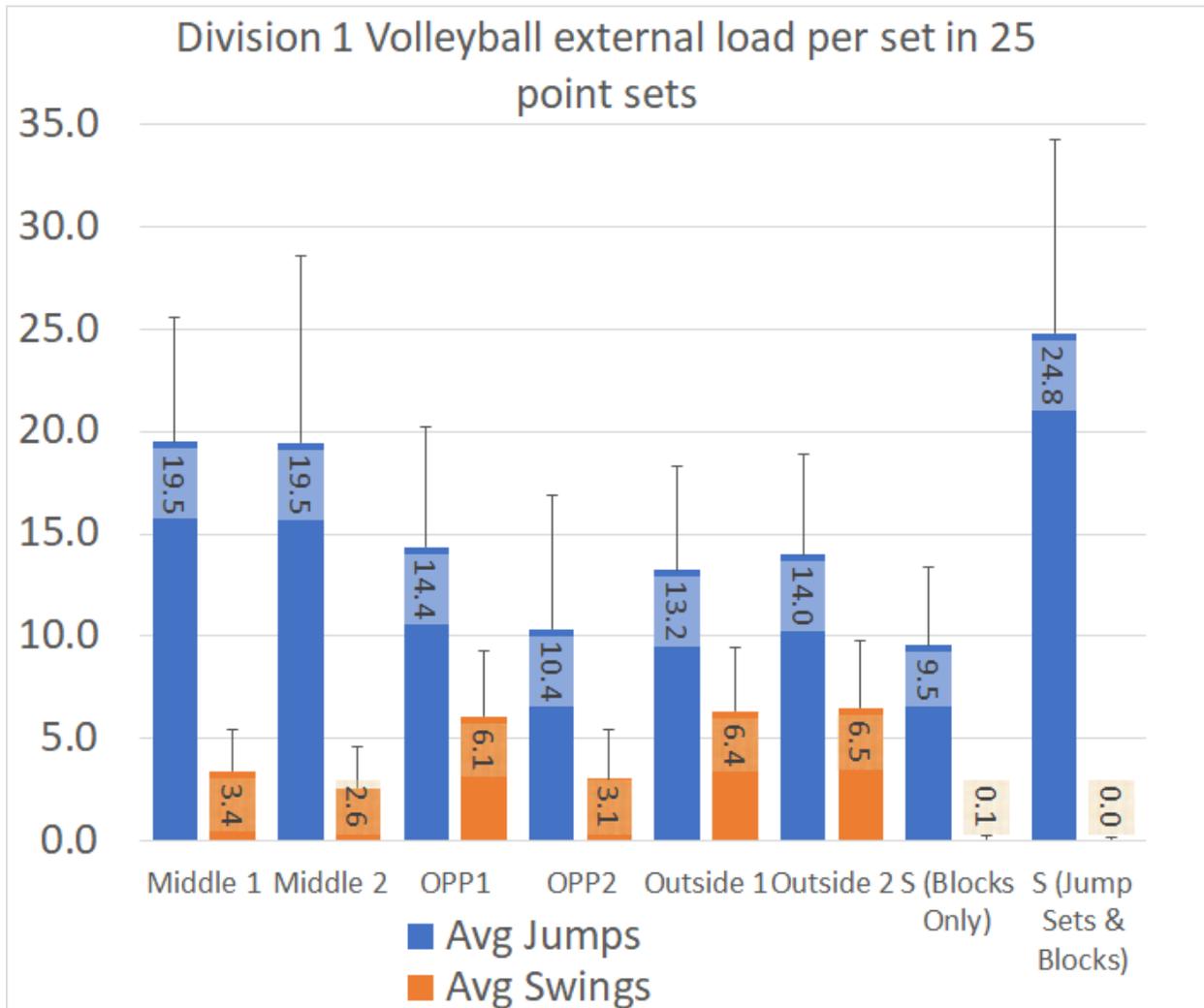


Table of physical demands of each position per set:

Position	Jumps	Swings	Sample Size (sets)
Middle 1	19.5 ± 6.1	3.4 ± 2.0	155
Middle 2	19.5 ± 9.1	2.6 ± 2	155
Opposite 1	14.4 ± 5.9	6.1 ± 3.2	152
Opposite 2	10.4 ± 6.5	3.1 ± 2.3	50
Outside 1	13.2 ± 5.1	6.4 ± 3.1	155
Outside 2	14.0 ± 4.9	6.5 ± 3.3	155
Setter (Blocks Only)	9.5 ± 3.9	0.1 ± 0.2	71
Setter (Jump Sets & Blocks)	24.8 ± 6.6	0.0 ± 0.2	34

All included sets to 25 points, rally scoring; Values are Mean ± SD

From this we can extrapolate to what a full 5 set match plus warmup will consist of:

Position	Jumps	Swings
Middles	134	34
Opposite	110	55
Outside	99	54
Setter (Blocks Only)	63	1
Setter (Jump Sets & Blocks)	144	0

Values are: Average Warmup + 4\* (Average Set + SD) + (0.6\* (Average Set + SD))  
60% of average set represents Set 5

The numbers above are considered “external load” - the amount of work an athlete produces in their external environment.

Are these numbers what you envisioned? And how do they align with your practice plans? Do your drills load up athletes with a full match’s worth of swings in the span of 5 minutes? Are they getting enough rest between efforts, similar to a match? How many times are they being asked even just to jump?

As the research indicates, we know:

- 75% of our injuries come in practice
- 30% of injuries can be described as overuse
- The highest rate of injury comes during the pre-season segment
- More injuries occur in hitting and blocking drills
- The majority of acute and overuse injuries stem from jumping
- Knees, ankles, and shoulders are the body parts most largely affected <sup>2</sup>

Therefore, the external load an athlete experiences in a match may very well not be reflected in the practice design and drill management seen during the pre-season. If teams avoided practicing multiple times a day, structured more modest jump and swing counts, and accounted for the body parts most affected, would we have as high of a rate of injury in the pre-season? Is there a better way to plan the external load your athletes undergo in practice, thereby reducing the risk of injury? The answer is yes. **Specific scaling calendars for external load are provided in “Return to Play Schedules” below.**

The number one takeaway is the understanding that practices should prepare athletes for the matches in which they play. As seasons progress, your loading may increase, allowing your athletes to handle more (being able to safely get through those 5-minute burner drills!). But to start a season placing athletes in environments and drill scenarios where they’re hitting 60 balls in a practice, often time and again, is out of line with what they’ll face. Using those precious pre-season weeks to responsibly scale is imperative.

How do these jump & swing demands fit into the timing of a match?

Others aspects of external load include time of exertion and rest intervals for recovery an athlete experiences. Here’s a look at the time demands of our sport:

Time Component	Measured Time
Average rally length	7.84s
Average set time (actual work, all matches)	339.41s (5m:39s)
Average set time (3 sets)	343.87 (5m:44s)
Average rest period between rallies	12-24s
Typical set time	~30m
Rest between sets	3m
Rest between sets 2/3	5m
Longest rally (averaged)	47.49

The body’s energy system requirements to perform with the above time domains are what Dr. Korem originally referred to as “bioenergetics.” Your fitness level and ability to manage fatigue, then, are critical to excelling in volleyball.

An average rally lasts 7.8 seconds, with 12-24 seconds between rallies (higher with more subs), and your athletes perform about 5½ total minutes of work over the span of an entire set (this varies by level, media timeouts, challenges, etc., but can range from 20-30+ minutes). The longest rallies observed averaged 47 seconds long.

A coach must, therefore, construct a training regimen that physically prepares his/her athletes for the number of jumps and swings they’ll see in a match - balancing practice demands to

avoid overuse yet maintain power - *and* ensure they are well-rested and ready to perform explosive efforts for the duration of the match, without driving up the risk of injury. Arranging consecutive high-intensity days, with more than one practice per day, is a surefire way to dramatically increase player fatigue, exposing them to risk of injury and subjecting the team to performance decompensation.

**Refer to the “Return to Play Schedules” for more detailed information on how to do so.**

## Internal Load

Measuring and controlling the External Load we place on athletes is very important to make sure we are exposing athletes to what they will be required to do in a game. It is just as important, however, to monitor and track the athlete’s response to that load. Internal Load is the physiological and psychological stress imposed from an external load. This is important because, due to differences in an athlete’s individual characteristics on a given day, he/she may be able to complete the same workload but at a different perception of effort.

For example, take an athlete approaching a day’s worth of activity. If that athlete didn’t sleep well the night before, didn’t eat enough, and independently decided to run 4 miles, they may find the exact same workload more difficult than if they slept sufficiently, ate well, and rested the day prior.

According to research, we know:

- Decreased fitness and increased load = injury susceptibility.<sup>2</sup>
- It is extremely doubtful athletes receive full recovery from multiple high-intensity sessions in 24 hours.<sup>10</sup>
- Exceeding weekly thresholds immediately place athletes at risk, and that risk can stay elevated by 2-4 times the normal for the next 7 days.<sup>1 3</sup>
- Without sufficient recovery, athletes suffer from performance drops.<sup>10 11</sup>

Therefore, the monitoring of internal load is of increasing importance because no two athletes, days, or practices will ever truly be the same in the context of everything that influences internal load. An athlete will have dramatically different perceptions of practice difficulty when he/she has undergone a thorough preparation period and consistent training as compared to the athlete who experiences the identical practice with limited to no training and novel exposure.

To track the interplay between load, intensity, fitness, difficulty, and need for recovery, you can use the surrogate TRIMP (training impulse) score, which is a means of calculating global load, covered next.

**Specific scaling calendars for internal load are provided in “Return to Play Schedules” below.**

# Measuring Load

## Global Load

So we know that diligent planning and monitoring of an athlete's external and internal loads will lead to healthier, more available rosters. We know that available rosters help teams win games!

So how do we go about measuring all of the above?

It's actually not as hard as you think.

Let's start with internal load, which characterizes how intense a practice/lift/warm-up is. You can (and should) track every session an athlete undergoes in a day - whether it be an early morning lift or conditioning segment, a serve/pass session, a full-scale practice, or even the warm-up for a match. Doing that consistently day-in and day-out results in a "global" picture of the load placed on an athlete.

To measure intensity, you can use the RPE (rate of perceived exertion) method, asking your athletes after x activity how hard they thought it was using the 1-10 RPE scale. Each athlete will give his/her 1-10 difficulty rating of practice, lift, etc. RPE has strong correlations with percentage of heart rate reserve and blood/muscle lactate, so can be considered a useful, easy-to-use tool to measure fitness and fatigue<sup>12</sup>. The easier an athlete feels a session is, the (presumably) more in shape he/she is. The harder a session feels, the less in shape or more fatigued he/she is. Hence, a great way to gauge internal global load.

### Rate of Perceived Exertion Scale:

RPE (Rate of Perceived Exertion)	
1	Very Light
2-3	Light
4-5	Moderate
6-7	Hard
8-9	Very Hard
10	Max Effort

You collect each individual's RPE, average them out as a team, and simply multiply that value by the duration of the practice, lift, etc. This should be done in minutes:

RPE (average of all athletes involved) x Practice Duration (minutes) = Internal Global Load

For example, let's say you practiced 1 hour, 40 minutes (100 minutes total). When averaged out, the players on your team rated practice a 5.

$5 \times 100 = 500 \text{ AU}$

This method typically refers to 500 as "arbitrary units" (AU), called such because they are a relative measurement that lose meaning when taken out of context.

Later in the day, assume you hold a serve/pass practice for 30 minutes. Players rate it, on average, a 3 on the RPE scale.

$3 \times 30 = 90 \text{ AU}$

Your daily global load for all of the day's sessions then = 590 AU.

To collect player RPEs, you can use a Google form your players fill out every session, or text a coach their RPE number, or simply walk up to you after practice and tell you while you input that number into a spreadsheet. It's important those numbers are communicated discretely, as you don't want players influenced by how their teammates rate sessions. Otherwise, you won't get an accurate picture of how the team is coping.

Do this every day and you can get a weekly "global load" number. The goal then, especially during pre-season, is to improve fitness through staged increases in total load, increasing ~10-15% each week (max at 15%)<sup>3</sup> until you reach what you've calculated to be a weekly global load number for "match week."

**A sample load calculator might look like this:**

Data			Game				Practice		Practice #2		Individual		Physical Preparation		Global Load
Date	Week	Athlete	WU RPE	WU Duration	RPE	Duration	RPE	Duration	RPE	Duration	RPE	Duration	RPE	Duration	
1/22/2020	Week 1	1													0
1/22/2020	Week 1	2													0
1/22/2020	Week 1	3													0
1/22/2020	Week 1	4													0
1/22/2020	Week 1	5													0
1/22/2020	Week 1	6													0
1/22/2020	Week 1	7													0
1/22/2020	Week 1	8													0
1/22/2020	Week 1	9													0
1/22/2020	Week 1	10													0
1/22/2020	Week 1	11													0
1/22/2020	Week 1	12													0

\* WU = match warm-up

\*\*Physical Preparation = strength & conditioning activities

How can you then use global load to appropriately scale your intensities in preparation for matches?

Start at the demands of competition week and work backward.

If you play two matches in your first weekend of competition and have 3 practices leading up to them, with two days off, you could create a conceptual weekly global load number. Here is an (oversimplified) example:

Two matches = 120 minutes each and RPE of 8 for each = 1920 AU

Two match warm-ups = 30 minutes each and RPE of 4 for each = 240AU

One high-intensity practice = 135 minutes and RPE of 8 for each = 1080 AU

Two low-intensity practices = one 30-minute (RPE 4) and one 60-minute (RPE 4) = 360 AU

Total weekly global load = 3600AU

Keep in mind, this example doesn't include team lifts or individuals, if held, and global load includes all events an athlete undergoes. If your first competition week was slated to be 3600 AU, then you can scale backward, starting your pre-season at a manageable, safe number that discourages injury and provides an avenue to progressively scale intensities up to "match readiness." We start our pre-season at ~60% (+/- 5%) of what we anticipate our first match week global load to be, assuming we have 4-6 weeks to prepare. This allows us to safely increase load by 10-15% each week and reach our estimated match week goal of 3600 by the end of those 4-6 weeks.

In the above example, 60% of 3600 would be 2160, meaning you can start week 1 scheduling your practices, lifts, and serve/pass sessions to accumulate to that 2160 goal. If you don't have any data to work off, you simply predict how long your practices may go and how hard you think the team will rate those practices. The first time through takes more guesswork, but once you have a base of numbers and how your team reacts to your drill planning, then it gets easier.

If you have 2-, 4-, or 6-weeks of pre-season training, then you can modify your weekly numbers to hit your final target. Ideally you want to boost your global load each week by 10-15%<sup>3</sup> until you reach match readiness, but that's not always possible. Using our above example, starting at 2160 and increasing 12%, it'd take 5-6 weeks to get there.

If you don't have that amount of time to prepare, you will want to start your week 1 global load higher (inherently riskier, albeit likely unavoidable), still maintaining a 15% increase until you're at competition readiness. You can see how this plays out in our Return to Play Schedules below.

Some of us only have two weeks to get the team ready - that doesn't mean all is lost. Use the first week as a reintroduction to volleyball. The temptation is to get back in the gym and squeeze the minutes from the day prepping skills and strategy but bear in mind that going overboard will jeopardize the health of your players.

It's not a mere anecdote that healthy teams win – research reflects this fact. If you have more of your roster available as a coach, then you can select the absolute best players to see the court, giving you better odds at winning. It's been shown a significant relationship exists between teams with less injury days and team success – final league standing.<sup>7</sup>

Another study found that a team with decreased injury rate and injury severity compared with the preceding season had a statistically better chance of team performance – they got healthier and by extension, better. Injuries to sport's most functional body parts (knees, ankles, and shoulders in volleyball's case), known as "injury burden," influenced negative team performance, i.e. when reliant on certain body parts to perform critical game skills, and those body parts are hurt, it's difficult to operate effectively. Finally, not only do injuries contribute to negative team results and performance, they carry immense collateral damage in negative psychological effects, both for the athlete who sustains the injury and the team as a whole.<sup>8</sup>

Finally, a study on Qatari professional football found lower injury occurrence strongly correlates with team ranking position, more games won, more goals scored, greater goal difference, and total points.<sup>9</sup>

The point? Proper load measurement as a means to design and implement effective training isn't just a "feel good" measure for players – it leads to results.

A more reasonable strategy if you only have two weeks? Start at 60% of what you think match week looks like - that's your week 1 global load target. Progress by 15% week two. Thereafter,

prioritize your competitions as the main stimulus. That might mean a significant reduction in practice time - which doesn't feel practical, as you'll want to prepare the team - but in the long run, your team's health and availability will benefit. As the weeks go on, you'll be able to do more and more during the week at practice, producing a robust, fit team safeguarded from injury.

We all feel the pressure to win, to perform. In the pre-season, you're balancing getting your team back into shape with morale management; winning games to boost team confidence without breaking the physical "bank." This is the creativity and art of coaching.

## Acute:Chronic Workload Ratio

If you're taking the time to calculate your team's global load — asking players for their RPE numbers after every workout, serve/pass, practice, individual, etc. and multiplying that average by the event duration (in minutes) — then you should absolutely take the time to calculate their ACWR, known as acute:chronic workload ratio.

If you consider your gym to be elite, then you should have people assigned to track and measure the acute:chronic workload ratios of every athlete on your team.

This ratio, also referred to as "training stress balance," gives a picture of your team's global load over the course of one week (acute) and how that week compares to the previous four weeks of global load averaged out (chronic).<sup>4</sup>

ACWR scores can be predictive of injury<sup>13</sup> and serve as a barometer for the team's fitness/fatigue level, appetite for intense training, or need for a break. Individual ACWR scores function as waypoints for each player's current health status. Starting players whose game workloads are higher may need less practice loading to reduce spikes in ACWR to keep them in an ideal range (more on ranges later). Those not receiving any match stimulus (reserves) may need additional attention or training throughout the week or on scheduled low days.

Essentially, as you calculate your internal global load and input those numbers into the ACWR formula below, you have the ability to see how players are responding to your training. ACWR will show you whether they're ready for you to step on the gas in practice, or schedule a lighter session. You'll be able to tell exactly what individual players need – organizing one-on-one or small group practices for those who need extra work or setting up recovery time for overworked players. Not only will this help you diagnose problems before they arise, it helps you properly schedule training weeks to retain team health. Your players will start to feel you modify training to adapt to their needs and will appreciate the mindfulness. Since you'll know when to push, you can demand more from them when the time is right.

How is it calculated?

You simply take the team's one-week global load (acute) and divide it by the previous four-week global load average (chronic).

For example, let's use the 3600 AU week load for the match week used earlier. And we'll say the previous 4 weeks had the following global loads:

3400  
4000  
3600  
3700

4-week average: 3675 AU

The acute:chronic workload ratio is the acute score divided by chronic score:

$$3600 / 3675 = 0.98$$

The ACWR score then, is 0.98. That indicates the one week global load is *slightly* lower than the previous four weeks, barely so.

A healthy range to keep your athletes in is 0.85-1.35. Anything above 1.50 increases injury risk 2-4 times over the next week. Really high scores (2.0+) put athletes in jeopardy for the current training week *and* subsequent training weeks, boosting risk of injury threefold to fourfold. When the acute, i.e. single-week load, outweighs what you've averaged over the past four, then your team is at greater risk of injury. If they're in the ideal range mentioned above, then your team is humming along within safe boundaries. If you're below 0.85, your team is falling out of shape (which can also lead to injury).<sup>1 3 5 6 13 14</sup>

Think of it like this: the more drastic your departure from one week to the next in training, the higher your acute:chronic workload ratio. The higher your ratio, the greater threat to your team's health and performance.

Sound like pre-season?

Imagine your athletes have been independently training at home, then return to campus and are thrown into team lift, a morning serve & pass, and an evening practice. Repeat this daily for two weeks. It's easy to envision how high an individual's and the team's ACWR ratio would be. This reinforces the previous idea of progressive scaling. Start your team with something manageable week one after they've come back from independent training. Increase by ~10-15% each week and they'll positively adapt to training, boosting fitness while minimizing the risk of injury.<sup>3</sup>

Using the 4-week model we've offered in the "Return to Play" schedules, let's look at the global loads as they scale up:

Week 1 = 2506

Week 2 = 2813 (12.2% increase from week 1)

Week 3 = 3164 (12.5% increase from week 2)

Week 4 = 3480 (10.0% increase from week 3)

4-week average = 2990

In week 4 (match week), our acute load is 3480, so our ACWR is:

$$3480 / 2990 = 1.16$$

This score is in the healthy range described above, so things are right on track.

With research has come the advent of a “high-low” model, a practical way to provide this scaled training while simultaneously matching the rhythm of your playing season.

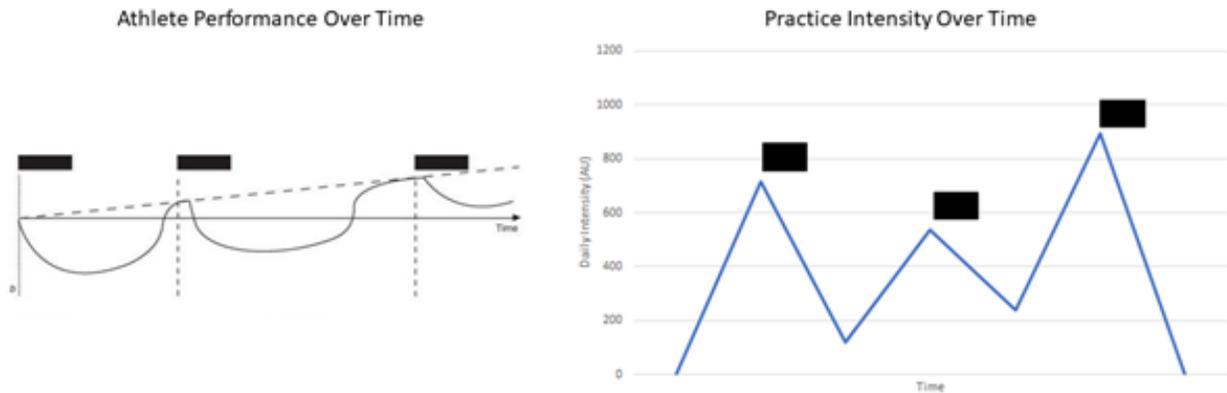
## The High-Low Model

### Basic Guidelines

During your season, you may find yourself playing matches on a Friday and Sunday. What do you do Saturday and Monday? The default answer would be something to the effect of, “enough to keep touches on the ball without wearing them out.” If you play Saturday and Sunday back-to-back, what do you do on Monday with the team? Likely you’re looking to give them a day off (or you have to...for good reasons!). If you play a mid-week match and one weekend match, say Wednesday and Saturday, what will you do on Thursday? You’ll likely start to prep for the Saturday match, have a serve & pass, something perhaps lower-key.

This natural ebb and flow can best describe the high-low model, which recommends a low-intensity day of training following a high-intensity day. Alternating high/low days of intensity in the practice gym offers the ability to “go hard” and receive positive performance improvement from that training while providing a built-in mechanism to manage fatigue and injury, the low day. That low day gives your players the opportunity to recover from the previous day’s session, thereby accomplishing training with fewer negative outcomes. <sup>11</sup>

Below is a representation of ideally timed training and subsequent performance (adapted from Zatsiorsky & Kramer<sup>15</sup>), shown alongside a High-Low practice week:

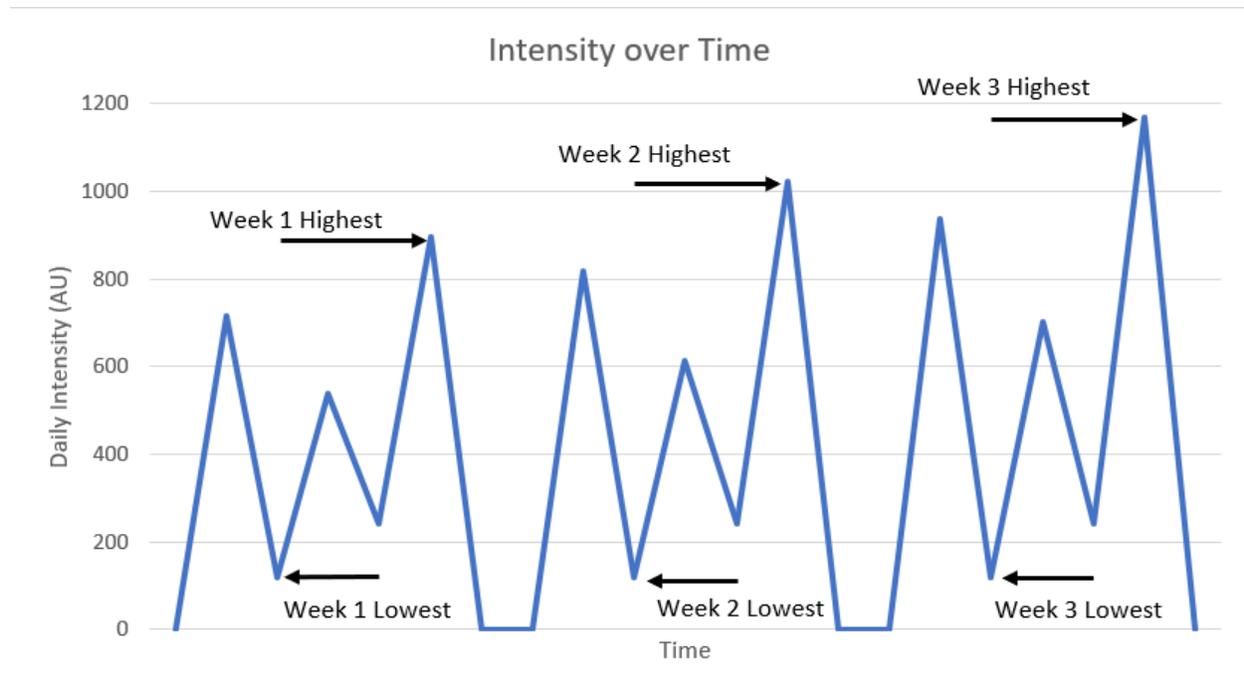


*\*Black boxes indicate high days*

As one can see from the graphs, the timing of the stimulus is important. The day immediately after a high day is a programmed low day, allowing the athlete to recover before being hit with another high day. It's important to understand that the stress of training and practice does not make an athlete better or fitter without sufficient time to recover. Knowing your athletes need time to recover, and allowing for that time, enables you to program a high day when they're ready for it, rather than keeping intensity high while they're down, which discourages gains (more on that later).

"But wait - doesn't that lead to 'spikes,' which you said were bad?"

To mitigate this, you start small with your high days, gradually building capacity. Consider this graph as a representation of your season intensities:

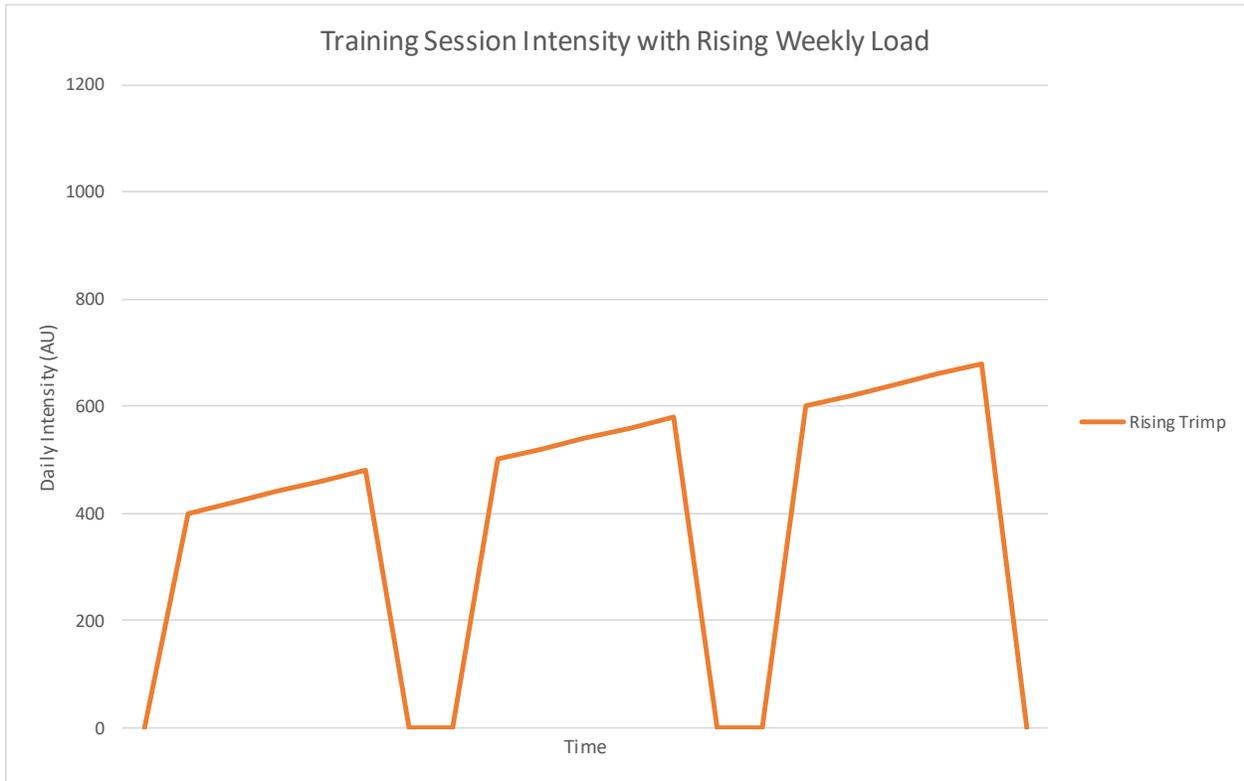


The peaks represent your high days and the valleys represent your low days, with the “bottom out” lines representing days off. At the start of your season, your high days aren’t super intense. You may limit the time (a hard 60-minute practice rather than 2 hours), or you might limit the number of drills where you crank things up (a 45-minute warm-up and skill period followed by a tough 20-minute drill). The high isn’t really that “high” to start.

As your team’s fitness improves, your coaching toolbox expands. You can start to make your high-intensity practices longer, or have an extra drill added in. By the end of the season, you should be able to challenge your team for the duration of practice and *they’ll have the physical means to respond*. If the end of the season is when we want to achieve optimal team performance, this serves as a roadmap.

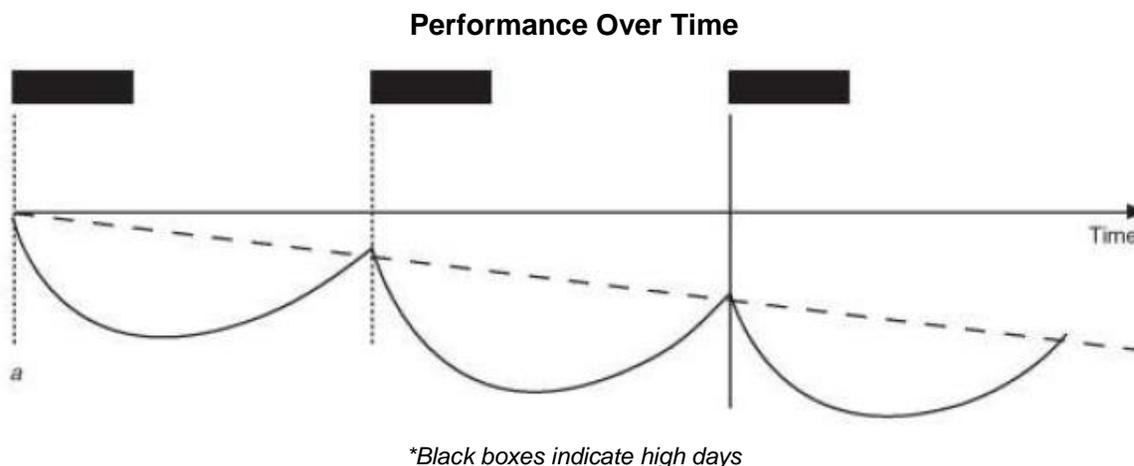
This approach offers an additional benefit: training for performance above what might be required in a game. As the amplitude of that high curve goes higher, the more your players and team can do. The more they can do, at higher intensities, for longer durations, enables them to navigate simple and complex match situations with greater efficiency and skill, performing at a high level throughout the match.

Consider a more linear approach:



This approach seems to have the same end result, right? Not quite, as this method has a higher potential for negative consequences. Without the accompanying valleys (low days), your body never gets a break. More is asked of you each time you train. With the stressors of travel, school, relationships, playing time, family, etc., a continually rising training stress compounds the toll on an athlete's body. Managing all facets of an athlete's load is part of a coach's job (and skill) – scheduling intentional rest periods and low days keeps your team mentally and physically fresh.

Below is a graph demonstrating what happens to performance when an athlete isn't given sufficient time to recover from a strenuous stimulus (adapted from Zatsiorsky & Kramer<sup>15</sup>):



In this model, daily intensity remains high. The athlete still needs time to recover but isn't afforded the chance to do so, resulting in performance decline over time. When programming daily high days, be mindful that stress and intensity compound in a way that discourages growth and performance, as athletes are asked to perform without the accompanying level of readiness.

It's advised to do all of your high-day activities on the same day - avoid spreading them out. So, for instance, conduct a morning lift or conditioning session the same day as a tough, intense practice. If you have to go back-to-back, that's fine. Budget at least 30 minutes between your lift and practice in that case, but still pair them on the same day.

This schedule has dual benefits: 1) concentrating the load on your central nervous system allows for what is called "supercompensation" between high intensity days, and 2) low central nervous system days facilitate recovery from high CNS bouts while also allowing for technical skill practice.<sup>10 16</sup>

As previously mentioned, conducting consecutive days of really hard practices, for long durations, can lead to performance decompensation, soft-tissue injury, and incomplete recovery.<sup>10 11</sup> This is not "building mental toughness" - this is forsaking athlete health and neglecting scientific research for the purpose of putting players through a crucible that eventually predisposes them to risk of injury and doesn't benefit the long-range goal of the team, which should be winning a championship. The temptation of "character building" is attractive, and well known. But it's also remarkably short-sighted.

## An Exception...

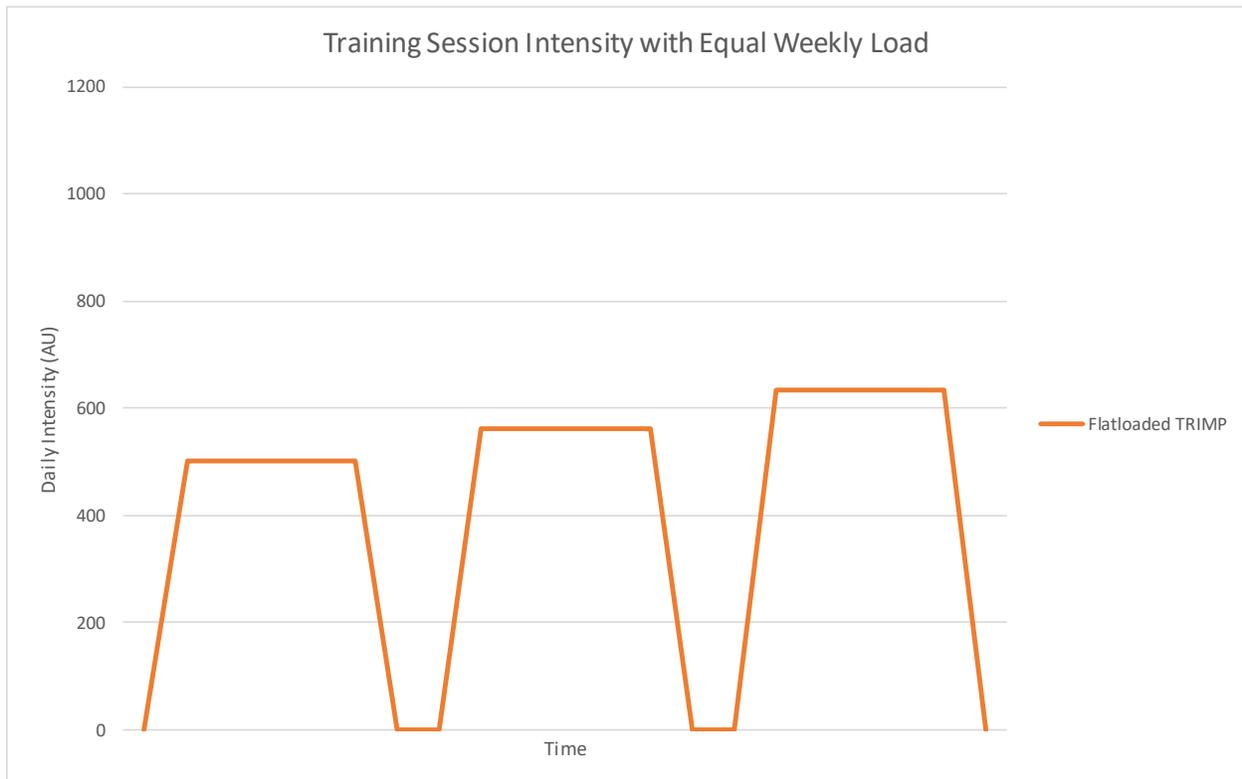
Many coaches also believe that consistently hard training safeguards their athletes from injury, allowing them to train, improve, and not get hurt. They ramp up the intensity for practice each day and keep it at that level every time they hit the court. Consistent, daily intensity. They're always ready to go. Does this work?

Kind of...to a point.

You can train at a consistent level on a daily basis, and this high chronic workload can be preventative for your players.<sup>3 5 13</sup> If you want to practice the same amount of time each day, at a relatively similar intensity, there are fringe benefits to doing so, but the following points should be noted:

- Starting the season at the level you intend to maintain still signifies an acute spike and should be avoided until capacity has gradually increased to sustainability. For example, under normal circumstances going from 8 hours of training to just 14 at the same average RPE of 5 would mean a 175% increase in training load from the last week of summer training to the start of camp.
- This schedule must be performed systemically, with an eye towards sequencing and organization.<sup>14</sup>
- Week-to-week load changes must be kept to 10% to retain player health.<sup>3</sup>
- The ACWR ratio should be kept in the moderate range (1.00-1.25).<sup>1</sup>
- Players cannot overcome excessive fatigue - once onset, the risk of injury rises.<sup>13</sup>
- Players cannot improve with a fitness level that's too low - so tracking practice RPE and conducting truly moderate sessions to avoid underperformance (and risk of injury) is paramount. Players will also not have a source of overload from practice, meaning the only overload stimulus would come from games.
- If players are suffering from residual fatigue, training benefits will be lost.
- High fatigue (shown through high ACWR ratios) has a one-week delay, meaning injury risk is elevated for the week following a jump greater than 10%.<sup>5</sup>
- How high is high? An RPE of 7 is considered "hard" and representative of vigorous activity that's "borderline uncomfortable." You may be operating a daily practice regimen that's closer to "moderate" than it is "high." You might be closer to a high-low model than you think.

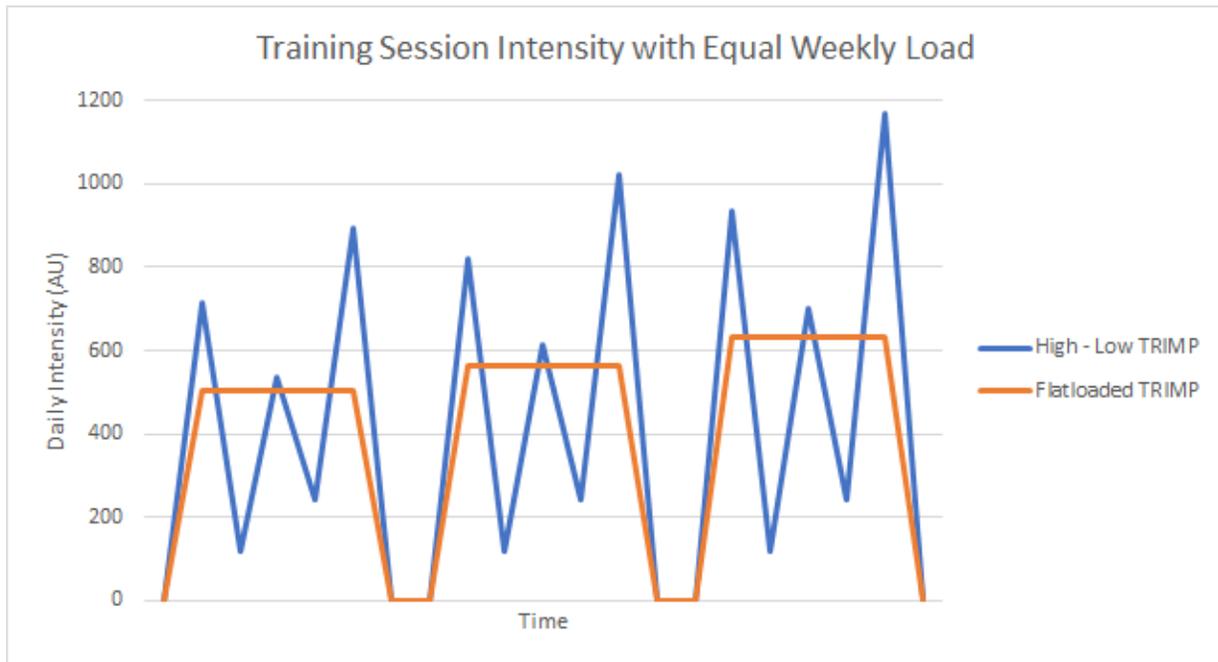
Consider this intensity graph over time:



If your seasonal plan reflects the graph above, not only do you run the risk of the big jump at the beginning of the season, but your training “monotony” is also high. Monotony measures day-to-day variation of your training.<sup>11</sup> A team who practices in the above fashion has high monotony due to little to no variation in their training intensities or durations. Research on monotony shows that high load + high monotony = negative adaptations to training.<sup>11</sup> Plus, as an athlete, it’s repetitive to the point of being dull and disengaging.

The disadvantage to a high monotony (same loads every day) plan is that it actually reduces the weekly training load an athlete is able to handle. Research has demonstrated that athletes exposed to the same weekly workload but on a High-Low model had less incidence of injury and illness than athletes with a flat-loaded week. Concentrating the workloads in a High-Low fashion also allows for higher single day loading than a flat-loaded model would, allowing for greater stimulus.<sup>11 17</sup>

Consider a final graph comparing the two approaches:



*Adapted from Smith 2016<sup>17</sup>*

Even though the High-Low model above matches the same weekly workload as the flat-loaded model, the High-Low model can reach 185% of the single day TRIMP of the flat-loaded model with significantly reduced probability of injury.<sup>11 17</sup>

With this in mind, for those ascribing to the flat-loaded training model we ask: have you been successful because of it, or in spite of it?

# Practical Application

## Return-to-Play Schedules

Below you'll find return-to-play schedules to match the length of the pre-season you'll have with your team. These schedules can be deployed in your gym regardless of whether you're a Division I college program or a small high school program.

**An important note on practice volume:** you'll find the number of jumps and swings, the length of practice, and the number of practices we're prescribing to be *the lowest with which you've ever trained*. In order to drop the existing high rate of injury during pre-season, minimize risk to your athletes as they return from their longest period away from volleyball and intense activity, and combat team health issues plaguing your season, then deliberate action to "do it different" is required.

This shift also necessitates buy-in from your coaching staff and the willingness to adopt an approach that acts on the research mentioned above. This doesn't magically preclude your team from suffering injury but it *does* diminish the likelihood you'll suffer from persistent nagging injuries and/or catastrophic events.

**An important note about off days:** if you're subscribing to the 2-week model, three off days are recommended. In the 4- and 6-week models, there are two days off per week. For many of you, this amount of off days may be equal to the total you've given your team in *entire pre-seasons* before this. Given COVID-19's impact, this is necessary. Many players will step into the gym for the first time having not trained since March. Considering the unmonitored nature of anything they have physically done (or say they have done), you must plan for the lowest common denominator – having done nothing.

Furthermore, the amount of training in week one is high in terms of global load; bodies need time to recover. For perspective, the suggested week 1 load you'll find below is 600AU *above* where our own team started when returning from winter break this past year. That winter break lasted about 6 weeks. Many athletes will return to gyms after 20-26 weeks off due to COVID-19. Having complete off days to mitigate strain is not only necessary, it's our responsibility.

What happens when you don't allow for time off to recover? Or when you've escalated training right out of the gate, resulting in that dangerous acute spike? Take, for example, our staff's favorite analogy – baking a cake. When you've undercooked a cake, you can always put it back in the oven to achieve the desired consistency. However, if it's left in the oven too long and burned, you can't reverse the cake into a beautiful masterpiece. It remains burned. By comparison, if you immediately place a high load on athletes upon their return to campus, you "burn the cake," creating a level of strain on the body from which it's difficult to recover, leaving athletes struggling to maintain future loads placed on them in a healthy manner. Or worse, they injure themselves early on, taking them out of the game. By programming conservative numbers

in a scaled fashion, you're able to measure progress, adjust course as needed, and end up with the perfect "cake" – an injury-free, physically prepared athlete hungry to win games.

A day off doesn't mean you stop all activity. Use those days as an opportunity to review video, organize team activities, break down tactics, or do a service project. Schedule time for regeneration – foam rolling, voodoo bands, ELDOA, mobility, stretching, etc.

### **Suggestions for tracking jumps and swings:**

- Diligent practice planning and disciplined execution of the practice plan.
- Videotape practice and count jumps & swings afterwards (labor-intensive).
- Have athletic trainers, if available.
- Use team managers, if available.
- Ask athletes to keep count during drills you're particularly concerned about – when given swing counts, most athletes take care to know their limit.
- If your school has a VERT system, then use one of the above options to add on swings later.
- If someone on staff can code with DataVolley, configure a best practice to code block jumps (all other jumps & swings will be easy to report).

### **A few other guiding thoughts:**

- "TRIMP" stands for "Training Impulse."
- External and internal loads are automatically scaled according to the aforementioned best practices.
- Jump and swing counts are sorted and scaled by position.
- Schedules are automatically situated into the "high-low" model.
  - "LowV-ModV-HighV" represents volume on that particular practice day, so on a HighV Global Load day, for instance, you'll see athletes take the most number of jumps and swings for the week.
- Friday & Saturday are back-to-back high days intended to prepare athletes for the back-to-back competitions in which they'll play. (Or what seems to be the most prevalent scheduling format as of current)
  - Although this is a minor departure from a strict "high-low," it mimics what the athletes will encounter. This fact is compensated for by pairing a low-volume high day with the high-volume high day (rather than mod-high or low-mod).
- Practice durations are suggested in minutes.
- Make sure you have an RPE collection system in place and have tested it before using. If, for whatever reason, you absolutely cannot collect RPE scores, then use the practice guidelines found in this manual to generally plan for expected intensities.
- This is not one-size-fits-all. Coaches will need to inject slight modifications to account for training start date, date of first competition, scrimmages, etc. Nonetheless, the general jump/swing count prescriptions remain.

- Pay attention to how your athletes react. If your team returns out of shape, or reacts adversely to the plan you enact, notching up the intensity level to account for the fitness gap is the single most inappropriate response. Adapt your plan.
- Plan a quality practice. The best way to hit these targets is to plan your practice in advance. Plot out time and rep schemes, then stick to your plan. Most of us don't have the luxury of an army of managers to live-stat, or may not have access to a VERT system. Rely on good, disciplined coaching.
- If your team has relatively new/developing skills – you're probably not reaching a very high intensity, as the athletes don't have the requisite ability to produce the corresponding force or power (think younger club teams, or freshmen high school teams). Your primary consideration should be practice length as they get used to the sport.

## 2-week return-to-play

This is the least desirable option but likely the most prevalent one, as you might be bound by start dates determined by your governing body.

If you're preparing for a 2-week pre-season, you have minimal time to gear players up, so you must inherently risk more earlier on in the season. However, a modest start to pre-season training will at least lay a foundation for future training.

In the chart below, "Week 3" is the week initiating match play. If your first competition takes place during what's shown as "Week 2," then ignore "Week 1" and progress straight to "Week 2" to start, with the competition coming during "Week 3."

Specific notes:

- Mondays are high days – you have practice – but you should avoid jumps and swings as a deload to compensate for the rest of the week.
- Wednesday, Friday, and Saturday are the remaining high days
- Tuesday, Thursday, and Sunday are off days
- Wednesday and Saturday allow for 30 minutes of individual work at a 4 RPE – these are referred to as "Practice #2"

2-Week External Load – Jumps & Swings:

Week 1	8/10/20 Monday	Global Load	8/11/20 Tuesday	Global Load	8/12/20 Wednesday	Global Load	8/13/20 Thursday	Global Load	8/14/20 Friday	Global Load	8/15/20 Saturday	Global Load	8/16/20 Sunday	Global Load				
	OH	Jumps Swings	No Jump	OH	Jumps Swings	Low	OH	Jumps Swings	ModV	OH	Jumps Swings	LowV	OH	Jumps Swings	High V			
MIDS	Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings		
OPP	Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP	Jumps Swings
Setters	Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters	Jumps Swings
S Jump Set	Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set	Jumps Swings
									2 Sets + WU									
Week 2	8/17/20 Monday	Global Load	8/18/20 Tuesday	Global Load	8/19/20 Wednesday	Global Load	8/20/20 Thursday	Global Load	8/21/20 Friday	Global Load	8/22/20 Saturday	Global Load	8/23/20 Sunday	Global Load				
	OH	Jumps Swings	No Jump	OH	Jumps Swings	Low	OH	Jumps Swings	ModV	OH	Jumps Swings	LowV	OH	Jumps Swings	High V			
MIDS	Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings		
OPP	Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP	Jumps Swings
Setters	Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters	Jumps Swings
S Jump Set	Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set	Jumps Swings
									2.5 Sets + WU									
Week 3	8/24/20 Monday	Global Load	8/25/20 Tuesday	Global Load	8/26/20 Wednesday	Global Load	8/27/20 Thursday	Global Load	8/28/20 Friday	Global Load	8/29/20 Saturday	Global Load	8/30/20 Sunday	Global Load				
	OH	Jumps Swings	No Jump	OH	Jumps Swings	Low	OH	Jumps Swings	ModV	OH	Jumps Swings	Low	OH	Jumps Swings	GAME			
MIDS	Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS		Jumps Swings	MIDS	Jumps Swings
OPP	Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP		Jumps Swings	OPP	Jumps Swings
Setters	Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters		Jumps Swings	Setters	Jumps Swings
S Jump Set	Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set		Jumps Swings	S Jump Set	Jumps Swings
									5 Sets									

Week 1

Position	Count	Week Totals
Outsides	Jumps	176
	Swings	95
Middles	Jumps	251
	Swings	58
Opposites	Jumps	196
	Swings	98
Setter (block jumps)	Jumps	153
	Swings	0
Setter (jump sets included)	Jumps	254
	Swings	0

Week 2

Position	Count	Week Totals
Outsides	Jumps	206
	Swings	112
Middles	Jumps	295
	Swings	69
Opposites	Jumps	230
	Swings	115
Setter (block jumps)	Jumps	180
	Swings	0
Setter (jump sets included)	Jumps	298
	Swings	0

Week 3

Position	Count	Week Totals
Outsides	Jumps	243
	Swings	132
Middles	Jumps	347
	Swings	81
Opposites	Jumps	272
	Swings	136
Setter (block jumps)	Jumps	213
	Swings	3
Setter (jump sets included)	Jumps	351
	Swings	0

2-Week Internal Load – Fitness & Fatigue:

Week 1	8/10/20 Monday			Global Load	8/11/20 Tuesday			Global Load	8/12/20 Wednesday			Global Load	8/13/20 Thursday			Global Load	8/14/20 Friday			Global Load	8/15/20 Saturday			Global Load	8/16/20 Sunday			Global Load	Week Summary							
	Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game TRIMP Sum							
	Practice #1	100	6	600				0	Practice #1	90	6	660				0	Practice #1	90	6	540				780				0	2580							
	Practice #2				Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4	Practice #2	30	4	7.50	
	Individual				Individual				Individual				Individual				Individual				Individual				Individual				Individual			Individual			2915	
	Physical Prep				Physical Prep				Physical Prep				Physical Prep				Physical Prep				Physical Prep				Physical Prep				Physical Prep			Physical Prep			Monotony	
																																		1.13		
Week 2	8/17/20 Monday			720	8/18/20 Tuesday			0	8/19/20 Wednesday			680	8/20/20 Thursday			0	8/21/20 Friday			600	8/22/20 Saturday			960	8/23/20 Sunday			0	Week Summary							
	Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE	Game	Duration	RPE	2960	
	Practice #1	120	6		Practice #1				Practice #1	80	7		Practice #1	80	7		Practice #1	100	6		Practice #1	120	7		Practice #1	120	7		Practice #1	120	7	Practice #1	120	7	Practice #1	14.7%
	Practice #2				Practice #2				Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4	Practice #2	30	4	Practice #2	8.00
	Individual				Individual				Individual				Individual				Individual				Individual				Individual				Individual			Individual			Individual	3294
	Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep	1.11							
Week 3	8/24/20 Monday			600	8/25/20 Tuesday			0	8/26/20 Wednesday			600	8/27/20 Thursday			0	8/28/20 Friday			1080	8/29/20 Saturday			1080	8/30/20 Sunday			0	Week Summary							
	Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE		Game	Duration	RPE	Game	Duration	RPE	3360	
	Practice #1	100	6		Practice #1				Practice #1	60	8		Practice #1	60	8		Practice #1	30	4		Practice #1	30	4		Practice #1	30	4		Practice #1	30	4	Practice #1	30	4	Practice #1	13.5%
	Practice #2				Practice #2				Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4		Practice #2	30	4	Practice #2	30	4	Practice #2	8.17
	Individual				Individual				Individual				Individual				Individual				Individual				Individual				Individual			Individual			Individual	3556
	Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep			Physical Prep	1.06							

## 4-week return-to-play

This is a workable calendar – somewhat steeper than an ideal 5- or 6-week schedule, but not an outright problem.

### Specific notes:

- High days – Tuesday, Friday, and Saturday
- Low days – Wednesday and Thursday
- Off days – Sunday and Monday
- Wednesday is a dedicated day for a 30-minute individual
- Thursday allows for a 60-minute practice



Week 1

Position	Count	Week Totals
Outsides	Jumps	149
	Swings	81
Middles	Jumps	201
	Swings	51
Opposites	Jumps	164
	Swings	82
Setter (block jumps)	Jumps	130
	Swings	0
Setter (jump sets included)	Jumps	216
	Swings	0

Week 2

Position	Count	Week Totals
Outsides	Jumps	175
	Swings	95
Middles	Jumps	236
	Swings	59
Opposites	Jumps	193
	Swings	96
Setter (block jumps)	Jumps	153
	Swings	0
Setter (jump sets included)	Jumps	254
	Swings	0

Week 3

Position	Count	Week Totals
Outsides	Jumps	205
	Swings	113
Middles	Jumps	278
	Swings	70
Opposites	Jumps	228
	Swings	113
Setter (block jumps)	Jumps	180
	Swings	0
Setter (jump sets included)	Jumps	298
	Swings	0

Week 4

Position	Count	Week Totals
Outsides	Jumps	241
	Swings	132
Middles	Jumps	327
	Swings	83
Opposites	Jumps	268
	Swings	134
Setter (block jumps)	Jumps	213
	Swings	0
Setter (jump sets included)	Jumps	351
	Swings	0



## 6-week return-to-play

This is ideal, ensuring gradual increases in external and internal load that prepare players for competition without subjecting them to undue risk. It allows time to start at a moderate RPE and duration and build within the three high day schedule. In this model, you can start slow, mimic game weeks, building to back-to-back matches appropriately.

### Specific notes:

- High days – Tuesday, Friday, and Saturday
- Low days – Wednesday and Thursday
- Off days – Sunday and Monday
- Wednesday is a dedicated day for a 30-minute individual
- Thursday allows for a 60-minute practice

# 6-Week External Load – Jumps & Swings:

Week	8/10/20 Monday		8/11/20 Tuesday		8/12/20 Wednesday		8/13/20 Thursday		8/14/20 Friday		8/15/20 Saturday		8/16/20 Sunday	
	OH	Swings	OH	Swings	OH	Swings	OH	Swings	OH	Swings	OH	Swings	OH	Swings
Week 1	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings
	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings
	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings
	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings
	Global Load		Global Load		Global Load		Global Load		Global Load		Global Load		Global Load	
Week 2	8/17/20 Monday		8/18/20 Tuesday		8/19/20 Wednesday		44063 Thursday		8/21/20 Friday		8/22/20 Saturday		8/23/20 Sunday	
	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings
	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings
	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings
	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings
Week 3	8/24/20 Monday		8/25/20 Tuesday		8/26/20 Wednesday		44070 Thursday		8/28/20 Friday		8/29/20 Saturday		8/30/20 Sunday	
	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings
	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings
	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings
	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings
Week 4	8/31/20 Monday		9/1/20 Tuesday		9/2/20 Wednesday		44077 Thursday		9/4/20 Friday		9/5/20 Saturday		9/6/20 Sunday	
	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings
	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings
	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings
	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings
Week 5	9/7/20 Monday		9/8/20 Tuesday		9/9/20 Wednesday		44084 Thursday		9/11/20 Friday		9/12/20 Saturday		9/13/20 Sunday	
	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings
	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings
	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings
	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings
Week 6	9/14/20 Monday		9/15/20 Tuesday		9/16/20 Wednesday		9/17/2020 Thursday		9/18/20 Friday		9/19/20 Saturday		9/20/20 Sunday	
	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings	MIDS	Swings
	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings	OPP	Swings
	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings	Setters	Swings
	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings	S Jump Set	Swings

Week 1

Position	Count	Week Totals
Outsides	Jumps	107
	Swings	58
Middles	Jumps	145
	Swings	37
Opposites	Jumps	119
	Swings	58
Setter (block jumps)	Jumps	95
	Swings	0
Setter (jump sets included)	Jumps	156
	Swings	0

Week 2

Position	Count	Week Totals
Outsides	Jumps	126
	Swings	69
Middles	Jumps	171
	Swings	43
Opposites	Jumps	140
	Swings	69
Setter (block jumps)	Jumps	110
	Swings	0
Setter (jump sets included)	Jumps	183
	Swings	0

Week 3

Position	Count	Week Totals
Outsides	Jumps	149
	Swings	81
Middles	Jumps	201
	Swings	51
Opposites	Jumps	164
	Swings	82
Setter (block jumps)	Jumps	130
	Swings	0
Setter (jump sets included)	Jumps	216
	Swings	0

Week 4

Position	Count	Week Totals
Outsides	Jumps	175
	Swings	95
Middles	Jumps	236
	Swings	59
Opposites	Jumps	193
	Swings	96
Setter (block jumps)	Jumps	153
	Swings	0
Setter (jump sets included)	Jumps	254
	Swings	0

Week 5

Position	Count	Week Totals
Outsides	Jumps	205
	Swings	113
Middles	Jumps	278
	Swings	70
Opposites	Jumps	228
	Swings	113
Setter (block jumps)	Jumps	180
	Swings	0
Setter (jump sets included)	Jumps	298
	Swings	0

Week 6

Position	Count	Week Totals
Outsides	Jumps	241
	Swings	132
Middles	Jumps	327
	Swings	83
Opposites	Jumps	268
	Swings	134
Setter (block jumps)	Jumps	213
	Swings	0
Setter (jump sets included)	Jumps	351
	Swings	0



## Planning Practices

So now we have a daily plan leading up to our first competition weekend. We know what sort of intensities we want to produce and how many jumps and swings we have to work with each day.

Now comes the actual assembly of drills that produce these outcomes.

How should we plan drills?

First, we want to account for intensity. Let's refer back to this data table:

Time Component	Measured Time
Average rally length	7.84s
Average set time (actual work, all matches)	339.41s (5m:39s)
Average set time (3 sets)	343.87 (5m:44s)
Average rest period between rallies	12-24s
Typical set time	~30m
Rest between sets	3m
Rest between sets 2/3	5m
Longest rally (averaged)	47.49

Since an average rally equals 7.84 seconds, volleyball can be considered a largely anaerobic alactic sport – short duration, high intensity. For context, 7 seconds is about the length of time it takes for the ball to cross the net twice – a team on offense receives serve, attempts to score (but doesn't), and the defending team transitions to score. Think of the amount of work in that time span – you're putting maximum effort into a short window.

With the injection of longer rallies (longest being upwards of 45 seconds), there's an "anaerobic lactic" component to the sport as well – medium duration with relatively high intensity. Lactic acid is a byproduct, so this is what gives that distinctly exhaustive feeling when the rally is over. Or why coach-run wash drills are usually the most brutal!

The last energy system is aerobic – our sport itself isn't primarily aerobic, but the development of that system will benefit recovery and is foundational to strength and conditioning gains.

**We should incorporate drills using these three energy systems in the following ways:**

### Short duration, high-intensity (anaerobic alactic)

- High power output – think 1-3 dynamic attacks/block moves/1-on-1's, etc. Anything within that "2 crosses of the net" space
- 6-8 seconds of work
- Quality rest should be included to ensure recovery

- Work:Rest ratio of 1:3-5
  - Example: A outside attacker performs an approach + swing, recovers, transitions, and performs it two more times. Outside then rests 30-45 seconds
  - Example: Use an average rally length (7s) and average rest between rallies (12-24s) to structure reps in a 6 v. 6 wash drill game
  - Example: 4 v. 4 games in an offense vs. defense wash drill setup. Off-court group is resting while on-court group plays. Cycle groups frequently.
- Best performed immediately after a thorough warm-up
- Suitable for high & low days (modifying intensity, depending)
- Good when working with position groups or individuals

Medium duration, relatively high-intensity (aerobic lactic)

- Medium power output
- 15-30 second work intervals (occasionally longer)
- High intensity, incomplete recovery or 1:1 work:rest
  - Example: Coach runs a 6 v. 6 wash drill, entering in free balls to either side for a total of 30-40 seconds of play. At the whistle, team rests for average length (12-24s)
  - Example: Libero position group performs a coach-led chase + dig series (assuming 2 players). One player goes for 30 seconds, then the other, alternating work-rest efforts together.
- Best performed towards the middle-end of practice
- Only use on high days
- Good for team-based drills or when needing to boost difficulty

Long duration, low intensity (aerobic)

- 30+ seconds at low intensity
- Low speed, controlled reps
- Players should be able to hold a conversation
- Use on low days
- Great for restoration
- Reinforce volleyball moves without speed or with low intensity
  - Example: Coach tosses a setter 15 balls to set to either target, working the setter at the net in a 5-7 ft. "bubble," forcing some movement but not extreme and not in transition from a base position
  - Example: Middles perform blocking footwork without the A >> B speed they'd use in a game, allowing them to reinforce technique. Walk back to the middle of the court after each rep before performing the next. Cycle middles every 60 seconds (or have them work in pairs, one on either side of the net). You can eliminate the end-point jump to minimize impact.
  - Example: Primary passers, split in groups of 2, receive serves from coaching staff, alternating which player is passing every 5 reps. You can split the court in half and use both sides depending on number of passers.

You can modulate the intensity of any drill by how quickly in succession you enter balls, the distance you ask players to cover, the transition times from one movement to the next. Consider

this drill “tempo” – a throttle for your drill execution. Use the above guidelines as a steering wheel, and change tempo with the pedals.

Higher intensities require longer recovery intervals to keep all working sets high and consistent. If the intensity of a work interval planned to last longer than 15 seconds starts too high, it won't be able to be sustained without a performance drop off.

**A time-based way of drill design is as follows:**

- Drill work up to 8 seconds = 1-2 crosses of the net; average rally
- Drill work up to 20 seconds = Lots of application; frequent amount of rallies in this range
- Drill work between 20-30 seconds = getting into the lactic zone; occasional rallies in this range
- Drill work up to 60-90 seconds = “suck” drills for intensity/load; seldom rallies in this range
- Drill work beyond 90 seconds = slow things down, make aerobic; work in this range helps physical “base” to operate in the aforementioned work time periods

**Guidelines by “high” or “low” day:**

*High:*

- Thorough warm-up that can quickly elevate heart rate and body temperature
- Moderate intensity group game to extend warm-up, if desired
- “Power drills” – alactic in nature. Keep work segments in that sub-8 second range, give quality rest, demand explosive efforts
- Alternate player groups to keep action turning over while building in work:rest periods that control themselves
- Gameplay – potential alactic/lactic mix. 6 v. 6, wash drills, high intensity effort
- Long duration practices

*Low:*

- Slow, focused, methodical
- Stay in alactic zone (sub 8-seconds) or perform slow, controlled reps if extending duration
- Intensity is submaximal, fluid, relaxed, well-timed, coordinated
- Rest a few minutes between sets, performing easy stretches
- Make sure the day is sensible in the context of what's been done and what remains to be done that week.
- Good opportunity to foam roll, perform rehab, work on mobility, use voodoo bands, or incorporate regimens from athletic performance staff

## Scheduling Matches

Knowing what we know about increases in week-to-week workload and acute:chronic workload ratios, safely building to 2 full matches in a single day over 6 weeks would require athletes be in a position to play a full 5 sets of volume starting in week 1 (in addition to practice). Many, if not most, college tournament formats position teams to play consecutive days of 1-2 matches per day. Junior tournaments require athletes to play, in the author's opinion, an insane volume of matches.

With that in mind, under present circumstances, we cannot in good faith recommend anyone schedule 2 full matches in the same day, much less 3-4 matches in two days. Especially if presented with a two-week training period, this format is extremely risky and perilous to athletes' short-term and long-term health. Consecutive multi-match days should only be considered when athletes have accrued a sufficient global loading that's mindful of the jumps and swings they're taking in practice as a lead-up to these match weekends.

Furthermore, college programs would benefit from the adoption of single-match days, regardless of time of year.

A feasible alternative for this would be playing early season tournament matches to 3 sets (similar to club volleyball), as this:

- 1) Reduces the maximum possible workload to 6 sets, vs. 10 in a 2 full-match scenario.
- 2) Reduces the 3 matches in 2 days scenario to a maximum of 9 sets in 2 days vs. 15.
- 3) Reduces necessary week 1 highest day to 2.5 competitive sets + warmup, from 4 competitive sets + warmup.

We realize these proposed changes significantly deviate from typical practice. In light of scientific review and new data on external load, we feel these changes ultimately best serve our "customer" – the student-athlete.

# Resources

## Team Drills

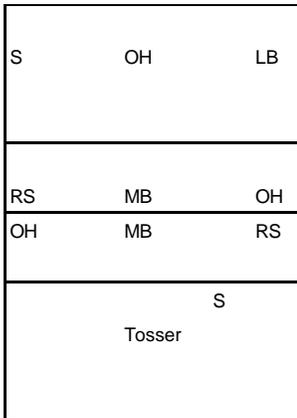
# Team Drills Recommendations

### High Day: Lactic Training

#### Offense vs Defense:

**Good For:**

High lactic day  
 Team <12 players  
 Shorter practice



**Defenders:**

Continuous defending for 30 seconds  
 Dead ball after second touch

**Attackers:**

Attackers: Block base to transition  
 Attacking continuous for 30 seconds

**Duration:**

30 seconds on 30 seconds off  
 3 rounds

**Drill Explanation:**

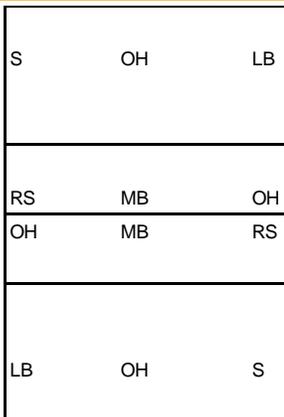
Quick tempo  
 High intensity  
 Do not play out ball in transition  
 Setter starts in backrow  
 Tosser slaps ball to release setter  
 Next ball comes in after dead ball

This drill would be great for a team that does not have enough for a 6v6 practice, but still want a high intensity training day. It can also be used for a large team with players waiting to fill in, because it is a quick tempo. Positions can be manipulated depending on the wanted duration of the drill. The goal is to have everyone play on both sides of the net for at least 3 rounds on each side. Players should not fill in until the end of all three rounds. That would give you the best result for a lactic training session.

### 6v6 Transition

**Good For:**

High lactic day  
 Team >12 players  
 Longer practice



**Objective:**

SR for transition opportunity  
 Scoring side gets db (starts transition)  
 First to 5 transition pts gets 1 big pt

**Duration:**

15 sec team huddle after each big pt  
 Rotate after each big pt  
 First to score 4 big pts

**Drill Explanation:**

Quick tempo  
 High intensity  
 Down ball comes after dead ball  
 15 sec gives time to catch breath  
 Huddle let players gameplan  
 Alternate side SR after big pt

If you have a large team, this 6v6 drill would work for a high lactic training day. Although this is a transition-focused drill, we start it off with a serve receive (SR). The 15 seconds in between big points will mimic the rest time between a dead ball and the next serve. Since this is a high lactic day, the rest time will be short and the work load will be quick and intense. This drill would fit well in the middle of a practice that needs a quick 15-20min high intensity session.

## High Day: Alactic Training

### Offense vs Defense

**Good For:**

High alactic day  
Team <12 players  
Shorter practice

S	OH	LB
RS	MB	OH
OH	MB	RS
Tosser		S

**Defenders:**

Continuous defending  
Dead ball after second touch

**Attackers:**

Attackers: Block base to transition  
One attacker at a time: 3 ball sequence  
Different attacker after 3 ball sequence

**Duration:**

Defenders must get 3 second touches

**Drill Explanation:**

Quick tempo  
High intensity  
Do not play out ball in transition  
Setter starts in back row  
Tosser slaps ball to release setter  
Next ball comes in after dead ball

This alactic drill is suited for a team that has less than 12 players. You can run this drill with a bigger team, but note the rest time will be longer in between for each player. Focusing on one attacker for a consecutive 3 ball sequence will mimic a sprint in workload. This sequence can be changed to a higher number depending on where the athletes are in the season. The defenders will also be working in a sprint manner. They will be defending consecutive balls until they can get 3 digs with a second touch. Once again, this number can be manipulated depending on the skill level and workload capacity of your players. This would be a good drill to start a high-intensity practice after some warmup drills. 6v6 Transition:

### 6v6 Transition

**Good For:**

High alactic day  
Team >12 players  
Shorter or long practice

S	OH	LB
RS	MB	OH
OH	MB	RS
LB	OH	S

**Objective:**

SR for transition opportunity  
Scoring side gets another transition ball  
2 consecutive transition pts gets 1 big pt

**Duration:**

Rotate after each round  
First to score 2-3 big pts wins the round  
60-90 second TO in between each round  
Best 2/3 rounds (short practice: 15-20 mins)  
Best 3/5 rounds (long practice: 20-30mins)

**Drill Explanation:**

Quick tempo  
High intensity  
Transition ball comes in quick  
Do not SR for each transition ball  
SR after each round of 2-3 big pts

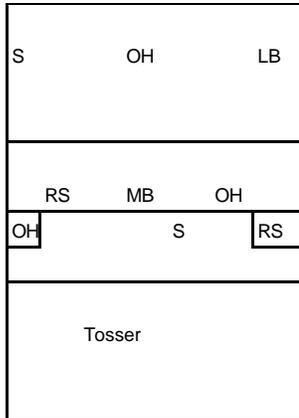
For teams that have 12 players or more, use this drill to train for a high alactic session. Although this is a transition focused drill, we start it off with a serve receive (SR). Note the built-in timeout (TO) after each round. This drill is meant to make each player experience a rapid and intense workload with a longer rest in between for their bodies to catch up. It is very important for the person that is providing the transition ball to be quick with their tempo. This transition ball can be a free ball or down-ball depending on your skill level, but it must be right after the ball in play is dead. This drill will fit in any length of practice depending on how many rounds you want to play.

## Medium Day:

### Offense vs Defense:

**Good For:**

- Medium day
- Team <12 players
- Medium length practice
- Can be no jump day



**Defense:**

- Dig the ball
- Make block move

**Offense:**

Setter can set either OH or RS (On box)

**Duration:**

- Rotate after a dig attempt
- Rotate after a block attempt
- Rotate after 5 swing attempts

**Drill Explanation:**

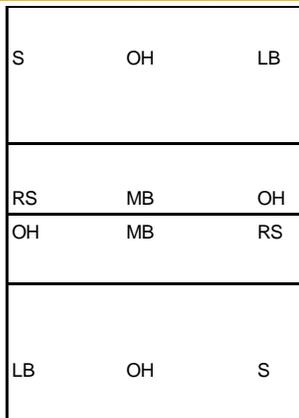
- Medium tempo
- Tosser slaps ball before toss
- Toss comes in after dead ball
- Attackers are on a box

This drill can be changed to accommodate your specific training day. If you need a no jump day, but still want to work on your offense vs defense, this would be a good drill for that situation. You can put the attackers and blockers on boxes so you can focus on their swing and blocking mechanics. If you are very low on players, you can have as low as one attacker vs 3 defenders. You can also add in a bit of jumping if you want just one side to jump. For example, attackers can be on the boxes while the blockers can make live block moves.

### 6v6 First Ball Side-Out

**Good For:**

- Medium day
- Team >12 players



**Objective:**

- Score on FBSO
- Winner gets FBSO Opportunity
- 2 Consecutive FBSO = 1 big pt

**Duration:**

- Rotate after each big pt
- First to score 3 big pts wins the round

**Drill Explanation:**

- Medium tempo
- Change server after big pt
- Winner gets side-out opportunity
- Can only score on FBSO
- Dead ball after first swing
- Can play it out

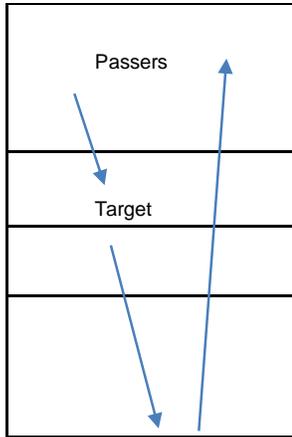
This first ball side-out (FBSO) drill needs at least 12 players. A play is considered an FBSO if the ball is terminated in the first swing of the side-out opportunity. It has built-in break time in between plays, just like in a real match. A coach can whistle in the serves to simulate real game timing. Depending on preference, you can play out the side-out ball or call it dead after the first swing. For the purpose of this drill, the point will only count if it was a FBSO. If it was not a FBSO, but a normal side-out, the other team would get the next serve receive ball.

## Low Day:

### Serve & Pass:

#### Good For:

Low day  
Team >5 players  
No jump day



#### Passers:

Communicate  
Pass ball to target  
Rotate

#### Drill Explanation:

Medium tempo  
Low impact  
Passer rotates to target  
Target rotates to server  
Server rotates to passer

This no jump serve and pass drill is great for a low training day. Since there should be no jumping involved, this drill would be great after a high jump count training session. Due to the constant rotation, players will still get a small stimulus of movement, but not enough so that it will be taxing on their bodies. This drill can also be run with a specific time before rotating. For example, players would stay at their position for 2 minutes before rotating. This will allow less moving around to the next position and will help the players focus more at each stop. This makes it easy when planning practice as well, you can control practice duration to fit your schedule. You can also make the drill more difficult by using 2 passers instead of 3. Setters can also replace the target position and get in some setting repetition. If you happen to have a large team, consider running this drill on both sides of the court. Servers will have to alternate serve timing to avoid simultaneous serves and confusion. Like most drills, this one can be manipulated to match your personnel.

## Individual Training Plans & Position Specific Recommendations

Individual sessions and positional work should live in the moderate camp when programming according to the high-low model. Drills should be geared towards alactic power/capacity (drills are typically sub-10 seconds and include sufficient rest so as not to fatigue the athlete) while avoiding high intensity drills. Typical sessions last 20-30 minutes so you want to program 2-3 drills within that time frame that have a work:rest ratio of 1:1-5. For example, a work:rest ratio of 1:2 could be a drill with 30 seconds of work and 60 seconds of rest. Rest time varies depending on the demands being placed on the athlete during each specific drill.

For example, when programming for a middle blocker, a ratio of 1:1 allows for adequate rest time when working solely on the first step of their block move. However, if they're being asked to max out on a 3-step block move, transition, and approach to swing for an extended series, a greater work:rest ratio is required. The goal is to diligently limit the number of jumps and swings they're taking in a given session, particularly if a team practice is to follow, while also making sure they're growing and evolving as players. This, again, is the art of coaching.

One of the first things to consider when planning positional work or an individual session is whether team practice will be a high day or a low day. If it's a low day, then that position group session might be the only training they do all day so you can demand a bit more from each athlete. That being said, asking players to max out during the session should be avoided at all costs since it defeats the purpose of a low day. When it's a high day, it's also important to avoid "spending all your money in one place" when it comes to jump and swing counts. On these days in particular, program with the intent to refine and prepare the athletes for the team competitions to follow.

Another thing to consider when planning these sessions is player availability and individual limitations. This is why weekly meetings with the team's athletics performance coach and athletic trainer are vital to ensure that everyone is on the same page. If an attacker is limited by a daily swing count, then on high days plan to save their swings for competitions that ensue during team practice. Daily staff meetings are recommended in order to cover the practice plan along with any player limitation updates so all positional work and individual sessions can be programmed with intention.

As coaches, it's our responsibility to monitor work:rest ratios in order to make sure we're safely training our athletes. One easy way to build in rest time during drills that require a higher power output is to utilize video feedback. Video delay apps are a great tool to build in consistent recovery time while also carving out time for technical feedback. Whether athletes want water or not, plan to carve out 75 second "timeout" water breaks in between drills so players have time to properly hydrate and mentally gear up for the next drill. Whether you're working with four outsiders or leading an individual session, a consistent dosage of rest time is required across the board.

This fall, it will be of the utmost importance to fight the urge to overcompensate and use these sessions to hammer home a new skill with an endless amount of reps. As the weeks progress, athletes will be able to do and handle more during individual and position group sessions, but it falls on us as coaches to structure the demands of each session in a way that allows for appropriate recovery time and mimics the work:rest flow of a match itself.

# Middle Blockers

## Position Group Session Example:

Emphasis: blocking footwork \*team practice with high swing volume



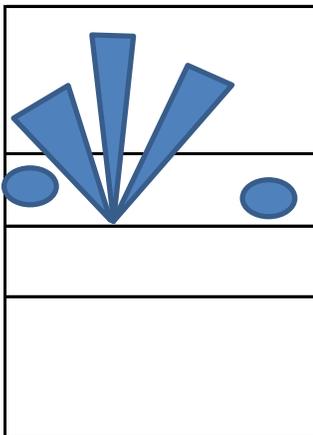
- A. First step reaction work with a mini band 20s:20s ea. side
- B. First step reaction work with no band 20s:20s ea. side
- C. Band resisted 3-step block move (no jump) 30s:60s ea. side
- D. 3-step block move (no jump) 30s:60s ea. side
- E. Band resisted 3-step block move 1:3 (3 reps) ea. side
- F. 3-step block move 1:3 (3 reps) ea. side

Finisher: reading off live setter 6 reps ea.  
 i. If setter unavailable, coach directed with point left or right

Jump Count: 18  
 Swing Count: 0

## Position Group Session Example:

Emphasis: 31 shot selection \*team practice with low swing volume



31's from a box 1:3 (5 reps; tip for 2, swing for 3)

### Repeat series

2-step approach work with a mini hurdle (no jump, coil & catch) 1:1 (5 reps)

2-step approach work with a mini hurdle (jump & swing) 1:1 (5 reps)

5 swings from a box then 5 swings live with full approach; rest 2 minutes \*watch video

### Repeat series

Finisher: 31 attacking off a setter 1:3

- i. 5 swings max, highest number of terminal swings to one of the 3 spots wins

Jump Count: 20  
 Swing Count: 36

## Recovery Session Example:

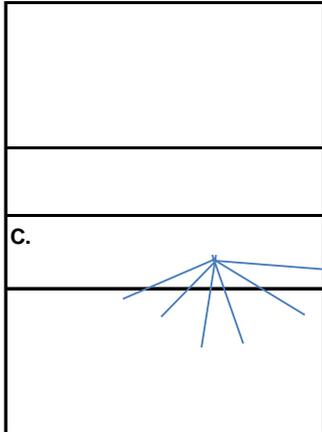
Emphasis: upper chain recovery

<u>5-Way Shoulder Series</u>	<u>Time</u>
Overhead distraction	2m each arm
"Punch through" overhead variation	2m each arm
Crossbody pull	2m each arm
Away from body pull	2m each arm
Front rack with movement	2m each arm
	_____
	20m total

# Setters

## Position Group Session Example:

Emphasis: footwork & defense



- A. OH buckets to target 40s:40s
- B. OPP buckets to target 40s:40s
  - i. From coach toss, small-range "bubble" to start, expand second time through

**Repeat series**

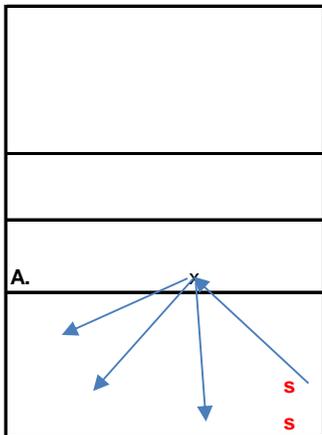
- C. Off-net work with fan setting (see left) 40s:40s
  - i. Start at net (see fan diagram left)

**Repeat series**

- D. Defense 2x ea. 30s:60s
  - i. Step & dig inside hip
  - ii. Move from base, defend attack from zone 2
  - iii. Move from base, defend attack from zone 4
  - iv. Serve, defend, set from box or from toss

## Position Group Session Example:

Emphasis: footwork



- A. 1-footed round offs 30s:60s
  - i. From coach toss, coach slaps to trigger setter release from base (see bold red "s")

**Repeat series**

- B. Simple explode from the net 30s:60s
  - i. From coach attack, "off" setter is digging the ball

**Repeat series**

- C. 2-step pops 30s:60s
  - i. From coach toss

**Repeat series**

Finisher: 10 consecutive out of system buckets

## Recovery Session Example:

Emphasis: lower chain recovery

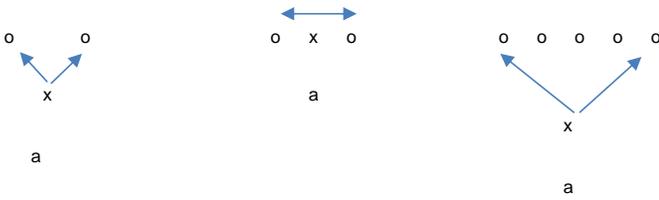
<u>Foam Roll</u>	<u>Time</u>
Calves	2m each
Hamstrings	2m each
Glutes	2m each
IT Band	2m each
Quads	2m each
—	
20m total	

# Liberos

## Position Group Session Example:

### Emphasis: short form passing

B.



A. Warm up footwork w/ whistle

B. Banded passing w/ non passer as anchor 30s:30s

**Repeat series without band**



C. Short form passing x2 ea. 30s:30s

- i. 3-steps and pass from a simple drop over net
- ii. Hips underneath from low toss by coach at net
- iii. Step-drive from simple drop over the net

D. Finisher: serve receive gauntlet 20 serves

- i. Server trying to ace passer
- ii. High percentage of short serves

#### Drill Notes

a = anchor

x = passer

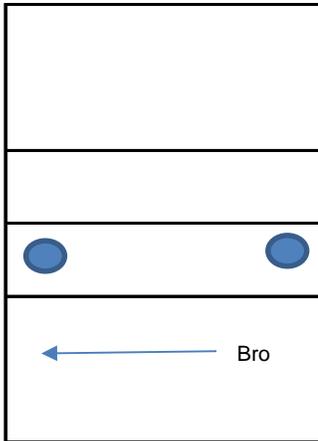
o = cones

→ player movement

→ direction of toss

## Position Group Session Example:

### Emphasis: foot speed & arm drive on short ball + second-touch setting



A. Serve receive in right back alt. short & deep 60s:90-120s

**Repeat in middle back & left back**

B. Serve receive in right back w/ random short & deep 60s:90-120s

**Repeat in middle back & left back**

Second-Touch Setting

C. OH buckets w/ target 60:90-120s

**Review video & repeat**

D. OPP buckets w/ target 60:90-120s

**Review video & repeat**

Finisher: 10 makes in a row anywhere

## Recovery Session Example:

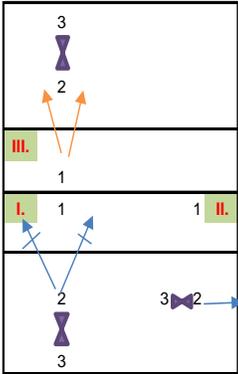
### Emphasis: lower chain recovery

<u>Band Distraction Series</u>	<u>Time</u>
Prone ankle	2m each leg
Kneeling lunge	2m each leg
Hip abduction	2m each leg
Hip flexion	2m each leg
Pigeon pose	2m each leg
	—
	20m total

# Pins

## Position Group Session Example:

Emphasis: passing



Drill Explanation
i. :30s per passer
ii. Ro. ea. person through passing
iii. Ro. to next station

Drill Notes
1 = tosser
2 = passer
3 = anchor
→ player movement
⌘ band
→ ball tossed
I. = Diagonal L/R forward movements
II. = 1-way lateral (go the other way 2nd cycle)
III. = High hip clears (tossor chooses)

A. Banded passing circuit pictured left

**Repeat with no band**

B. "Over-under" 60s:60s

- Ball tossed/served over
- Ball tossed under (drop hips)

**Repeat x3**

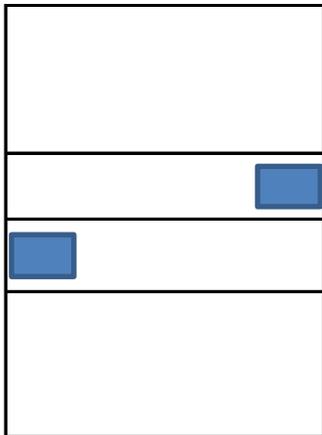
C. Step in and kicks 1:3 (5 reps)

- Step-shuffle, pass, initiate 4-step move

**Repeat x3**

## Position Group Session Example:

Emphasis: tempo timing & shot selection



A. Attacking line from a box 1:3 (5 reps)

**Repeat for cross and sharp**

B. Approach to catch 1:3 (3 reps)

**Repeat x3**

C. Attacking line with full approach from coach toss + video feedback 1:3 (2 reps)

**Repeat for cross and sharp**

Finisher: attacking line, sharp, cross 1:3

- Use setter if available otherwise initiate from coach toss
- 10 swings max, highest number of terminal swings line, sharp, or cross wins

Jump Count: 25  
Swing Count: 31

## Recovery Session Example:

Emphasis: lower chain recovery

Voodoo Band	Time
Calves	2m each
Hamstring	2m each
<b>Mobility</b>	
Rocking pigeon pose	2m each
Couch Stretch	2m each
<hr/>	
16 min	

# Sources

---

- <sup>1</sup> Malone S, et al. The acute:chronic workload ratio in relation to injury risk in professional soccer. *Journal of Science and Medicine in Sport* 2017; 20: 561-565
- <sup>2</sup> Sole C, Kavanaugh A, Stone M. Injuries in collegiate women's volleyball: a four-year retrospective analysis. *Sports* 2017; 5, 26
- <sup>3</sup> Windt J, Gabbett TJ. How do training and competition workloads relate to injury? The workload-injury aetiology model. *British Journal of Sports Medicine* 2017;51:428–435
- <sup>4</sup> Blanch P, Gabbett TJ. Has the athlete trained enough to return to play safely? The acute:chronic workload ratio permits clinicians to quantify a player's risk of subsequent injury. *British Journal of Sports Medicine* 2016;50:471–475
- <sup>5</sup> Hulin BT, et al. Spikes in acute workload are associated with increased injury risk in elite cricket fast bowlers *British Journal of Sports Medicine* 2014;48:708–712
- <sup>6</sup> Murray NB, et al. Calculating acute:chronic workload ratios using exponentially weighted moving averages provides a more sensitive indicator of injury likelihood than rolling averages. *British Journal of Sports Medicine* 2016;0:1–7
- <sup>7</sup> Arnason A, et al. Physical Fitness, Injuries, and Team Performance in Soccer. *Medicine & Science in Sports & Exercise* 2004; 36, 2:278-285
- <sup>8</sup> Häggglund M, et al. Injuries affect team performance negatively in professional football: an 11-year follow-up of the UEFA Champions League injury study. *British Journal of Sports Medicine* 2013;47:807–808.
- <sup>9</sup> Eirale C, et al. Low injury rate strongly correlates with team success in Qatari professional football. *British Journal of Sports Medicine* 2013;47:807–808.
- <sup>10</sup> Francis C. *Key Concepts*. Charliefrancis.com, 2008.
- <sup>11</sup> Foster C. Monitoring training in athletes with reference to overtraining syndrome. *Medicine & Science in Sports & Exercise* 1998; 30, 7:1164-1168
- <sup>12</sup> Foster C, et al. Monitoring training loads: the past, the present, and the future. *International Journal of Sports Physiology and Performance* 2017; 12, 2:2-8
- <sup>13</sup> Hulin BT, et al. The acute:chronic workload ratio predicts injury: high chronic workload may decrease injury risk in elite rugby league players. *British Journal of Sports Medicine* 2015;0:1–7
- <sup>14</sup> Gabbett TJ. The training-injury prevention paradox: should athletes be training smarter and harder? *British Journal of Sports Medicine* 2016;0:1–9
- <sup>15</sup> Zatsiorsky V, Kraemer W. *Science and Practice of Strength Training*. Human Kinetics, Inc., 2006.
- <sup>16</sup> Francis C. *The Charlie Francis Training System*. 1992.
- <sup>17</sup> Smith J. *The Governing Dynamics of Coaching: A Unified Field Theory of Sport Preparation*. Vervante, 2016.