HIGH PERFORMANCE NEWSLETTER

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 draw weight, 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 which provides a clear pathway for making decisions related to increasing draw weight along with a sample progression plan for strength training. The standardized use of MQM by coaches prioritizes 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 in the slightest way 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 at suboptimal form because of something as simple as draw weight is a tragic use of time and holds athletes back.

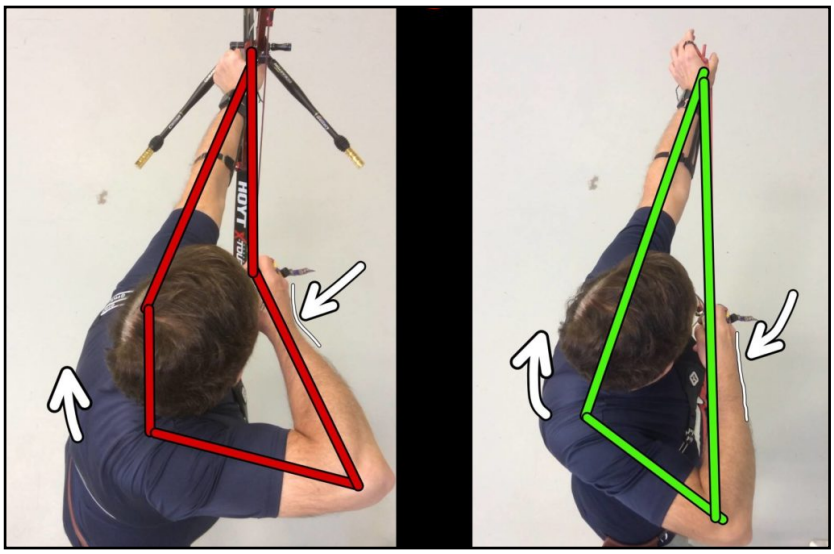
Minimum Qualifying Movement Model

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 in order 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 in order 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 MQM is used and the athlete and the athlete's process come first.

The MQM Standard for Olympic, Barebow, Compound

Achieving Holding is the most important phase of the shot cycle for Compound, Barebow, and Olympic disciplines. Holding can only be achieved if BOG is established. The MQM Standard

is the same for Olympic and Barebow and is adjusted slightly for Compound. Regardless, the common thread for all disciplines is: establishing BOG while maintaining proper posture and other elements of form en route to achieve BOG with relative ease and consistency.



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 necesarry 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.*

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 elements of form to observably suffer when resistance is too high; 2) it is not in the athlete's best interest to train at any draw weight where BOG cannot be achieved as suboptimal neural pathways are reinforced; 3) if BOG is not achieved, Holding cannot be achieved.

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 upper and lower body while the draw-side scapula simultaneously depresses to the spine, not to mention bow side stabilization and pressure control. The muscles required for the action of lower body stabilization (glutes and hip stabilizers, hamstrings, quads), upper body rotation (transverse abdominis and obliques), and scapular depression (lower trapezius) are unfortunately some of the same muscle groups that atrophy as a result of the more modern, sedentary lifestyle. 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. Stance must be considered first if BOG is not being achieved as it is simpler to adjust and a variable which can be tested and assessed rapidly.

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 elements of form to disintegrate when resistance is too high are seen during the Drawing phase, on the way to BOG, and 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 be recruited (struggle) in an effort to overcome peak bow weight; 3) the mental aspect of Holding may not be possible to obtain if the mind is unsettled 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 for Olympic and Barebow. Specifically, the Coiling of the upper body against a stable base and scapular depression are similar movements in Compound that take place during Drawing rather than Set Up on the way to achieve BOG. It is this rotational movement of the

torso around the spine (transverse abdominis and obliques), bow arm stabilizers (tricep and latissimus dorsi, forearm), and muscles in the back (lower trapezius) that are needed to overcome the resistance of the limbs during Draw.

Assessing MQM
Now that the minimum qualifying movements for increasing draw weight across disciplines have been established, it is necessary that criteria be set for assessing MQM. For Olympic and Barebow, BOG must be achieved 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 for Olympic and Barebow requires strength. Strength is the ability to exert a force against resistance. In NTS, force is exerted 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) and requires reconsidering the elements of 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 for increasing draw weight, small increments at a time, to assure the MQM is maintained.

What about the mantra "movement over muscles?" The mantra "movement over muscles" is absolutely true 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. However, and to apply the 3P Performance Profile from Winkelman's *Language of Coaching*, imagine the following example. An athlete demonstrates they have the coordination required

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.

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 16# training bow. Yet, when handed a 20# training bow MQM (Position) is lost, Pattern suffers and all because the athlete cannot yet generate enough *Power* to perform the Pattern and Position at the higher level of resistance (Winkelman, 2021).

While cues can assist athletes tremendously and literally 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 make the movement. Rather, the issue 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 16# threshold to inform rather than interrupt neural pathway development and b) engaging in strength 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.

If 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), it is imperative that MQM and other elements of good form be maintained. 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 strength gained for the time lost training with desirable form.* Musculoskeletal systems must be overloaded in order to build strength. In archery, that overload and struggle may be best applied while strength training without a bow so that the elements of good form are preserved and the development of power, muscle balance, desirable coordination patterns, and range of motion are maximized.

When looking to build the type of specific strength needed to achieve MQM at a higher draw weight, it is necessary to engage in strength training as well as SPTs for Archery. While continuing to shoot arrows is an important part of staying motivated, it may not be wise for athletes who are progressively overloading through SPTs and strength training to also overload by increasing draw weight while shooting. Engaging in a strength 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

If you ever hear, *"You need heavier limbs! You'll get used to the increase after a while. Besides, it's the only way you'll reach your outdoor distance,"* 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 they are 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 and, assuming the athlete can perform the movement at a lower resistance successfully, demands the athlete gain strength. Gaining strength requires overloading the body (Martens, 2012). Overloading the body so it can use higher resistance limbs is most effectively developed in the gym. SPTs can also be used but the overload will be less than what can be done in a gym because MQM must still be met. Again, struggling at the

range, logging hours of faulty neural pathway imprinting 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 time for 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 MQM is not achieved, then the athlete has demonstrated the draw weight progression is too steep. In these cases, resistance must be reduced 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 MQM can be achieved at a resistance that is up to 2 pounds higher than the old threshold.

Specificity & Variation Principles can to be followed 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 great 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 strength training and the Coiling SPT to the volume of arrows prescribed in the Training Plan will build athlete strength while having no interruption in ability to achieve MQM. Arrow volume in the Training Plan may need to decrease if the strength training, SPTs, and volume raise training load too much fort he athlete. Either way, the volume of arrows shot while adapting to the strength training plan need to be shot at the current draw weight.

The Sample Strength Training Exercises Table below includes a variety of movements that can be performed with resistance or body weight to build the strength needed to obtain MQM. The Sample Strength Training Progression Plan on the following page offers a glimpse into what a one month strength training plan might look like. Work with a Coach to integrate a strength training plan into your current Training Plan if you do not have one, the increased load needs to match the micro, meso and/or macro cycles of the larger plan while working for your body and mind, not against them. All of the exercises on the Sample Strength Training Plan below are listed in the Sample Strength Training Exercises, above. The Coiling SPT (Specific Physical Training), mentioned on the Sample Strength Training Progression Table, is explained later.

SPTs follow the Specificity Principle and the Overload Principle as they train the specific movement patterns and muscle groups needed for a variety of 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 movements needed to achieve BOG. The Sample Strength Training Progression Plan offers athletes a template for increasing strength needed to effectively use higher resistance limbs while still achieving MQM. 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.

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

Trunk Rotation	Scapular Depression	Bow Shoulder Stabilization	Bow Arm Stabilization	Lower Body Stability
Transverse Abdominis / Internal & External Obliques	*Lower Trapezius*	*Latissimus Dorsi*	*Triceps*	*Gluteus Maximus & Leg Abductors*
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

Coiling SPT for Olympic or Barebow
Goal: Build strength and endurance of the muscles that rotate the core, stabilize the bow and depress the scapula during Set Up.

Equipment Needed: Stretch band, recurve training bow, or a stretch band placed over a recurve training bow. Only slightly increase draw weight for this SPT. While the exercise can be easily modified for compound athletes, 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 key to building a solid foundation to coil from. 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. Continue to build tension 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, focus deeply on what is required to hold the position. For this SPT, consciously build back tension in the lower trapezius to beyond 60% in order to hold the position at the end of Set Up. Using a mirror can help provide feedback. Whether the Coiling SPT is conducted with slightly heavier limbs, a stretch band, or a stretch band placed over the current riser and string, position of *MQM must still be achieved*. Coaches and Athletes need to take care here because the goal is to *progressively 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 fo Archery Training. While there is not a demonstration of the Coiling SPT, the video will likely clarify any questions you have about Set Up and is full of useful cues and visuals.

Cue: Imagine your upper body as a lid on a jar that locks into position ONLY when MQM is found. 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 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: Always 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 hips stable.

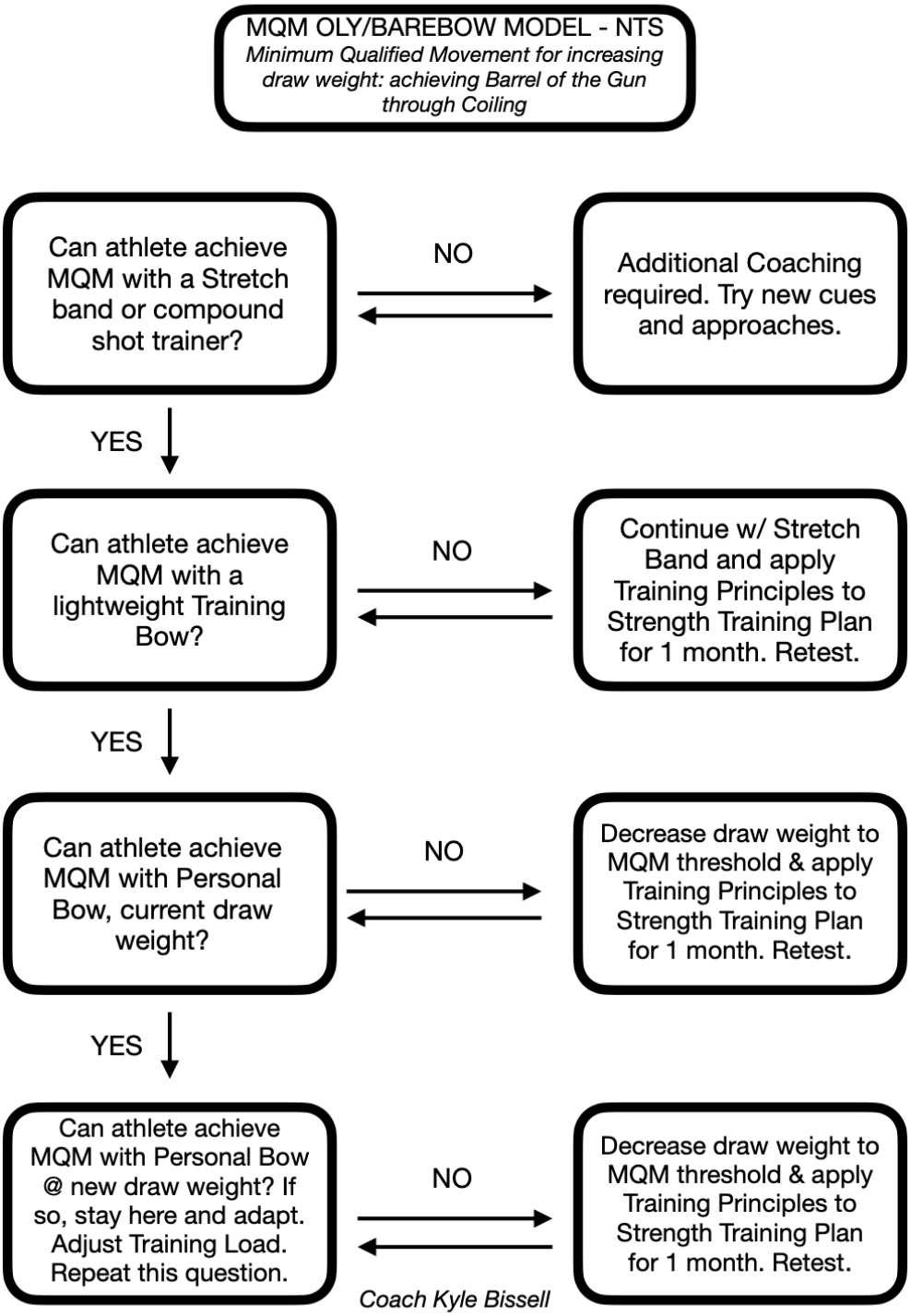
Debrief: Describe what it felt like when you were excelling at maintaining that posture at the end of Set Up for 3-5 seconds. If there were reps that felt weaker than others, where on your body did the posture feel weak first, second? How do you prevent this in the future?

Sample Strength Training Progression focused on Achieving MQM at Higher Resistance

Sunday	Tuesday	Wednesday	Friday	Saturday
1. Coiling SPT, 1X20 2. Seated Russian Twist (no weight) 1X12 3. Goblet Squats 1X20 4. Side Plank Progression	1. Scap Depressions in Plank Position, 1X12 2. Banded Shuffle 1X60sec. 3. Tricep Pull Downs 1X12 4. Leg Wipers 3X20	1. One Arm Dumbbell Row, 2X12 2. Coiling SPT, 2X20 3. Bulgarian Split Squats 2X12 4. Squat with Rotation 1X12	1. Glute Bridge 8X30sec. 2. Seated Russian Twist 2X12 3. Prone Trap Raise, 2X12 4. Lying Tricep Extension 2X12	1. Coiling SPT, 2X20. 2. Plank with Rotational Reach, 2X12 3. Scap Depression in Plank Position 4. Goblet Squats 2X20
1. Coiling SPT, 3X20. 2. Plank with Rotational Reach, 3X12 3. Scap Depression in Plank Position, 3X15 4. Goblet Squats 3X20	1. Coiling SPT, 3X20 2. Seated Russian Twist (no weight) 3X12 3. Goblet Squats 3X20 4. Side Plank Progression 3X60sec.	1. Scap Depressions in Plank Position, 3X12 2. Banded Shuffle 3X60sec. 3. Tricep Pull Downs 3X12 4. Leg Wipers 3X20	1. One Arm Dumbbell Row, 3X12 2. Coiling SPT, 3X20 3. Bulgarian Split Squats 3X12 4. Squat with Rotation 3X12	1. Glute Bridge 8X30sec. 2. Seated Russian Twist 3X12 3. Prone Trap Raise, 3X12 4. Lying Tricep Extension 3X12
1. Coiling SPT, 4X20 2. Lat Pull Downs 3X12 3. Dumbbell Pullover 3X15 4. Banded Shuffle 3X60sec.	1. Coiling SPT, 4X20 2. Lat Pull Downs 3X12 3. Close Grip Bench Press or Push Ups 3X15 4. Dumbbell Pullover 3X15	1. Squat with Rotation at Bottom 3X20 2. Seated Russian Twist 3X20 3. Tricep Pull Downs 3X15 4. Side Plank Progression 3X30sec.	1. Coiling SPT, 4X20 2. Lying Tricep Extension 3X12 3. Banded Shuffle, 3X60sec. 4. Scap Drepression in Plank Position, 3X15	1. Coiling SPT, 4X20 2. Inclined Overhead Tricep Extension, 3X12 3. Lat Pull Down, 3X12 4. Plank with Rotational Reach, 3X20
1. Coiling SPT, 5X20 2. Inclined Overhead Tricep Extension, 3X12 3. Lat Pull Down, 3X12 4. Plank with Rotational Reach, 3X20	1. Coiling SPT, 5X20 2. Lat Pull Downs 3X12 3. Dumbbell Pullover 3X15 4. Banded Shuffle 3X60sec.	1. Coiling SPT, 5X20 2. Lat Pull Downs 3X12 3. Close Grip Bench Press or Push Ups 3X15 4. Dumbbell Pullover 3X15	1. Coiling SPT, 5X20 2. Seated Russian Twist 3X20 3. Tricep Pull Downs 3X15 4. Side Plank Progression 3X30sec.	Recover here and retest ability to achieve MQM on Wednesday or Thursday of the following week with 2# more resistance. 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 or not draw weight should be increased.



Summary

Archery is a form-based sport that requires attention to process for the purpose of achieving exceptional outcomes. Holding, the most important part of the process that leads to greater control over the shot and decreased mental injury, will not be achieved if the athlete 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. Engaging in a strength straining program that targets sport-specific muscle groups needed for trunk rotation, scapular depression, lower body and bow arm stabilization is a required strategy for anyone looking to increase resistance. Progressively overloading the body is physiologically required to increase strength and, until the athlete can achieve BOG while coiling through Set Up (Olympic and Barebow) or coiling/drawing past peak bow weight (Compound), the overloading and struggle needs to take place 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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About the Author

Kyle Bissell lives in Greenfield, MA with his wife and two daughters, has a Masters in Education, is a Level IV NTS Coach, Level III Coach Trainer, Level II Instructor Trainer, RED Team East Alternate Coach, Athletic Director at a public school, and founder and head coach at Sattva Center for Archery Training (10yrs). Coach Kyle was a teacher of Physical Education for 8 years and a Level III Professional Ski Instructor of America (13 yrs) where he was identified in Skiing Magazine (1997) as among the 75 best ski instructors in the USA for children. Besides being a multi-sport athlete, Bissell loves teaching the physical and mental elements required to pursue increased performance. He has actively studied and applied the art and science of teaching movement and coaching character for 28 years. Coach Kyle begins a doctoral track in Integrated Health Sciences with a focus on coaching and sports science in May, 2021. Appreciation and acknowledgement to Coaches SerahRose Bissell, Charles Rendleman, Lynn Oberbillig, Amy Porter, and Guy Krueger for feedback on early drafts.