Tug of War Ireland Registered Office
Irish Sport HQ
Blanchardstown, Dublin 15
D15 DY62

Coach and Athlete Education

Introduction

The TOWI High Performance Unit has developed this resource to support coaches and volunteers working with tug of war athletes across the country. Our goal is to provide a foundation of key training principles and practical guidance to help improve the quality and effectiveness of athlete development.

This document aims to enhance the planning and delivery of training sessions by outlining fundamental concepts in physical preparation and progression. It offers insights into structuring effective training programs and monitoring athlete development to support each athlete in reaching their full potential. While this resource is intended to guide best practices in training, it is not designed to serve as a complete training plan.

The High Performance Unit will also deliver official coach education programs, certification courses, and in-person workshops throughout the year. These initiatives, offered nationwide, are aimed at upskilling coaches and raising the overall standard of tug of war coaching and performance across Ireland—now and into the future.

Principles of Training

Effective training in Tug of War follows key principles that ensure continuous improvement, injury prevention, and peak performance. These principles guide the development of structured training programs that optimize strength, endurance, and technique.

1. Specificity

According to the principle of specificity, training adaptations are most effective when the exercises performed closely mirror the biomechanical and physiological demands of the sport. In Tug of War, this means targeting rope-pulling strength, grip endurance, lower-body power, and core stability.

Training methods such as gantry pulling, heavy resistance sled work, isometric holds in sport-specific postures, and maximal strength efforts under fatigue are essential. These approaches replicate the force production patterns, muscle recruitment, and time-under-tension experienced during competition.

In practical terms, athletes will gain far more from developing muscular strength-endurance relevant to pulling than from activities like long-distance running, which do not engage the specific movement patterns or energy systems required in Tug of War.

2. Overload

The principle of overload states that in order to stimulate physiological adaptations and improve performance, the body must be subjected to progressively greater training demands over time. In the context of Tug of War, this involves systematically increasing the intensity, volume, or complexity of training stimuli.

This can be achieved through methods such as progressively loading strength exercises (e.g., increasing resistance in deadlifts), extending the duration of isometric pulling holds, or incorporating additional resistance into technical drills.

As long as overload is applied in a structured and safe manner, it allows for continual gains in maximal strength, strength endurance, and muscular resilience—key qualities required for competitive success in Tug of War.

3. Progression

The principle of progression emphasizes the need for a structured and gradual increase in training load to facilitate ongoing adaptation while minimizing the risk of injury. In Tug of War, progressive overload should be carefully planned to enhance key physical qualities—such as strength, power, and endurance—without exceeding the athlete's capacity to recover.

This is best achieved through a periodized training model, where training intensity, volume, and specificity are strategically varied across phases. Incorporating progressive increases in load, duration, or complexity—while allowing for adequate recovery—ensures long-term performance development and reduces the likelihood of overtraining or injury.

4. Reversibility

Gains in strength and endurance are lost when training is reduced or stopped. Regular participation and maintenance sessions prevent performance decline, ensuring athletes stay competition-ready.

5. Individualization

The principle of individualization recognizes that each athlete responds uniquely to training stimuli based on factors such as training age, current fitness level, injury history, and recovery capacity. In Tug of War, where athletes may vary significantly in strength, body composition, and technical proficiency, it is essential to tailor training programs to meet individual needs and optimize performance outcomes.

Effective individualization involves modifying variables such as training volume, intensity, frequency, and exercise selection based on an athlete's strengths, weaknesses, positional role, and readiness. Regular monitoring and feedback are critical to adjust programming dynamically and ensure athletes are progressing while minimizing risk of overuse or under-recovery.

6. Variation

The principle of variation highlights the importance of systematically altering training variables—such as exercise selection, intensity, volume, and modality—to prevent performance plateaus, reduce the risk of overuse injuries, and maintain athlete engagement. In the context of Tug of War, consistent exposure to the same training stimulus can lead to stagnation in adaptation and decreased motivation.

A well-rounded training program should integrate multiple components, including maximal strength development, muscular endurance, technical drills (e.g. gantry work), mobility training, and recovery strategies. While sport-specific exercises are fundamental, incorporating varied strength endurance sessions, auxiliary lifts, and movement prep work across the training cycle promotes balanced development and supports long-term performance sustainability.

7. Recovery & Adaptation

Recovery and adaptation are essential components of an effective training program. Without adequate rest and proper recovery strategies, athletes risk overtraining, fatigue, and injury, which can negatively impact performance and long-term development.

During intense training, muscles undergo microscopic damage, which is a natural part of the process that leads to increased strength and endurance. Recovery periods are essential, as they allow the body time to repair and rebuild these muscle fibres—making them stronger, more resilient, and better prepared for future exertion. This adaptation process is crucial for enhancing overall performance in Tug of War.

To support this recovery and adaptation cycle, athletes should incorporate a variety of recovery methods into their training regimen:

Passive Recovery: This involves complete rest—such as taking a day off from training—to allow the body to heal without additional physical stress. It's especially important after high-intensity sessions or competitions.

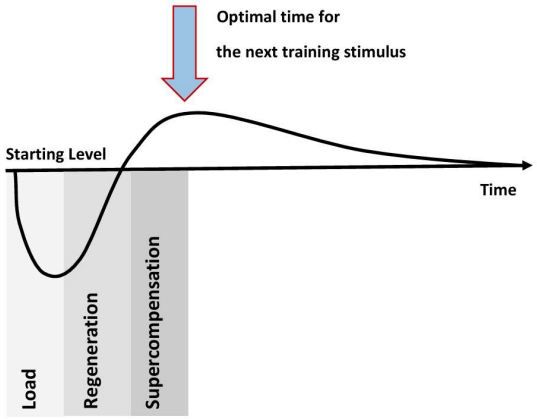
Active Recovery: Engaging in low-intensity activities like light jogging, stretching, or mobility exercises can promote blood circulation, reduce muscle stiffness, and aid in the removal of metabolic waste. This type of recovery is effective following moderate workouts.

Sleep & Restorative Recovery: Sleep plays a vital role in muscle repair, hormone regulation, and mental recovery. Athletes should prioritize consistent, high-quality sleep—aiming for 7 to 9 hours per night—to ensure their body and mind are fully recharged.

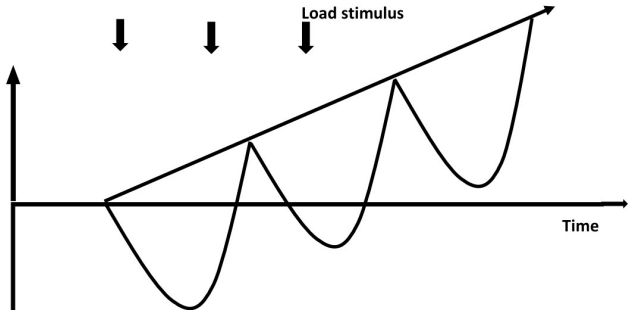
By prioritizing recovery alongside training, Tug of War athletes can optimize their physical output, reduce the risk of injury, and maintain the intensity and quality of their performance over time.

Overtraining is a very common problem and comes about when you don't get enough rest during your training schedule, you overdo it thinking you are making more gains by workout out more but this could actually be having an adverse effect. This should not be confused with overload which is the planned exposure to an increased workload and the right amount of rest between each session.

Signs of overtraining include persistent fatigue, decreased performance, mood changes, and increased injury risk. Incorporating structured rest days, monitoring training loads, and listening to the body's signals help prevent burnout and ensure long-term progress. Without the correct amount of rest, you could be exposed to overtraining. With the correct amount of increased training and the right rest, you get overload which will lead to an increase in performance.



The above graph illustrates the principle of **supercompensation**, a fundamental concept in sports science that explains how the body responds to training. Initially, when an athlete undergoes a training session (referred to as the load phase), their performance temporarily declines due to fatigue and muscle breakdown. This is a natural and expected response to physical stress. Following this, the regeneration phase begins, during which the body repairs damaged tissues, restores energy stores, and brings physiological systems back into balance. If adequate recovery strategies—such as rest, sleep, hydration, and nutrition—are in place, the body then enters the supercompensation phase. Here, the body adapts to the training stress by building a slightly higher level of fitness or performance capacity than before. This adaptive response prepares the body to better handle similar or greater loads in the future. The graph highlights the optimal time for the next training stimulus, which occurs during the supercompensation phase. Training again at this peak helps to capitalize on the body's increased capacity, leading to progressive improvements. However, if training is delayed too long after supercompensation, the performance level may regress back to the original starting point, and the adaptation window is missed.



This second graph builds on this concept by showing how properly timed training sessions, delivered consistently at the peak of each supercompensation cycle, lead to cumulative improvements in athletic performance over time. Each curve represents a cycle of training load, fatigue, recovery, and supercompensation. The arrows indicate training stimuli that are strategically placed at the point where the body has just reached peak adaptation from the previous session. This approach ensures that each new training load builds upon a higher level of fitness than the one before. As a result, the overall trend of the graph is upward, indicating progressive overload and long-term performance gains. This model underscores the importance of balancing stress and recovery—overtraining without sufficient recovery interrupts this process and may lead to injury or performance plateaus, whereas well-timed training maximizes the benefits of supercompensation and drives continuous improvement.

FITT Principle

The FITT Principle— Frequency, Intensity, Time, and Type — is a framework used to structure training programs effectively. Applying it to a sport like tug of war, which requires maximal strength, muscular endurance, explosive power, coordination, and teamwork, allows athletes to train in a targeted and efficient way.

Frequency refers to how often training sessions occur:

- **Strength training:** 2–4 times per week focusing on major muscle groups (especially the posterior chain — hamstrings, glutes, back).
- **Endurance training:** 2–3 times per week to improve muscular stamina and recovery between pulls.
- **Team practice:** 1–2 times per week to build coordination, technique, and teamwork.
- **Rest/recovery:** At least 1–2 days of rest or active recovery per week to prevent overtraining and injury.

Frequency may vary depending on the season — more technical and tactical work during competition season, more strength work during off-season.

Intensity is how hard the exercise is performed:

- Strength sessions: High intensity (75–95% of 1RM) with compound lifts like deadlifts, squats, and rows to build maximal pulling strength.
- Conditioning: Moderate intensity for muscular endurance (e.g., sled pulls, bodyweight circuits) or low intensity for recovery days.
- Tug of war practice: High intensity in simulated matches, emphasizing real-time application of force, timing, and grip endurance.
- Plyometrics and explosive training: Moderate to high intensity to improve reaction time and pulling explosiveness.

Time is the duration of each session*

- Strength workouts: 45–75 minutes, depending on focus (max strength vs. endurance).

- Conditioning sessions: 20–40 minutes (can include HIIT or circuit training).

- Tug of war practice sessions: 60–90 minutes, including warm-up, drills, and practice pulls.

- Rest periods: In strength training, longer rests (2–5 minutes) for max effort; shorter rests (30–60 seconds) in endurance or circuit-based workouts.

Type refers to the specific mode of exercise used

- **Strength training:** Focus on compound movements (deadlifts, Romanian deadlifts, bent-over rows, squats, farmer's carries). Emphasize posterior chain and grip strength.
- **Conditioning:** Sled drags, prowler pushes, battle ropes, rope climbs, or bodyweight circuits that simulate the demands of pulling.
- **Technical/tactical practice:** Drills that refine timing, coordination, body position (low center of gravity), foot bracing, and team pulling synchronization.
- **Flexibility & mobility work:** Active stretching, foam rolling, and mobility drills to prevent injury and aid recovery.

Components of Fitness

Success in Tug of War depends on multiple physical attributes that contribute to an athlete's ability to generate force, sustain effort, and execute effective pulling techniques. Developing these key components of fitness enhances overall performance and reduces injury risk.

Cardiovascular Endurance is the ability of the heart, lungs, and blood vessels to deliver oxygen to working muscles over an extended period. In Tug of War, cardiovascular endurance is crucial for maintaining effort during prolonged pulls and enabling faster recovery between rounds. A strong aerobic base allows athletes to sustain force application without early fatigue, while an efficient cardiovascular system supports oxygen delivery to working muscles. Training methods such as rowing, cycling, and high-intensity interval training (HIIT) help improve endurance and recovery capacity.

Muscular Endurance is the ability of a muscle or group of muscles to sustain repeated contractions over time without fatigue. In Tug of War, matches can last several minutes, requiring athletes to maintain tension and resist the opposing force for extended periods. High-repetition resistance training, isometric holds, and rope-pulling drills help build endurance in key muscle groups, ensuring that athletes can sustain effort without losing form or strength.

Importance of basic endurance

Although endurance is a fundamental prerequisite for the athlete's performance, it must not be seen in relation to the requirements of the respective sport. The importance of an individual factor must therefore always be seen in relation to the whole.

A well or sufficiently developed basic endurance - it is a basic prerequisite for all sports to increase athletic performance - has a positive effect:

- Increasing physical performance has a favourable effect on both the competition performance itself and the resilience in training. Premature fatigue is shortened.
- Optimising the recovery capacity of the endurance-trained athlete can eliminate fatigue substances more quickly and compensate for energy bottlenecks more effectively. In addition, the athlete recovers more quickly after training and competition.
- **Minimise injuries:** Athletes who are better trained are less likely to get injured than those who tire early.
- **Increasing mental resilience:** Athletes have an increased resistance to stress and greater mental stability. they are better able to cope with failure.

Muscular Strength refers to the maximum force a muscle or group of muscles can exert in a single effort. It is a fundamental requirement for Tug of War, as athletes must generate high levels of force to overcome the opposing team. Strong legs, core, and grip muscles are essential for holding position and exerting maximum pulling power. Key strength exercises include heavy compound lifts such as squats, deadlifts, and pull-ups, which develop the force needed to maintain an effective pulling stance and drive against resistance.

Mobility and Flexibility play a critical role in maintaining an effective pulling position and preventing injuries. Mobility refers to a joint's ability to move freely through its full range of motion, while flexibility is the ability of muscles and connective tissues to stretch without restriction. Athletes with good mobility in the hips, knees, and ankles can achieve a lower, more powerful stance, improving stability and force transfer. Incorporating dynamic stretching, yoga, and resistance band exercises helps enhance flexibility, reducing the risk of strains and improving overall movement efficiency.

Strength is the foundation of Tug of War performance, but Power—the ability to generate force quickly—is equally important. Power is a combination of strength and speed, allowing athletes to react explosively at the start of a pull and make quick adjustments under load. A more powerful athlete can apply force rapidly, giving their team an advantage in the initial stages of a contest. Power development involves exercises such as Olympic lifts (cleans, snatches), plyometrics (box jumps, depth jumps), and sled drags, which enhance the ability to generate maximum force in minimal time.

Body Composition is the ratio of fat mass to lean mass (muscle, bone, and organs). A high muscle-to-fat ratio is ideal for Tug of War, as excess body fat does not contribute to pulling strength and can reduce overall efficiency. Athletes with a strong, lean physique are better able to produce force while maintaining endurance. Proper nutrition, resistance training, and high-intensity conditioning help optimize body composition, ensuring athletes have the right balance of strength and endurance for peak performance.

By developing all these components of fitness, Tug of War athletes can improve their strength, endurance, and technique, leading to greater success in competition. A well-rounded training program should target each area, ensuring balanced physical development and long-term performance gains.

Athlete Testing and Monitoring

Effective athlete testing and monitoring are critical components of performance management in Tug of War. They provide objective data to track physical development, identify individual strengths and weaknesses, and evaluate the effectiveness of training interventions.

The following assessments have been selected by the High Performance Unit (HPU) based on their relevance to the specific physical demands of Tug of War. While these tests are recommended for their specificity, coaches may choose to incorporate alternative assessments or modify protocols based on their individual coaching philosophy, athlete needs, or equipment availability.

Ultimately, the goal remains consistent across all coaching environments: to accurately assess, develop, and demonstrate improvements in athletes' physical capacities that directly translate to enhanced performance on the rope.

1. Body Composition

Body Composition is the ratio of fat mass to lean mass, which directly influences strength, endurance, and power-to-weight ratio—key factors in Tug of War performance.

We will use skinfold callipers to estimate body fat percentage. This involves measuring the thickness of skinfolds at specific sites and applying validated equations to calculate body fat.

Measuring body fat percentage using skinfold callipers is more effective than using BMI in Tug of War because it distinguishes between fat mass and lean muscle, providing a more accurate assessment of an athlete's functional body composition and power-to-weight ratio—critical factors for optimal performance in the sport.

Classification	Women	Men
Essential Fat	10-12%	2-4%
Athletes	14-20%	6-13%
Fitness	21-24%	14-17%
Acceptable	25-31%	18-25%
Obese	32+%	25+%

2. Grip Strength

Measures the maximal force exerted by the hands and forearms using a dynamometer. This is essential for maintaining a secure grip on the rope, reducing fatigue, and improving pulling power. Stronger grip endurance helps sustain force application throughout a pull.

By Age & Sex (Mathiowetz et al., 1985)

Dominant hand, average of 3 trials, seated with elbow at 90°

Age Group	Male	Female
15-19	45-50	27-30
20-29	46-55	28-35
30-39	44-52	27-33
40-49	42-48	25-30
50-59	38-45	23-28
60+	23-33	14-21

3. Chin-Ups (Max Reps)

Max reps chin up test evaluates upper body strength and endurance, particularly in the back, shoulders, and arms. Strength in the latissimus dorsi and biceps is crucial for pulling mechanics, aiding in rope control and maintaining body position under tension.

Strength/Power Athletes Norms

	Male	Female
Good	15-20	5-8
Excellent	20-25	9-12
Elite	25+	12+

4. Gantry Test

Simulates real Tug of War conditions, assessing endurance, pulling technique, and maximal force output against a controlled resistance. Provides sport-specific feedback on an athlete's pulling strength, efficiency, and fatigue resistance under match conditions.

5. Squat 1RM (One-Rep Max)

Maximal lower-body strength, particularly in the quadriceps, hamstrings, and glutes. A strong squat improves the ability to generate force through the legs and maintain a low, powerful pulling stance.

Strength/Power Athlete Normative Data (Relative Strength)

	Male	Female
Beginner	1.25x BW	0.75x BW
Intermediate	1.5x BW	1.0x BW
Advanced	2.0x BW	1.5x BW
Elite	2.5x BW	2.0x BW

6. Rowing Endurance Test

Cardiovascular endurance and muscular endurance in the legs and back, typically assessed over 2,000m or 5-minute intervals on a rowing ergometer. Enhances endurance for prolonged pulls, maintains power output over time, and improves recovery between bouts.

	Male	Female
Elite	<6.20	<7.10
Excellent	6.20-6.40	7.11-7.40
Good	6.41-7.10	7.41-8.15
Average	7.11-7.45	8.16-9.00
Below Average	7.46+	9.01+

7. Core Stability

Assesses the endurance and control of the core muscles, measured through plank holds, leg raises, or stability ball exercises. A strong core supports proper posture, reduces energy leaks, and improves force transfer from the lower to upper body during pulling.

Level	Score
Elite	<2.0
Excellent	2.0-2.5
Very good	2.5-3.0
Average	3.0-3.5
Below average	3.5-4.0
Poor	4+

8. Hamstring Strength

Assessed using Nordic hamstring curls or isometric hamstring holds to measure eccentric strength. Strong hamstrings improve the ability to drive through the legs while stabilizing the knee joint, reducing injury risk.

Performance Level	Hamstring extension (degrees)	Description
Excellent	≥ 50°	High eccentric hamstring strength and control – often seen in elite-level soccer players and sprinters.
Good	43° – 49°	Well-developed posterior chain strength; typical of collegiate or semi-pro athletes.
Average	36° – 42°	Moderate eccentric control; may need improvement for injury prevention.
Below Average	30° – 35°	Weak hamstring control; higher risk of hamstring injury under load or sprinting.
Poor	< 30°	Insufficient eccentric strength; indicates high injury risk and poor neuromuscular control.

9. Countermovement Jump (CMJ)

Measures lower-body explosive power by assessing jump height using a force plate or jump mat. Explosive leg power contributes to quick, forceful movements needed at the start of a pull and during surges in competition.

Regular testing allows coaches to monitor progress, adjust training loads, and tailor programs to individual athlete needs. Results should be recorded and compared over time to optimize performance development.

	Male	Female
Elite	>60cm	>50cm
Excellent	50-60cm	40-50cm
Good	40-49cm	30-39cm
Average	30-39cm	20-29cm
Below Average	<30cm	<20cm

Planning and Periodisation

Periodisation is a systematic approach to training that structures the year into distinct phases, each with specific goals, workloads, and recovery strategies. It ensures that athletes peak at the right time, usually for a key competition, while reducing the risk of overtraining, burnout, and injury.

Core Components of Periodisation

- **Macrocycle** – The entire season or training year (e.g., 12 months).
- **Mesocycles** – Blocks within the macrocycle (e.g., 4–6 weeks) focused on specific goals such as strength, endurance, or power.
- **Microcycles** – Shorter training periods (e.g., 1 week) that structure specific sessions and recovery.

Month	Jan	Feb	March	April	May	June	July	August
Training Block	Pre-Season			Pre-Competition			Competition	
Gym	Hypertrophy 1		Strength 1		Strength & Power		Explosive Power	
Fitness			Aerobic Emphasis			Anaerobic Emphasis		
Speed			Beginner Speed & Plyos			Advanced Speed & Plyo's		
Test	Test 1			Test 2		Test 3		

Each cycle is designed to follow a logical progression:

1. **General Preparation** (e.g., endurance and foundational strength)
2. **Specific Preparation** (e.g., sport-specific drills, heavier resistance)
3. **Pre-competition** (e.g., power and speed work)
4. **Competition**
5. **Transition/Recovery** (active rest and rehabilitation)

Periodisation plays a crucial role in ensuring Tug of War athletes reach their peak performance during key competitions. By structuring training phases carefully, athletes can build toward maximum strength and power while managing fatigue. This methodical approach allows for optimal physical readiness when it matters most. Additionally, by balancing periods of high-intensity training with appropriate rest and recovery, periodisation significantly reduces the risk of overuse injuries, which are common in repetitive, high-load sports like Tug of War.

Beyond short-term gains, periodisation supports long-term development by promoting steady progress and avoiding training plateaus. By cycling through phases like endurance, strength, and power, it enhances neuromuscular and metabolic adaptation—building the strength, coordination, and energy efficiency essential for Tug of War success.

Tapering

Tapering is a science-based reduction in training volume, typically lasting 7 to 14 days before a key competition, designed to optimize recovery and enhance performance. While overall volume is reduced by 40–60% to lower fatigue, training intensity is maintained to preserve strength, speed, and neuromuscular adaptations. Frequency may decrease slightly, but sessions remain purposeful. Prioritizing rest during this phase supports muscle repair and central nervous system recovery, allowing athletes to enter competition feeling fresh, strong, and ready to perform at their peak.

Sample Weekly Plan

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Strength & Power	Conditioning (Intervals)	REST	Strength	Gantry Session	Rest	Team Session Rope Technique

- **Progressive overload:** Increasing intensity while decreasing volume as the season advances.
- **Deloads:** Scheduled after heavy training blocks (every 4–6 weeks).
- **Tapering:** Implemented 7–10 days before Nationals and Worlds to peak for performance.
- **Recovery blocks:** Mid-July after Nationals to reset before the international phase.
- **Adaptability:** Plan can be modified based on selection, injury status, or shifting competition dates.

Tailor individual plans based on athlete needs (e.g., U23 vs Senior).

Consider travel fatigue and logistical planning around major competitions.

Monitor performance with testing markers (max pull strength, grip endurance, bodyweight.

Importance of Warm-Up for Tug of War

A proper warm-up is a critical preparatory phase that enhances performance and reduces the risk of injury in Tug of War. The physical demands of the sport—explosive power, maximum muscular contraction, isometric strength, and intense grip activation—require the body to be physiologically and mentally prepared before any training or competition.

Physiological Benefits of Warm-Up

- Raising muscle temperature improves the efficiency of muscular contractions and enhances force production. Warmer muscles are more pliable and less prone to strain (Shellock & Prentice, 1985).
- Warm-ups increase nerve transmission speed and neuromuscular coordination, which is vital in Tug of War where synchronized, explosive pulls can determine success.
- Dynamic movements and mobility exercises included in the warm-up help lubricate joints, improve range of motion, and prepare the connective tissues for the load-bearing nature of the sport.
- Warm-up routines also serve a psychological function—improving focus, reducing anxiety, and promoting team cohesion before competition.

Recommended Warm-Up Structure for Tug of War:

1. **General Phase (5–10 mins):** Light jogging, skipping, or cycling to raise core temperature.
2. **Dynamic Stretching (5–10 mins):** Leg swings, arm circles, hip mobility drills.
3. **Specific Drills (5–10 mins):** Isometric holds, mock pulls, resistance band work to activate pulling muscles (back, glutes, hamstrings, grip).
4. **Neural Prep:** Short bursts of maximal tension mimicking competition effort (e.g., 3–5 second maximal pulls with rest in between).

Research shows that a structured warm-up can significantly improve performance and reduce the incidence of muscular injuries by preparing muscles and joints for the demands ahead (Fradkin et al., 2006; Bishop, 2003).

Injury Prevention

Tug of War is deceptively demanding and places high strain on muscles, tendons, and joints, particularly in the lower back, hamstrings, shoulders, and forearms. An injury not only disrupts an athlete's development but also the rhythm and synergy of the team. Coaches and athletes must prioritize injury prevention through a holistic approach.

1. Strength & Conditioning

A structured program focusing on core stability, posterior chain strength (glutes, hamstrings, lower back) and grip endurance builds resilience against common injuries.

Strength imbalances and weakness in stabilizing muscles are known contributors to injury risk in power sports (Kibler & Chandler, 2003).

2. Recovery & Load Management

Fatigue is a major injury risk factor. Overtraining without sufficient recovery leads to decreased neuromuscular control and coordination.

As supported by Meeusen et al. (2013), load monitoring, adequate rest, and active recovery protocols are essential in preventing overuse and soft tissue injuries.

3. Warm-Up and Cool-Down Integration

As highlighted above, proper warm-up preps the body for activity, while a cool-down aids in recovery and reduces muscle soreness (Cheung et al., 2003). Both should be non-negotiable parts of every training session.

4. Technique and Posture

Incorrect pulling posture (e.g., rounded lower back, improper foot placement) increases risk for acute and chronic injuries. Coaches should prioritize technical drills and video analysis to reinforce safe and efficient movement patterns.

5. Flexibility and Mobility

Regular flexibility work—especially in the hamstrings, hips, and thoracic spine—helps reduce strain and maintain joint health, particularly in the pulling stance where the body is under constant tension.

Nutrition

Optimal nutrition is a cornerstone of athletic performance, especially in a sport like Tug of War , which demands maximal strength, muscular endurance, explosive power, and team synchronization . Proper dietary strategies support training adaptations, enhance recovery, reduce injury risk, and improve competitive readiness.

Carbohydrates

Carbohydrates are the primary source of energy during high-intensity, anaerobic efforts like a Tug of War pull. Muscle glycogen, the stored form of carbohydrate, is critical for fueling muscular contractions and preventing early fatigue during repeated bouts of training or competition.

- Intake should range from 5–7 g/kg body weight per day for moderate training, and up to 8–10 g/kg during intense phases or competition preparation (Thomas et al., 2016).

- Prioritize complex carbs (e.g., oats, rice, potatoes, whole grains) for sustained energy, and simple carbs (e.g., fruit, sports drinks) around training for quick glycogen replenishment.

Inadequate carb intake leads to reduced training capacity and increased perception of effort (Burke et al., 2011).

Protein

Tug of War places significant strain on skeletal muscles, particularly in the posterior chain (glutes, hamstrings, back) and grip muscles. Protein is essential for muscle tissue repair, recovery, and hypertrophy —especially following eccentric and isometric loading.

- Recommended intake is 1.2–2.0 g/kg of body weight per day , depending on training intensity (Jäger et al., 2017).

- Distribute protein across 3–5 meals/snacks per day , aiming for 20–30 g per serving .

- Include high-quality sources such as lean meats, fish, eggs, dairy, soy, or plant-based combinations (e.g., beans and rice).

Post-exercise protein intake within 30–60 minutes accelerates muscle protein synthesis and supports recovery (Phillips et al., 2009).

Fats

While fats are not the primary energy source during competition, they are vital for hormone production, joint health, and recovery. Certain fats also possess anti-inflammatory properties which can reduce muscle soreness and support immune function.

- Daily intake should make up 20–35% of total energy intake , with a focus on unsaturated fats (IOC Consensus Statement, 2010).

- Emphasize sources like olive oil, nuts, seeds, fatty fish (omega-3s) , and avocados.

- Limit trans fats and excessive saturated fats from processed foods.

Omega-3 fatty acids have been shown to reduce muscle soreness and improve recovery in resistance-trained individuals (Jouris et al., 2011).

Hydration

Dehydration can negatively impact muscle strength, coordination, reaction time, and increase risk of cramps and heat-related illness. Athletes should prioritize fluid intake before, during, and after activity—especially during multi-round competition days or summer training.

- Aim for 5–10 mL/kg body weight of fluid 2–4 hours before exercise (Sawka et al., 2007).

- Drink small amounts regularly during training; water is usually sufficient unless sessions exceed 60 minutes, in which case electrolyte beverages may be beneficial.

- Rehydrate post-training by drinking 150% of fluid lost (determined by pre- and post-exercise body weight).

Just 2% body weight loss through sweat can impair physical performance and cognitive function (Casa et al., 2010).

Tug of War athletes should adopt a balanced nutrition strategy that supports their sport's explosive and high-resistance demands. By prioritizing:

- **Carbohydrates** for glycogen and energy,
- **Proteins** for repair and strength,
- **Healthy fats** for recovery and hormones, and
- **Hydration** for sustained performance,

Tug of War Ireland is committed to safeguarding the health, well-being, and long-term performance of all its athletes. In alignment with best practices in sports science and athlete safety, we strongly discourage the use of severe or rapid weight-loss methods, particularly those that involve extreme caloric restriction, dehydration, or other dangerous tactics commonly referred to as "weight cutting."

Scientific evidence consistently shows that aggressive weight cutting can lead to serious short- and long-term health risks, including:

- Decreased muscle strength and endurance
- Impaired cardiovascular and kidney function
- Electrolyte imbalances and acidosis
- Increased risk of heat illness and brain injury
- Mood swings, cognitive impairment, and in extreme cases, death

As a strength-based and endurance-dependent sport, performance in tug of war relies on optimal physical and mental capacity—not on making arbitrary weight targets through dangerous methods.

Tug of War Ireland advocates for evidence-based, sustainable, and health-conscious approaches to weight management. Athletes are encouraged to:

- Aim for gradual weight loss of 0.5–1.0% of body mass per week, as recommended by the American College of Sports Medicine (ACSM) and other leading authorities
- Prioritize adequate hydration, especially in training and competition environments where dehydration poses additional risk
- Maintain sufficient caloric and protein intake to preserve lean tissue and support performance during training
- Work closely with qualified professionals such as registered dietitians or sports nutritionists to develop personalized and periodized nutrition plans

Coaches' Role and Duty of Care

Coaches and team staff play a critical role in fostering safe behaviors. The Tug of War Ireland Coach Code of Conduct upholds the duty to prioritize athlete health and explicitly prohibits the endorsement or promotion of rapid weight-loss practices that compromise safety

We are committed to implementing athlete education initiatives and collaborating with sports medicine professionals to ensure that all athletes, coaches, and guardians are informed about the risks of rapid weight loss and equipped with the knowledge to pursue safer alternatives.

Severe and rapid weight cutting is strongly discouraged. Tug of War Ireland stands for athlete safety, well-being, and ethical sport. We endorse weight management strategies that are safe, evidence-based, and tailored to the individual athlete, with the ultimate goal of enhancing—not endangering—performance and lifelong health.

Tug of War Technical guidance.

Height of COG

During the offensive pressure position the specific height of the centre of gravity (HCOG), for most competitive classes and positions on the rope, was greater than that observed for the defensive pressure position in inefficient teams. This would imply that proficient offensive teams were more mobile (unstable) than inefficient teams on the defence where they attempted to increase their stability by lowering their HCOG as defensive strategy. The highest HCOG was observed in the Anchor (No. 8) position for both proficient offensive and inefficient defensive teams. This appears to be a morphological phenomenon, indicating the generally characteristic tall stature of individuals pulling in this position on the rope.

Base of Support

during the offensive pressure position the base of support measured for most competitive classes and positions on the rope was greater than that observed for the defensive pressure position in inefficient teams. This would imply that, in the pressure position, proficient offensive teams were more stable than inefficient teams on the defence

Trunk Angle

during the defensive and offensive pressure position the specific trunk angles measured for most competitive classes and positions on the rope, were close to the respective ideal of 100° and 140 to 160° range. By comparison, in both defence and offence, greater trunk angles were observed in the front and rear of the rope, although the smallest (most upright) offensive angle of 141° was observed the Anchor (No. 8) position. Inversely, the Anchor (No. 8) position showed the greatest defensive trunk extension (135°) of all positions on the rope.

Knee Angle

during the defensive and offensive “pressure position” the specific knee angles in inefficient teams, for most competitive classes observed and most positions on the rope, were greater than the ideal 120°.

Body Angle

during the “power hold” position the body angles measured for proficient teams, in all competitive classes observed, and in all positions on the rope were 90°. Furthermore, it was observed that the body angle measured for proficient teams tended to increase from the front towards the rear of the 11 rope. Inversely, in inefficient teams the body angle decreased from the front towards the rear of the rope.

References

Shellock, F. G., & Prentice, W. E. (1985). Warming-up and stretching for improved physical performance and prevention of sports-related injuries. Sports Medicine, 2(4), 267–278.

Bishop, D. (2003). Warm up I: Potential mechanisms and the effects of passive warm up on exercise performance. Sports Medicine, 33(6), 439–454.

Fradkin, A. J., Zazryn, T. R., & Smoliga, J. M. (2006). Effects of warming-up on physical performance: A systematic review. Journal of Strength and Conditioning Research, 20(3), 663–664.

Kibler, W. B., & Chandler, T. J. (2003). Sport-specific conditioning. The American Journal of Sports Medicine, 31(6), 934–936.

Meeusen, R. et al. (2013). Prevention, diagnosis and treatment of the overtraining syndrome. European Journal of Sport Science, 13(1), 1–24.

Cheung, K., Hume, P., & Maxwell, L. (2003). Delayed onset muscle soreness: treatment strategies and performance factors. Sports Medicine, 33(2), 145–164.

Rhea, M. R., et al. (2003). A comparison of linear and daily undulating periodized programs with equated volume and intensity for strength. Journal of Strength and Conditioning Research.

- Thomas, D. T., Erdman, K. A., & Burke, L. M. (2016). *Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance*. Journal of the Academy of Nutrition and Dietetics.

- Phillips, S. M., et al. (2009). *Protein intake and muscle mass in athletes: the importance of timing*. Current Opinion in Clinical Nutrition.

- Jäger, R., et al. (2017). *International Society of Sports Nutrition Position Stand: Protein and Exercise*. JISSN.

Issurin, V. B. (2010). New horizons for the methodology and physiology of training periodization. Sports Medicine.

Mujika, I., & Padilla, S. (2003). Scientific bases for precompetition tapering strategies. Medicine & Science in Sports & Exercise.& Exercise.

- Jouris, K. B., McDaniel, J. L., & Weiss, E. P. (2011). *Omega-3 Fatty Acid Supplementation Improves Recovery from Eccentric Exercise-Induced Muscle Damage*. JSSM.

- Casa, D. J., et al. (2010). *National Athletic Trainers' Association Position Statement: Fluid Replacement for Athletes*. JAT.