

Minimum Qualifying Movement (MQM) as the Standard for Increasing Resistance

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This article offers a specific model, Minimum Qualifying Movement (MQM), for coaches and athletes to use for: a) identifying when to increase limb resistance, b) verifying the increase is appropriate, and c) a progression for building sport-specific strength needed to achieve MQM. For Olympic and Barebow disciplines, achieving Barrel of the Gun (BOG) by coiling efficiently during Set-Up is the Minimum Qualifying Movement for considering if increasing bow resistance is appropriate. For Compound archers, once optimal draw length is set, achieving BOG as an outcome of Drawing with comfort and ease while maintaining posture is the MQM for assessing draw weight. Included is an MQM flow chart that provides a clear pathway for making decisions related to increasing draw weight and a sample progression plan for strength training. The standardized use of MQM by coaches prioritizes the process and, therefore, the athlete.

The Case for a Standardized Approach

When coaches and athletes raise draw weight with the primary goal of increasing arrow flight distance, the decision-making process is no longer athlete-centric or process-based. Without a standardized approach for increasing draw weight, prioritizing outcome at the expense of process and possibly even athlete health may become the compelling yet tragic default. “Compelling” because changing limbs or turning limb bolts is low commitment, and the results are immediate - the arrow travels the required distance; “Tragic” because the focus was on how far an arrow traveled and not on the form used to send the arrow downrange. Critical elements of form are lost when draw weight increases too quickly. Among a host of other negative impacts, shooting at resistance levels that stymie optimal positioning interrupts, rather than informs, ideal neural pathway development. Practice does not make perfect. Practice makes permanent because the myelin sheath that grows around our neural fibers as we practice reinforces specific movement patterns, whether those movements are optimal or not. Therefore, any time spent training in suboptimal form because of something as simple as draw weight is a tragic use of time and holds athletes back.

Minimum Qualifying Movement Model, The MQM Model, provides a modern, athlete-centered, process-based, and standardized framework to apply when assessing draw weight for all disciplines in archery. MQM is designed to integrate with the National Training System and applies contemporary sports science principles. Focusing on criteria specific to whether or not an athlete is executing a movement to a minimum standard places the importance on form and the need to progressively develop strength to maintain that form at a higher resistance. MQM shifts the question of: “What draw weight do I need to reach a specific distance?” to “What do I add to my Training Plan to progressively develop the strength needed to meet the MQM at a slightly higher resistance?” Increased performance due to optimal positioning and neural pathway development, athlete self-image, motor movement retention, and decreased mental

and physical injury are all probable outcomes when coaches and athletes apply MQM. With MQM, the athlete and the athlete's process come first, not the distance and certainly not the draw weight.

The MQM Standard for Olympic, Barebow, Compound

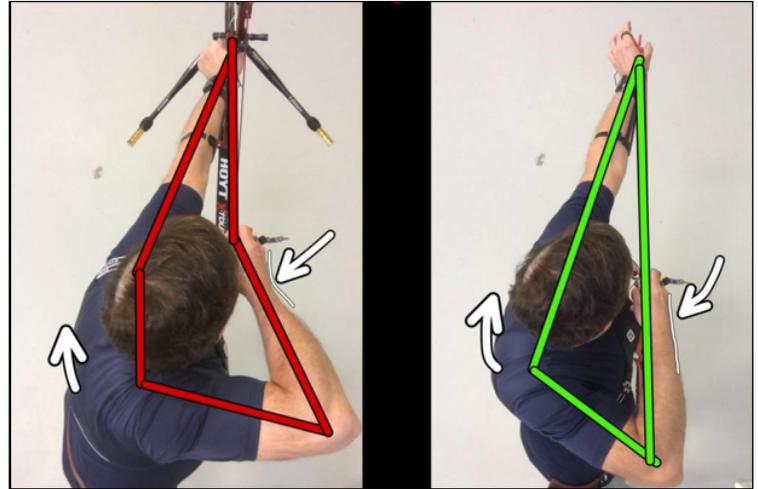
Achieving Holding is the most critical phase of the shot cycle for Compound, Barebow, and Olympic disciplines. Athletes can only achieve holding after establishing BOG. The MQM Standard is the same for Olympic and Barebow and is adjusted slightly for Compound. Regardless, the common thread for all disciplines is: establish BOG while maintaining proper posture and other elements of form with relative ease and consistency.

Olympic & Barebow

For Olympic and Barebow, achieving BOG by coiling efficiently during Set-Up is the MQM for considering if increasing bow resistance is appropriate. The rationale is three-fold:

1. Coiling and achieving BOG are the first observable elements of form to suffer when resistance is too high.
2. It is not in the athlete's best interest to train at a draw weight where it is impossible to achieve BOG.
3. If the athlete cannot achieve BOG, it will not be possible to achieve Holding.

Set-Up is the most dynamic movement in the National Training System for Olympic and Barebow. Most notably, the Coiling action of Set-Up demands a separation of the upper and lower body while the draw-side scapula simultaneously depresses towards the spine. In addition, managing the internal control of intensity is critical as the forces of the shot build through Set-Up. The muscles required for lower body stabilization, upper body rotation, and scapular depression are unfortunately some of the same muscle groups that atrophy as a result of the more modern, sedentary lifestyle. These muscles include glutes and hip stabilizers, hamstrings, quadriceps, transverse abdominis, obliques, and lower trapezius, to name a few. It is advisable athletes commit to a training plan that builds sport-specific strengths needed for, at a minimum, establishing BOG. Note that not achieving BOG can also be caused by having a stance that is too open. Coaches must consider stance first if an athlete cannot achieve BOG. Adjusting stance is far simpler to adjust and a variable that can be tested and assessed rapidly.



Olympic or Barebow. Left: MQM not achieved with Bow. Resistance may be too high, stance may be too wide, or athlete may not have motor skill acquisition yet for MQM. Right, taken moments later: MQM achieved with stretch band and same stance eliminates stance as cause and demonstrates necessary motor skills. Not shown: In this example, the athlete could transfer MQM from band to lightweight training bow. However, the limbs used in the left image were beyond the athlete's threshold for achieving MQM.

Compound

For Compound, once optimal draw length is set, achieving BOG as an outcome of Drawing past peak bow weight with comfort and ease is the MQM for assessing resistance. The rationale:

1. The first form-based elements to disintegrate when resistance is too high occur during the Drawing phase on the way to BOG. They include the athlete's ability to coil efficiently, maintain posture, provide skillful directional guidance of LAN2, maintain shoulder alignment, and manage pressure control movements bow side to draw side.
2. It is not in the athlete's best interest to train at resistance levels that necessitate compensatory muscle groups fire to overcome peak bow weight.
3. The mental aspect of Holding may not be possible to obtain if the athlete has an unsettled mind due to a struggle during the shot process.

Drawing is the most dynamic movement in Compound for many of the same reasons that Set-Up is the most dynamic movement for Olympic and Barebow. Specifically, the Coiling of the upper body against a stable base and scapular depression occur during Draw rather than Set-Up on the way to achieve BOG.

Assessing MQM

Now that we have established minimum qualifying movements for increasing draw weight across disciplines, it is necessary to set criteria for assessing MQM. For Olympic and Barebow, the athlete must achieve BOG as viewed in 360 degrees. That is, not only do the three points of bow wrist, bow shoulder, and draw shoulder need to come into an observable straight line when viewed from above, the shoulders also need to remain low and level when viewed from Coaching Positions #1 or #3. From Coaching Position #3, the draw-side scapula needs to migrate as far to the spine as the athlete's range of motion will allow. For Compound, the vertical alignment of the spine needs to remain relatively unchanged as the athlete draws the bow past peak bow weight while other elements of form (posture and draw-side elbow alignment to name two) remain intact. The MQM Assessment Table below provides questions and criteria to apply when considering increasing draw weight.

Strength & MQM

The movements of Drawing the Compound bow over peak bow weight to find BOG (proper draw length assumed) requires strength. Coiling to find BOG against resistance involves strength. Strength is the ability to exert a force against resistance. In NTS, athletes exert force through a series of specific angular movements that, like gears, make the shot cycle more biomechanically efficient. More force is required to move higher levels of resistance. Increasing resistance (draw weight) not only requires more strength it also increases Training Load (stress on the athlete over time). It requires reconsidering the intensity, duration, and volume in the overall Training Plan (Austin, 2012). Achieving Barrel of the Gun with a higher draw weight requires more force and, therefore, more strength. Progressively building muscle power, endurance, and range of motion through strength training is required to increase draw weight, small increments at a time, and ensure the MQM is maintained.

MQM Assessment Table (Recurve/Barebow/Compound)	
Assessment Question	Assessment Criteria
When to consider increasing Draw Weight:	Achieving Minimum Qualifying Movement (MQM) consistently and with ease at current draw weight.
How to assess if new Draw Weight is appropriate:	Resistance is appropriate if athlete achieves MQM consistently and with ease. Check to make sure stance is not too open. Compound: Set Draw length.
What should resistance increase to?	Increase resistance no more than 2# at a time.
Where should strength be built to reach MQM?	Apply Strength Training Plan. Only apply Specific Physical Training (SPT) if Minimum Qualified Movement is still met at SPT resistance.

What about the mantra "movement over muscles?" The mantra "movement over muscles" is accurate when designing verbal cues that trigger athletes to perform specific movement patterns. Research shows that internal cues focused on muscles and joints are less effective for motor skill execution (Wulf, 2013; Winkelman, 2021) and more effective when hypertrophy is the goal (Schoenfeld et al., 2018). However, and to apply the 3P Performance

Profile (Patter, Position, Power) from Winkelman's Language of Coaching, imagine the following example. An athlete demonstrates they have the coordination required to produce the movement *pattern* of Set-Up and achieve the *position* of MQM effectively and consistently with their body, a stretch band, and even a 16lb. training bow. Yet, when handed a 20lb. training bow MQM (*position*) is lost. *Position* is lost because *pattern* suffers due to the athlete's inability to generate enough *power* to perform the *pattern* and *position* at a higher resistance level (16lbs. vs. 20lbs.) (Winkelman, 2021).

While cues can assist athletes tremendously and make people suddenly run faster, jump farther, and generally perform better, increasing the strength and health of specific muscles (*power*) can improve the qualities of a desired movement *pattern* and *position*. The issue in the example of the athlete in the preceding paragraph is not the athlete's general ability to perform the movement. Instead, the problem is the inability to execute MQM at a specific level of resistance: increased resistance demands increased strength and *power* output. In this example, a) dropping down to the 16lb. threshold to inform rather than interrupt neural pathway development, and b) engaging in resistance training for the muscle groups specific to coiling would help the athlete develop the muscles (*power*) needed to achieve the *position* of MQM at higher levels of resistance.

Suppose an athlete wishes to build strength while performing Specific Physical Training (SPT) drills or adding resistance to the bow (different limbs, turning limb bolts, adding a stretch band to the bow). In that case, the athlete must maintain MQM and other elements of good form. Attempting to build strength while shooting or performing SPTs at a resistance where MQM cannot be achieved increases the chance of injury and interrupts rather than informs the development of neural pathways associated with executing MQM. Any time spent cycling through low-quality repetitions at a higher resistance in the name of building strength is not

worth the *power* gained for the time lost training with desirable form. Athletes must overload musculoskeletal systems to build muscle. In archery, it is best to apply that overload during strength training without a bow. The athlete can then preserve elements of good form and maximize the development of power, muscle balance, desirable coordination patterns, and range of motion.

When looking to build the strength needed to achieve MQM at a higher draw weight, it is necessary to engage in resistance training and SPTs for Archery. While shooting arrows is an essential part of staying motivated, it may not be wise for athletes who are progressively overloading through SPTs and resistance training to increase weight concurrently. Engaging in a resistance training plan that includes a coiling specific SPT while continuing to shoot at the current draw weight maximizes optimal neural pathway development (imprinting), maximizes muscle growth, minimizes overtraining, and minimizes possible interruptions of optimal neural pathway development.

Training Principles to Achieve MQM

“You need heavier limbs! You’ll get used to the heavier weight after a while. Besides, it’s the only way you’ll reach your outdoor distance.” If someone ever says this to you, consider training a different way with the following four common Training Principles that, like NTS, apply modern sport science to the sport of archery.

The Overload Principle:

Musculoskeletal systems get stronger when loaded beyond their comfort zone (Martens, 2012). In archery, the inability to achieve BOG is a non-starter for the rest of the shot process. If an athlete can perform MQM efficiently at 16 lbs., for example, but not at 18 lbs., the athlete must build strength by overloading muscles to exert more power during Set-Up. Resistance-based exercises are best for overloading muscles, not shooting at a higher draw weight. Again, struggling and logging hours of faulty neural pathway imprinting at the shooting line while not achieving BOG because the resistance is too high is not an effective or efficient use of time.

The Progression Principle:

Increase the amount of overload in increments that allow the athlete to adapt and recover while balancing optimal levels of overload with injury prevention (Martens, 2012). Word of caution: an archer using a resistance that prohibits them from achieving BOG very well may adapt to the increase in resistance but over a shorter range of motion that does not include achieving MQM. If the athlete cannot achieve MQM, then the draw weight progression is too steep. In these cases, athletes must reduce resistance, and the Specificity Principle and Variation Principle can be applied (below) by adding in movement-specific strength-building exercises. After about one month of consistent strength training, retest to see if the athlete can achieve MQM at a resistance of up to 2 pounds higher than the old threshold.

Specificity & Variation Principles:

Athletes can follow specificity and variation principles concurrently by making sure strength training plans focus on: a) specific movements required for the sport (such as coiling

against a stable base, scapular depression, or stabilization of the bow arm) and b) a variety of training activities to avoid overtraining while adding novelty to the training process which is excellent for morale (Martens, 2012). Apply the exercises below using the Training Principles above to build the strength needed to increase draw weight while still achieving MQM.

Sample Progression for an Intermediate Athlete

Adding resistance training and the **Coiling SPT** to the volume of arrows prescribed in the Training Plan will build athlete strength while having no interruption in achieving MQM. Arrow volume in the Training Plan may need to decrease if the resistance training, SPTs, and arrow volume raise training load too much for the athlete. Either way, the volume of arrows shot while adapting to the resistance training plan needs to be shot at the current draw weight. The Sample Resistance Training Exercises Table below includes various movements that athletes can perform with resistance or bodyweight to build the strength needed to obtain MQM.

The Sample Resistance Training Progression on the following page offers a one-month resistance training plan. Work with a coach to integrate a resistance training plan into your current training plan. The increased training load needs to match the micro, meso, and/or macrocycles of the larger training plan. All of the exercises on the Sample Resistance Training Plan below are also in the Sample Resistance Training Exercises above. The **Coiling SPT** (Specific Physical Training), mentioned on the Sample Strength Training Progression Table, is explained later.

Sample Resistance Training Exercises to Assist with achieving MQM at Higher Resistance Levels

Trunk Rotation	Scapular Depression	Bow Shoulder Stabilization	Bow Arm Stabilization	Lower Body Stability
<i>Transverse Abdominis / Internal & External Obliques</i>	<i>Lower Trapezius</i>	<i>Latissimus Dorsi</i>	<i>Triceps</i>	<i>Gluteus Maximus & Leg Abductors</i>
Seated Russian Twist	Prone Trap Raise	Side Plank Prog.	Side Plank Prog.	Glute Bridge
Leg Wipers	45 degree Hip Thoracic Extension	Lat Pull Downs	Tricep Pull Downs	Air Squats
Alternating Lunge with Rotation	Ys, Ts, Ws	Pull Ups	Inclined Overhead Extension	Bulgarian Split Squats
Squat with Rotation at Bottom	Bi-lateral 45 degree Cable Pull	One Arm Dumbbell Row	Close Grip Bench Press	Goblet Squats
Plank with Rotational Reach	Scap Depression in Plank Position	Dumbbell Pullover	Lying Tricep Extension	Banded Shuffle

SPTs follow the Specificity Principle and the Overload Principle. They train the specific movement patterns and muscle groups needed for various steps in the shot cycle while demanding the body perform the movements at increased ranges of motion, resistance, volume, or duration. The Coiling SPT, outlined below, focuses on the movement patterns

needed to achieve BOG. The Sample Resistance Training Progression offers athletes a template for increasing the strength required to use higher resistance limbs while still achieving MQM effectively. Adding strength training to a Training Plan increases Training Load (stress) on the athlete. Adjust the Training Plan intensity, duration, and volume when introducing new elements such as strength training to make sure the athlete adapts.

Coiling SPT for Olympic or Barebow

- *Goal:* Build strength, stability, and endurance of the muscles that rotate the core, stabilize the bow and lower body and depress the scapula.
- *Equipment Needed:* You will need a stretch band, recurve training bow, or a stretch band placed over a recurve training bow. Only slightly increase draw weight for this SPT. While a compound archer athlete can easily modify the exercise for compound bows, do not use a compound bow for this exercise.
- *Description:* Find strong core alignment in Set Position with a deep inhale and exhale. Tuck the tail. Drop the chest. Firm glutes and hip stabilizers are crucial to building a solid foundation from which to coil. Inhale while raising the bow or stretch band and exhale while coiling around the spine, migrating the scapula 100% of the way to the spine. Use the exhalation to go deep into the trunk rotation and scapular depression. Keep the chest down, and tail tucked. Manage intensity control from the pressure point on the grip through the lower trapezius for 3-5 full seconds before coming out of the step and resetting for another repetition. During those 3-5 seconds, choose an internal focus to build muscle or learn the movement. Choose an external cue if performance and efficiency are your goals. For this SPT, consciously build back tension in the lower trapezius to beyond 60% to hold the position at the end of Set Up. Using a mirror can help provide feedback. Whether an athlete conducts the Coiling SPT with slightly heavier limbs, a stretch band, or a stretch band placed over the current riser and string, the athlete must still achieve the position of MQM. Coaches and Athletes need to take care here because the goal is to overload the body while still achieving MQM.
- *Demonstration:* If the movements of Set-Up for Olympic or Barebow are new to you, or you want more information, refer to this Training Video [HERE](#) from Sattva Center for Archery Training. While there is no demonstration of the Coiling SPT, the video will likely clarify any questions you have about Set Up and is full of valuable cues and visuals.
- *Cue:* Imagine your upper body as a lid on a jar that locks into position ONLY once you find the *position* of MQM. The lid of the jar spins down onto the base that is stable and unmoving. Imagine yourself sliding down the threads of the jar lid to “Lock the Lid.” Lock the Lid.
- *Do:* Warm up first with 3X10 Scapular Depressions in Plank Position or against a wall. Perform 20 repetitions of the Coiling SPT, holding for 3-5 full seconds at the end of Set-

Up before coming out of the position. Rest for 10-15 seconds before performing another repetition. Repeat this cycle 2-3X with a five-minute rest between sets.

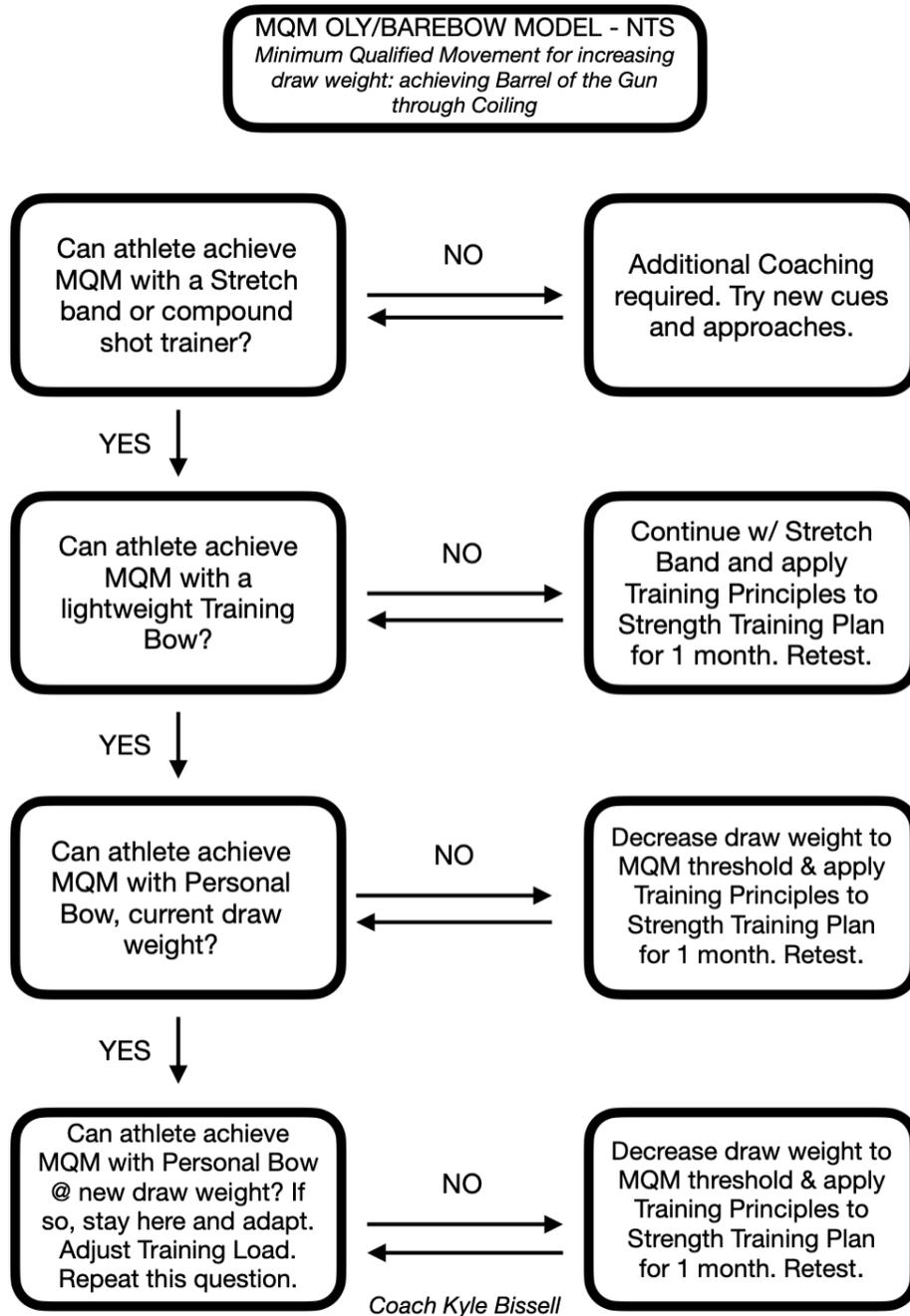
- **Standard:** Consistently achieve BOG, the MQM. Consider placing a camera above the athlete and placing bright stickers on the bow wrist, bow shoulder, and draw side shoulder, as seen in the video link above, so BOG can easily be observed. Achieve BOG on 100% of the repetitions, hips remaining stationary. Sit on a chair if you are having trouble keeping your hips stable.
- **Debrief:** Describe what it felt like when you excelled at maintaining that posture at the end of Set-Up for 3-5 seconds. If some reps felt weaker than others, where on your body did the posture feel weak first, second? How do you prevent this in the future?

Sample Resistance Training Progression focused on Achieving MQM at Higher Resistance

Sunday	Tuesday	Wednesday	Friday	Saturday
<ol style="list-style-type: none"> 1. Coiling SPT, 1X20 2. Seated Russian Twist (no weight) 1X12 3. Goblet Squats 1X20 4. Side Plank Progression 	<ol style="list-style-type: none"> 1. Scap Depressions in Plank Position, 1X12 2. Banded Shuffle 1X60sec. 3. Tricep Pull Downs 1X12 4. Leg Wipers 3X20 	<ol style="list-style-type: none"> 1. One Arm Dumbbell Row, 2X12 2. Coiling SPT, 2X20 3. Bulgarian Split Squats 2X12 4. Squat with Rotation 1X12 	<ol style="list-style-type: none"> 1. Glute Bridge 8X30sec. 2. Seated Russian Twist 2X12 3. Prone Trap Raise, 2X12 4. Lying Tricep Extension 2X12 	<ol style="list-style-type: none"> 1. Coiling SPT, 2X20. 2. Plank with Rotational Reach, 2X12 3. Scap Depression in Plank Position 4. Goblet Squats 2X20
<ol style="list-style-type: none"> 1. Coiling SPT, 3X20. 2. Plank with Rotational Reach, 3X12 3. Scap Depression in Plank Position, 3X15 4. Goblet Squats 3X20 	<ol style="list-style-type: none"> 1. Coiling SPT, 3X20 2. Seated Russian Twist (no weight) 3X12 3. Goblet Squats 3X20 4. Side Plank Progression 3X60sec. 	<ol style="list-style-type: none"> 1. Scap Depressions in Plank Position, 3X12 2. Banded Shuffle 3X60sec. 3. Tricep Pull Downs 3X12 4. Leg Wipers 3X20 	<ol style="list-style-type: none"> 1. One Arm Dumbbell Row, 3X12 2. Coiling SPT, 3X20 3. Bulgarian Split Squats 3X12 4. Squat with Rotation 3X12 	<ol style="list-style-type: none"> 1. Glute Bridge 8X30sec. 2. Seated Russian Twist 3X12 3. Prone Trap Raise, 3X12 4. Lying Tricep Extension 3X12
<ol style="list-style-type: none"> 1. Coiling SPT, 4X20 2. Lat Pull Downs 3X12 3. Dumbbell Pullover 3X15 4. Banded Shuffle 3X60sec. 	<ol style="list-style-type: none"> 1. Coiling SPT, 4X20 2. Lat Pull Downs 3X12 3. Close Grip Bench Press or Push Ups 3X15 4. Dumbbell Pullover 3X15 	<ol style="list-style-type: none"> 1. Squat with Rotation at Bottom 3X20 2. Seated Russian Twist 3X20 3. Tricep Pull Downs 3X15 4. Side Plank Progression 3X30sec. 	<ol style="list-style-type: none"> 1. Coiling SPT, 4X20 2. Lying Tricep Extension 3X12 3. Banded Shuffle, 3X60sec. 4. Scap Depression in Plank Position, 3X15 	<ol style="list-style-type: none"> 1. Coiling SPT, 4X20 2. Inclined Overhead Tricep Extension, 3X12 3. Lat Pull Down, 3X12 4. Plank with Rotational Reach, 3X20
<ol style="list-style-type: none"> 1. Coiling SPT, 5X20 2. Inclined Overhead Tricep Extension, 3X12 3. Lat Pull Down, 3X12 4. Plank with Rotational Reach, 3X20 	<ol style="list-style-type: none"> 1. Coiling SPT, 5X20 2. Lat Pull Downs 3X12 3. Dumbbell Pullover 3X15 4. Banded Shuffle 3X60sec. 	<ol style="list-style-type: none"> 1. Coiling SPT, 5X20 2. Lat Pull Downs 3X12 3. Close Grip Bench Press or Push Ups 3X15 4. Dumbbell Pullover 3X15 	<ol style="list-style-type: none"> 1. Coiling SPT, 5X20 2. Seated Russian Twist 3X20 3. Tricep Pull Downs 3X15 4. Side Plank Progression 3X30sec. 	<ol style="list-style-type: none"> 1. Recover here and retest ability to achieve MQM on Wednesday or Thursday of the following week with 2# more resistance. 2. Continue strength training after recovery.

The MQM Decision Making Tree

The flow chart below provides a structure coaches and athletes can apply or consider when faced with the question of whether draw weight should be increased.



Summary

Archery is a form-based sport that requires attention to the process to achieve exceptional outcomes. Holding is the most important part of the shot process as it leads to greater control over the shot and decreased mental injury. The athlete will not achieve Holding if they cannot exert the force needed to coil and achieve Barrel of the Gun during Set-Up (Olympic and Barebow) or maintain posture while drawing through peak draw weight (Compound). For Olympic and Barebow, achieving BOG by coiling efficiently during Set-Up is the MQM for considering if increasing bow resistance is appropriate. For Compound, once optimal draw length is set, achieving BOG as an outcome of Drawing with comfort and ease while maintaining posture is the MQM for assessing draw weight. Resistance exercises to develop core stability, lower body stability, and bow arm stabilization may benefit athletes looking to increase draw weight. Progressively overloading the body is physiologically required to increase strength. Until an athlete can achieve Barrel of the Gun while coiling through Set-Up (Olympic and Barebow), the overloading and struggle need to occur in the gym and not with the bow on the field where neural pathway development will be interrupted rather than informed, and time wasted.

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