



# Gymnastics BC STRENGTH AND CONDITIONING FOR GYMNASTICS

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## **INTRODUCTION AND HOW TO USE THIS MANUAL**

This manual is meant to replace the Strength and Conditioning for Gymnastics manual originally created in 2010 (and updated in 2013). Specific improvements include:

- a) a comprehensive and gymnastics specific warm-up;
- b) a recommended assessment protocol to be performed annually, for post competitive season recovery (mid-late June);
- c) a Range of Motion and Performance Complexes that you can assign your athletes based on areas identified as weaknesses in the ROM (Range of Motion) screen test; assessed as described in b);
- d) an updated full-year periodized Strength and Conditioning plan using the latest available protocols to enhance athletic performance and drawing ideas from various gymnastics strength coaches to ensure protocols are gymnastics specific.

Please refer to each section for additional information on each update and how to apply them to your athletes.



## **STRENGTH AND CONDITIONING GOALS**

Success comes not only from working hard, but working smart. As they say, if you always do what you've always done, you will always get what you've always got. Although every athlete's schedule and level is unique, a training season should follow a general outlined training plan. The strength and conditioning goals for the season are to:

- a) have every athlete follow a great warm-up routine;
- b) assess all athletes with both Range of Motion and performance based activities;
- c) prescribe self-mobility and stretch complexes to athletes based on their assessments (can be done in between turns on apparatus, or post-training within the strength and conditioning piece of your workouts) and, for more serious athletes, make the complexes a priority to be completed 5x/wk.;
- d) be consistent and systematic with your strength and conditioning plan (including both strength and energy systems/work capacity components);
- e) learn how to teach basic strength movements as part of your strength plan (consider working with a strength and conditioning professional);
- f) determine what works best for your athletes as a taper protocol leading into a competition.

It is important for coaches to start the Strength and Conditioning workouts in June and follow them closely as they are designed with athlete safety in mind to systematically enable them to peak for their competitive season. Please refer to the following page for a visual reference on how all months are "periodized" to the British Columbia gymnastics competitive season. We encourage you to include all the camps and competitions relevant to your athletes.



## OVERVIEW OF ANNUAL GYMNASTICS STRENGTH AND CONDITIONING PERIODIZATION AND PHASES

Month	Strength (2x's/wk.)	Energy Systems/Work Capacity Training	Individualized Mobility/Performance Complexes (3-7x/wk.)
<b>1</b> (Jun)	Recovery/ Assessment	Recovery	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>2</b> (Jul)	Anatomical Adaptation	Moderate intensity for long duration (typically referred to as Aerobic Base) 2 x/wk. Post workout.	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>3</b> (Aug)	Max Strength Ramp	Moderate intensity for long duration (typically referred to as Aerobic Base) 2x/wk. Post workout.	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>4</b> (Sep)	Max Strength	Minimal to moderate technical high intensity efforts of a short duration (typically referred to as Anaerobic Base) 2x/wk. Post-workout.	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>5</b> (Oct)	Max Strength	Minimal to moderate technical high intensity efforts of a short duration (typically referred to as Anaerobic Base) 2x/wk. Post workout.	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>6</b> (Nov)	Power	Super high intensity efforts of a gymnastics natured skill/routine 1-2x/wk. Post workout. + Half-routines/skill repeat sets 2-4x/wk. Within practice.	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>7</b> (Dec)	Power	Super high intensity efforts of a gymnastics natured skill/routine 1-2x/wk. Post workout. + Half-routines/skill repeat sets 2-4x/wk. Within practice.	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>8</b> (Jan)	In Season Max Strength	Routines	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>9</b> (Feb)	In Season Power	Routines	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>10</b> (Mar)	Max Strength (In Season)	Routines	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>11</b> (April)	Power (In Season)	Routines	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)
<b>12</b> (May)	Max Strength (In Season)	Routines	Pre-workout, in between turns or post-workout. Ideally, daily. (choose 1 or 2 complexes each day)



# APPENDIX 1

Dynamic Warm-up How To



## **CREATING A BETTER WARM-UP**

Goals:

- to follow the most recent Strength and Conditioning principles while making the warm-up more gymnastics specific;
- to minimize injuries and to prepare for maximal performance at each practice.

\*\*Please pay attention to the notes and links below that suggest modifications and improvements on how we have typically taught athletes/gymnasts to stretch their hip flexors, groin and lats. Traditional forms of these stretches may contribute to the development of an injury.

There may be a lot of variation on exact exercises/stretchches included in your athletes' warm-up, but do try to include ALL of the following components:

- A. Soft tissue prep
- B. General warm-up/non-impact based joint & muscular prep
- C. Metabolic/cardiovascular prep and advanced movement patterns
- D. Advanced gymnastics specific dynamic stretching
- E. Basic core activation – proper breathing pattern and breathing  
“Behind the Brace” core control
- F. Gymnastics specific core control - activation/shaping
- G. Jumping and landing mechanics
- H. Line splits for alignment and bridge work
- I. Fundamental gymnastics skills/line drills, press handstands, handstand holds and back tucks

### **A. Soft tissue prep (foam rolling, the stick etc.)**

This can be done either before the general warm-up/non-impact based joint & muscular prep or after. If you have limited time and think your athletes can handle it, educate your athletes that it is their responsibility to come in 10 min pre-practice in order to complete their rolling independently (only if they will actually do it). Make daily soft tissue maintenance a high priority. For gymnasts, specific attention should be paid to calves, groin, quads, IT bands, lats/teres major and pecs. Athletes should commit at least 10 min for their soft tissue prep while allocating additional time to areas identified as their personal limitations as per their assessment results. See Appendix 3 for self-mobility/stretch complexes and refer to Appendix 4 for specifics on foam rolling/soft tissue work.

**B. General warm-up or non-impact based joint & muscular prep - easy dynamic stretches**

There are two approaches a coach can take. Some coaches prefer having the athletes do a very easy jog around the floor for 2-3 min before getting into easy dynamic stretches listed below. Other coaches prefer to streamline the process by leaving out the jog and opting for a back and forth walks across the floor while performing some very easy dynamic stretches.

Option 1	Option 2
Walk briskly the length of the floor while performing: <ul style="list-style-type: none"> <li>a) wrist rolls;</li> <li>b) slow shoulder circles;</li> <li>c) neck rolls;</li> <li>d) knee hugs;</li> <li>e) hip ER pulls or seated glute stretch;</li> <li>f) quad stretch.</li> </ul>	Jog or skip around the gym for 2-4 min then perform: <ul style="list-style-type: none"> <li>a) wrist rolls;</li> <li>b) slow shoulder circles (optional use of minimally resistant elastic);</li> <li>c) neck rolls;</li> <li>d) knee hugs;</li> <li>e) hip ER pulls or seated glute stretch;</li> <li>f) quad stretch.</li> </ul>



**C. Metabolic / cardiovascular prep and advanced movement patterns**

This step involves more “aggressive” running, skipping and gymnastics type movement patterns. Movement takes place in different planes geared at preparing the joints and nervous system for the greater demands of the gymnastics practice.



- a) Side chasse - down and back x 2
- b) Sideways knee ups - down and back x 2
- c) High skips down, deer runs back
- d) 4-way punches (two-foot hops, arms over ears) - jumping forwards, jumping facing L, jumping backwards, jumping facing R

Other ideas include: butt-kickers, high knee runs, run forward 4-5 steps, stop quick and backpedal 2-3 steps and repeat trying to stop with alternating lead leg. Repeat movement pattern for the full length of the floor.

#### D. Advanced gymnastics specific dynamic stretching

This is a series of multi-plane dynamic stretches through full ranges of motion designed to mimic what the athlete will experience during practice. As a coach, your job is to teach athletes to focus on technique control of each movement so the same patterns will show up in harder skill/routine work. Work from easier single planes to more complex or multi-plane movements.

- a) Front kick series (step, step kick)
- b) Right side kick series (moving laterally, step, step kick right)
- c) Left side kick series (moving laterally, step, step kick left)
- d) Back kick series (step, step back kick and focusing on engaging the glutes during the back kick)
- e) Dive/forward roll into true hip flexor stretch, back into hamstring stretch (every roll switch lead leg) and complete two floor lengths
  - i. Refer to <https://youtu.be/1hat3RdJjpU> for information on hip flexor anatomy and to help you understand why you should be changing HOW athletes properly stretch hip flexors.
  - ii. Refer to <https://youtu.be/x7Ezq9UFaYk> for the "True Hip Flexor" stretch.
- f) Dive roll into true quad (true hip flexor, grab back knee), back into hamstring stretch
- g) Roll into straddle, pull body up onto elbows, into ½ groin right, ½ groin left
  - i. Refer to <https://youtu.be/Reklzs7mmt8> for a how to on groin stretching.
- h) Roll into modified triangle-internal/external rotation
- i) Roll into true single arm lat stretch L and R (gather elbow into internal rotation)
  - i. Refer to <https://youtu.be/SPFc2bCsQtQ> for proper stretch techniques for lats/teres minor. Note that in the dynamic warm-up, the athletes stretch their lats one arm at a time using one hand to "gather" the elbow of the "stretching lat" inward instead of using a bar to establish ideal position.
- j) Roll into up-dog and roll into thread the needle shoulder stretch, then prone chest stretch



k) Side kick into lateral lunge, repeat on opposite side

**E. Basic core activation: proper breathing pattern and breathing “Behind the Brace” core control**

- a) 5 reps basic breathing and core control feet on the ground
  - i. Athletes lying on back with knees bent and feet on the ground.
  - ii. Inhale with wave like action allowing air to come into stomach, then into the chest.
  - iii. Exhale for the same or longer duration as the inhale. Athletes should feel the rib-cage draw-down and the belly button draw in towards the spine (without letting the shoulders roll forward) as they exhale.
  
- b) 5 reps basic breathing and core control with feet off the ground
  - i. Athletes lying on back with knees bent at 90, feet off the ground.
  - ii. Inhale with wave like action allowing air to come into stomach, then into the chest.
  - iii. Exhale for the same or longer duration as the inhale. Athletes should feel the rib-cage pull-down and the belly button draw in towards the spine (without letting the shoulders roll forward) as they exhale.
  
- c) 5 reps basic breathing “behind the brace” hands overhead
  - i. Athletes lying on back, legs extended and tight together as in typical gymnastics position.
  - ii. Cue the athletes to imagine a grape underneath their back. The goal is to gently press their backs into the grape without squishing it, but still maintaining that pressure.
  - iii. Inhale with wave like action allowing air to come into stomach, then into the chest.
  - iv. Exhale, feeling the rib-cage pull-down and the belly button draw in towards the spine. Cue the athletes to maintain the “brace” of the rib cage drawn down.
  - v. Cue the athletes to “breathe behind the brace” 5 times without losing the gentle pressure on the grape or the ribs down position.

**F. Gymnastics specific core control – activation/shaping**

The next step is to apply the core activation techniques listed above to basics gymnastics movements. Understanding body tension, proper form and body mechanics, the athletes create hollowed, and arched positions without overly relying on low back hyper-extension. It's important to reinforce these shapes during each practice.

- a) 10 sec hollow control.



- b) Roll over to stomach shape control (draw belly button up off floor, shoulder blades down and back).
- c) 10 sec arch control (squeeze glutes and hams to lift legs, squeeze upper back (t-spine) to lift upper back and reach arms up over head as far as possible (shoulder flexibility and control) as opposed to extending primarily through the lumbar spine. The chin should remain tucked in.

## G. Jumping and landing mechanics

It is no secret that gymnasts are susceptible to lower body injuries. A properly performed squat and ideal landing positions are essential to injury prevention, yet many gymnasts lack these basic skills. Gymnasts should practice jumping and landing mechanics daily within their warm-up; it only takes 1-2 minutes! Teaching and applying double leg and single leg mechanics in practice can greatly reduce injury and enhance sticking performance. As a part of the warm-up it is suggested that coaches include the following movement patterns. Coaches should cue their athletes to hinge their hips back while keeping the knees and ankles aligned straight and without collapsing inward.

For more information on how to break down the basic principles of squatting/landing mechanics (please ensure athletes are comfortable with these principles before integrating the following exercises into the warm-up), please check out the following links:

- a) <https://youtu.be/A3Lyz7T-USY> Jumping and Landing - 1 (Teaching a proper squat)
- b) <https://youtu.be/e4sC7-dzGU0> Jumping and Landing – Lesson 2 (How to jump applying proper squat form)
- c) [https://youtu.be/WgVbmC-l\\_9o](https://youtu.be/WgVbmC-l_9o) Jumping and Landing - Lesson 3 (Jumping and landing with strong glutes)

Initially, the Jumping and Landing Mechanics portion in the warm-up may consist of a 2-3 min review of the proper squat form using hands on correction, then progressively applying skills in 10 double leg landings. Once the athletes have mastered the basics, they can run through a more comprehensive exercise routine as suggested below. For all following exercises, the should hips hinge back with the knees aligned straight and without collapsing.

- a) 5 double leg squats
- b) 5 toe ball heel landings
- c) 5 jump and lands
- d) 5 single leg squats (only if athletes have mastered the double leg squats)
- e) 5 single leg squat and land



## H. Line splits for alignment and bridge work

Though current strength and conditioning research does not place much value on passive flexibility as traditional gymnastics training, passive flexibility for positional awareness, technique and, most importantly, as a re-occurring measure to see if mobility is improving is worthwhile. Consider including 20 sec holds of each middle, left and right splits focusing on alignment. Do the same for bridges making appropriate modifications/corrections for those athletes who have been identified as hinging primarily from their lumbar spine as opposed to focusing on mobilizing their T-spine. Ensure the athlete is getting the arms overhead as far as possible. In cases of injury or extreme limitation, you may choose to work on mobility of the T-spine and lats/teres as opposed to doing extra bridge work.

It is arguable whether passive flexibility should be the main strategy to increase split, bridge, or handstand patterns. Check out the following blogs that will challenge the traditional emphasis placed on passive stretching:

- a) <http://shiftmovementscience.com/gymnastics-please-stop-doing-these-stretches-part-1/>
- b) <http://shiftmovementscience.com/gymnastics-please-stop-these-stretches-part-2/>
- c) <http://shiftmovementscience.com/bridges-and-back-pain-my-5-most-common-issues-and-how-to-address-it/>

## I. Fundamental gymnastics skills/line drills - press handstands, handstand holds and back tucks

These are essential gymnastics fundamental movements that have to be practiced multiple times per week. Placing these exercises at the end of the warm-up accomplishes two things:

- a) you know they are going to be completed;
- b) following the passive flexibility work, the nervous system is re-activated and prepared for the dynamic demands of the practice immediately to follow.

**In summary, every warmup's goals should be the following.**

- a) Increase body temperature;
- b) Activate the nervous and muscular systems for the training load;
- c) Prepare the available range of motion that will be used during training;
- d) Move within all planes of movement, including rotational and expanded ranges needed for gymnastics;



- e) Practice critical movement basics and gymnastics technique such as core control, landing mechanics, hollow/arch shapes, handstands and more.



# APPENDIX 2

## Assessment

- 2-part assessment explanation
  - Gymnastics specific ROM screen
  - Performance based gymnastics functional tool
- Assessment recording sheet



## **2 PART RECOMMENDED ASSESSMENT**

There are two main parts to the recommended assessment. The goal is that the assessment is performed at least once every year in June following a two-week recovery from the previous season. Coaches are encouraged to perform the full or parts of the assessment regularly as a means to monitor athletes' progress.

Not included in the assessment sheet, it is also recommended to perform monthly growth tracking. Growth tracking includes an athlete's height, sitting height, wing span and weight. The benefit of growth tracking is that coaches can be aware of rapid periods of growth which can be associated with greater injury risk or temporarily decreased performance. If an athlete is experiencing a rapid growth spurt, you may need to consider a reduction in volume or modification of some practice elements as they may cause the athlete trouble. The strength and conditioning program included in this manual is safe to follow even during rapid growth spurts as long as the athlete is pain free.

Refer to the assessment recording sheet at the end of APPENDIX 2 for perspective on the information that follows.

### **Part 1: Gymnastics specific ROM screen**

Many of the tests in this section were taken from Dave Tilley's "Keys to Reducing Lower Back Injuries in Gymnastics-Maximizing Hip and Shoulder Mobility while developing Optimal Core Performance." The following aims at taking Tilley's tests and creating a gymnastics specific version of the functional movement screen. The tests essentially focus on identifying and screening for:

- a) limitations that may prevent the gymnast from being able to establish proper low back extension patterning or handstand quality (limited thoracic extension, limited overhead shoulder range in four possible hand positions/grips, limited wrist extension);
- b) limitations that would prevent ideal splits (limited hamstring, hip flexor, adductor/groin range);
- c) incorrect patterns in lower body movement. Proper squats and single leg squats are crucial for "sticking" landings;
- d) improper movement patterns into back extension;
- e) handstand quality.

Testing protocol explanations and "How To" included on the assessment recording sheet  
The goal is to produce YouTube videos that will be made available on the Gymnastics BC website as a reference for coaches as a "How to" perform each screen test on the assessment sheet.

### Interpretation of the gymnastics specific movement screen

The first part of the screen "Back pain markers" functions as a "red flag" for coaches. If the athlete scores "Y" (yes) on one or more tests, further investigation by a physiotherapist or



medical professional is advised.

#### Range of motion tests

The athletes are given either a pass or a NI (Needs Improvement). Athletes who score NI should be given the appropriate self-mobility/stretch complexes" (see Appendix 3) relative to that area of limitation.

#### The lower body movement pattern screen

This screen has the athlete performing 3 basic movement patterns; squat, lunge and single leg squat. This helps the coach identify common break downs in form. If any inadequacies are identified, the athlete should be given the appropriate form corrections and progressions in the squatting and landing portion of the warm-up. Coaches should watch for the same form breakdowns in the lower body movement patterns performed during the strength and conditioning workouts.

#### The back-extension movement patterns and handstand quality screen

This gives coaches each athlete's ideal and non-ideal patterns that can occur during back extension and handstand movements. The coaches will have a written record of each gymnast's tendencies. It will be up to the coaches to then create an appropriate intervention plan to steer the athlete towards success. The ROM screen can assist the coaches in creating a self-mobility/stretch plan should thoracic, shoulder or wrist mobility be a limiting factor. However, coaching and cueing proper movement patterns and creating appropriate progressions for a hopefully better range will be up to each individual coach. Within the Strength and Conditioning program there are some exercises designed to assist with that. Nevertheless, some athletes will need more concentrated work. There is more information on interpreting the ROM part of the assessment in Appendix 3.

## **Part 2: Performance Based Gymnastics Functional Tool**

The second part of the assessment is based on the Gymnastics Functional Measurement Tool which was designed to be a reliable and valid method of measuring and monitoring a gymnast's total physical fitness level and is needed to assist female gymnasts in achieving healthy and injury-free participation in the sport. The Gymnastics Functional Measurement Tool (GFMT) was previously designed as a field-test to assess physical fitness in female competitive gymnasts. The test we are suggesting is the same as recommended in the original GFMT, but with two modifications as follows.

- a) Instead of the over grip pull-up test, a horizontal pull-up test has been included. Though the over grip pull-up may be more gymnastics specific, the thought was that a horizontal pull-up test would encourage coaches to train the horizontal pulling motion with their athletes. If athletes are incredibly weak in this area, it would serve as a reminder to include this in their training. Having balanced strength in both the horizontal plane is important for injury prevention and athletic success. We know gymnasts train their vertical pull, but not always the horizontal pulling motion. If athletes are successful in the horizontal pull, they are probably also quite successful in the vertical pull.
- b) The split testing protocol for the left, right and middle split has also been modified. New research indicates that for a certain percentage of athletes, pushing for over-splits has



a strong potential to cause long-term and possibly irreparable damage due to their natural hip anatomy. Without x-rays, it is impossible to determine which athletes fall in this category, but it is irresponsible to set over-splits as the golden standard for gymnasts to achieve. Similarly, the middle split protocol originally suggested a chest on the ground position. Again, due to hip anatomy in some athletes, this causes potentially damaging stress to the ligaments while an elbow and core supported version would protect those susceptible athletes. While changing the tests means that some athletes may not demonstrate the full extent of their flexibility, the consensus is that the safety of all athletes should be prioritized. Furthermore, a good percentage of the athletes who can achieve over-splits passively can't display those impressive ranges actively so there is a question in the value of the time spent training for passive over active splits.

Please the link below for an explanation of all the tests included in the GFMT. Further, you can access a study from the International Journal of Sports Physical Therapy whose goal was to establish the test-retest reliability, construct validity of the GFMT and to establish a scoring system for individual test items (which we propose a variation of).

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3325636/>

Explanation of testing protocols included on the assessment recording sheet

We are aiming to produce YouTube videos that will be available on the Gymnastics BC website as a reference for coaches.

Interpreting the assessment

Please refer to the assessment sheet including the Performance Based Gymnastics Functional Tool.

Interpreting the performance based gymnastics functional tool part of the assessment

Interpreting the Performance Based Gymnastics Functional Tool is relatively easy but unfortunately imperfect. The closer to 10 the gymnasts scores on each individual test, the closer to excellent or ideal they are. A perfect total score on all tests is 100. Theoretically, the better physically prepared the athlete is and the higher their competitive level is, the closer they should be to a perfect score of 100. The American research study referred to above (upon which this testing is based) found that "the relationship between total GFMT scores and subjects' current USAG competitive level was found to be good." The main limitation is that this study and scoring system was designed for female athletes. If MAG coaches were to share their scores and feedback on the test, perhaps we could create a separate scoring system for male athletes in the future.



**ASSESSMENT RECORDING SHEET**



# APPENDIX 3

Self-mobility/Stretch Complexes and  
Performance Complexes



## **INTRODUCTION TO SELF MOBILITY / STRETCH COMPLEXES AND PERFORMANCE COMPLEXES**

We are aiming to create YouTube videos demonstrating each self mobility/stretch complex and performance Complex to serve as an easy reference for coaches and athletes. Several different tools can be used for self-mobility including foam rollers, (indoor) softballs, lacrosse ball and even tennis balls. To start building your mobility “tool box”, refer to the assessment sheet and the “Gymnastics Specific ROM Screen”. This will help determining which complexes should be a part of your athletes’ regular program.

Assign 1-3 mobility/stretch complexes per day that your athletes can complete either before practice or in between turns/rotations on apparatus. Older and motivated athletes can also be given these as homework.

Performance complexes could either be performed at the beginning of practice or in between turns/rotations on apparatus.

## **SELF MOBILITY / STRETCH COMPLEXES**

Note: 5 deep breaths should equal at least 20 seconds, but ideally 30-40 seconds. Cue the athletes to work on their “wave” breath: expanding their tummy (diaphragm) first, then expanding their rib cage (out wide) before exhaling for as long as possible.

- a) Overhead shoulder mobility limited = roll lats, pecs, true lat/teres stretch x 5 deep breaths each, partner pec minor on foam x 5 deep breaths
- b) Thoracic spine limited = foam roller extension x 5 deep breaths in 3 different position, thoracic windmill x 10 each side
- c) Chest mobility limited = foam roller partner pec stretch x 5 deep breaths, lax ball roll chest
- d) Hip flexor ROM limited = foam roll/softball quad, Hip flexor and TFL, TRUE hip flexor and quad stretch x 5 deep breaths each
- e) Glute/piriformis ROM Limited = softball roll glutes and TFL, glute and piriformis stretch x 5 deep breaths each
- f) Hamstring/L/R split ROM limited = foam roll hamstring and adductors, single leg lowers off block 10x each
- g) Middle split ROM limited = foam roll groin(adductors), SL correct groin x 5 deep breaths each, core activated rocking pancake x 5 deep breaths each



- h) Wrist ROM limited = lacrosse ball forearm flexors/pronators, stick, self-joint traction and glide, wrist/finger flexor stretch x 5 deep breaths each
- i) Ankle ROM limited = roll/stick calves and tibialis anterior, anterior, ankle self-mobilization (10 mini-squats/leg with traction belt/non-stretchy tube around lower ankle) anterior, stretch calves and soleus x 5 deep breaths each

## **PERFORMANCE COMPLEXES**

- a) Overhead shoulder stability/strength = floor/wall/prone angels x 20 + T's and Y's off block x 10-12 each loaded at appropriate weight (3-12 lbs.) + tucked handstand scapular pushes x 10
- b) T-spine stability = thread the needle x 10 each, upper thoracic extension x 10
- c) Wrist strength = db/elastic wrist flexion and extension x 12 each, wrist/finger flexor stretch recovery, wrist/fist push-up x 10, 1st knuckle push-up x 10, lax ball forearm flexors/pronators recovery, bear crawls one floor length down and back
- d) Split flexibility complex (from SHIFT Gymnastics):
  - i. Pre-test right, left and straddle split on a line
  - ii. Light soft tissue work on hamstrings, adductors, quads, and hip flexors x 3 minutes
  - iii. Core activated proper 1/2 kneeling hip stretch with deep breathing 10 seconds each side
  - iv. Frog rocks with core/glute activation and deep breathing x 10 seconds
  - v. Leg lowers x 10 reps each side off the edge of a block
  - vi. Single leg hip lifts x 10 each side
  - vii. Prone reptile slides x 10 each side
  - viii. Core assisted leg raises with feet elevated on a block
  - ix. Band assisted 1/2 kneeling front and side kicks kneeling beside a beam
  - x. Wall or stall bar needle progression x 10 each side
  - xi. Re-test right, left, straddle split on line
  - xii. Repeat steps 1-11 for one more cycle
  - xiii. Perform 10 minutes of tumble track jumps, jumping/leaping drills and technique work or go through pyramid progression set up to use new found range of motion.
- e) Ankle Strengthening Complex:
  - i. 30m walk in high relevé
  - ii. 30m walk on heels
  - iii. Stick calves
  - iv. Single leg squat with ankle traction x 12-15 each leg
  - v. Ankle external rotation with band resistance (choose seated or standing version) x 12-15



- vi. Ankle Internal rotation with band resistance (choose seated or standing version) x 12-15
- vii. Beanbag or ball pick-up with toes x 12
- viii. Single or Double leg calf-raise x 12-15, stretch calf and soleus

## **DIFFERENCES BETWEEN SELF MOBILITY / STRETCH COMPLEXES AND PERFORMANCE COMPLEXES**

You'll notice that some exercises part of the self mobility/stretch complexes and the performance complexes seem redundant and you may wonder why they weren't combined. The reason is that some athletes may have the passive range of motion available to perform skills, but they lack the strength or control to access that range of motion actively. These athletes would likely pass most of their Range of Motion screens during their assessment, but you may still find that those ranges don't show up in their skills. The natural conclusion is that they lack the strength or stability to capitalize on their natural flexibility. Athletes whom have passed their Range of Motion tests but still show limitations in position or stability during active skill work should prioritize the performance complexes.

For the athletes lacking range of motion, the priority must be placed on the self mobility/stretch complexes until you notice some improvement. This is especially true if you are following the periodized monthly strength and conditioning programs which have some overlap with some exercises found in the performance complexes. If you have time to do both, fantastic, but the assumption is that time is at a premium for coaches. If you are unsure if you are seeing improvements, consider re-testing the athletes in the areas you are curious about using the assessment sheet and the June assessment results for reference. If you have permission, you could take pictures to document progress. You will notice on the Excel spreadsheets that in June, July and August, only the self-mobility/stretch complexes are included on the workout/tracking sheets. This does not mean you can't/shouldn't include any performance complexes during these months. It is presented that way to serve as a reminder that mobility issues should always be prioritized for your athletes.

Sometimes the assessment will identify a weak link in the athletes' ROM. This allows you to personalize and streamline their mobility work. For example, an athlete's overall left lead leg split is lacking both passively and in skills, but both hamstrings pass the ROM test and their right hip flexor shows limitations. Therefore, it makes sense to spend extra time on hip flexor mobility work (especially the R side) in addition to just performing the split performance complex. Creating self mobility/stretch complexes separate from the performance complexes allows for extra personalization. In the Energy Systems/Work Capacity protocols, the recovery time periods in between work intervals. This is often the perfect time to have athletes perform the



self mobility/stretch complexes which is another advantage of separating them from the slightly more taxing performance complexes.

Please review the following table to see how you, as a coach, should choose the appropriate self-mobility/stretch complexes and performance complexes based on each athlete's assessment results and their tendencies or current status.



\*Note: NI (Needs Improvement) as indicated on Assessment

<b>Limitation as identified on assessment sheet</b>	<b>Self mobility / stretch complex</b>	<b>Performance complex</b>	<b>Both</b>
NI on thoracic mobility	T-spine limited	T-spine stability	YES
NI shoulder mobility any hand position	Overhead shoulder limited	Overhead shoulder strength/stability	YES (but prioritize self mobility / stretch)
Athlete lacks control in OH movements but passed shoulder mobility tests	NO	Overhead shoulder strength/stability	NO
NI chest mobility	Chest mobility limited	Overhead shoulder strength/stability	YES (but prioritize self mobility / stretch)
NI Thomas stretch	Hip flexor ROM limited	Split flexibility performance complex	YES
NI hamstring passive, active and core assisted	Hamstring L/R split ROM limited	Split performance complex	YES
Good hamstring passive and core assisted but poor active	NO	Split performance complex and core control work	NO
NI ankle ROM	Ankle ROM complex	Ankle strengthening Day 1 Day 2	YES, prioritize ROM
Ankles collapse during landings/lower body movement patterns or recovering from injury	NO	Ankle strengthening Day 1 Day 2	NO
NI wrist ROM in assessment or in Handstand quality	Wrist ROM complex	Wrist strength	YES, but prioritize ROM
Lacks wrist stability or recovery from an injury	NO	Wrist strength	NO



# APPENDIX 4

Energy Systems /  
Work Capacity Training



## **ENERGY SYSTEMS/WORK CAPACITY TRAINING**

Just like strength training, Energy Systems/Work Capacity Training needs to be periodized based on your annual training plan. Contrary to what is typically suggested, the 3 energy systems - ATP/PC, anaerobic and aerobic - do NOT function as timed switches that sequentially turn on and off as the duration of the exercise increases. It is typically taught that the ATP/PC system kicks in at 0-30 sec, anaerobic at 30-120 sec and aerobic for efforts greater than 120 sec. In reality, all three systems are “turned on” at the beginning of exercise.

Essentially, the proportionate contribution of each system will vary with the intensity and duration of the effort (Vern Gambetta, Athletic Development-The Art and Science of Functional Sports Conditioning, 2007). Thus, the term “Work Capacity” may be more appropriate. Whatever you decide to call it, your job as a coach will be to develop the athletes’ ability to tolerate the following intensities and durations throughout the season:

- a) moderate intensity for a long duration (typically known as aerobic Base);
- b) non-technical, high intensity efforts for a short duration;
- c) super high intensity efforts of an increasingly gymnastics skill/routine based nature.

<b>Phase of the Competitive Season</b>	<b>Calendar Months (WAG, MAG BC)</b>	<b>Energy Systems/Work Capacity Focus</b>
Off-season	July, Aug	Moderate intensity for long duration (typically referred to as Aerobic Base)
Pre-season	Sept, Oct	Minimally to moderately technical high intensity efforts of a short duration (typically referred to as Anaerobic Base)
Pre/early season	Nov, Dec	Super high intensity efforts of an increasingly gymnastics skill/routine based nature
In-season	Jan to May	Routines

Please see below for a breakdown of each phase noted above as well as specific suggestions on how to structure your work capacity workouts.

### **July and August (off-season) – focus on aerobic base**

Goal:



- Increasing non-gymnastics specific cardio capacity. This is important because it helps athletes recover in between apparatus rotations and routines as well as after practices.

Parameters/Guidelines

- a) Usually longer in duration, at least 12-20 min.
- b) Moderate intensity: 6-7 on a scale of 1 to 10.
- c) 2-3x's/wk., usually performed post practice.
- d) If choosing in the gym options, aim to hit all different movements throughout the week.
- e) Can vary based on equipment, gymnast level/maturity and time available.
- f) Consider using a heart rate monitoring to manage intensity level.
- g) Create a Day 1 and Day 2 aerobic base session, repeat it for at least 4 wks. and stick with the same basic "aerobic workout" for 4 weeks before changing it.
- h) Make sure to record data in your athlete's strength and conditioning binder (see Appendix 5), so that both coaches and athletes can monitor improvements.

**Suggestion 1**

- Athletes do an easy jog 3 corners of floor mat then perform very easy "tumbling pass" or leap series of coach's choice relative to athlete's skill x 5
- 30 tucks jump on thick crash mat
- 20 med ball slams
- Athletes should feel as if they are working at a level 6-7 on a scale of 1 to 10
- Repeat for 10-12 min

**Suggestion 2**

- Partner athletes into pairs
- Coach creates 5 stations: Each station has an associated moderate intensity cardio pattern and exercise (making sure to balance out muscle groups used in each exercise)

	Cardio Pattern	Exercise
1	Jogging around floor	Squat pattern
2	Skater hops	Monkey pull-ups on beam/horizontal rows
3	Skipping	Inchworms across floor
4	Deer hops/skips	Single leg deadlift pattern
5	Crash mat jogs	Core hold (supine) watching for rib flare and loaded overhead reach

- One partner performs the cardio pattern for 40sec while the other performs the exercise. Athletes stay at their station until each has performed 2 sets of both the cardio pattern and the exercise at each station. Coach cues every 40 secs to indicate the switch.



- Once athletes have completed their stations, the coach cues the rotate change and the athlete pairs have 20 secs to move to the next station.
- The goal is to complete all 5 stations which should take approximately 20 min.
- Athletes should feel as if they are working at a level 6-7 on a scale of 1 to 10.

### Suggestion 3

- Can be done in groups or independently.
- 12-20 min bike/other cardio machine or jog at continuous pace OR 15 sec walk/15 sec easy jog/15sec run x6 (if on a bike 15 sec easy/15 sec moderate/15 sec hard).
- Overall, athletes should feel as if they are working at a level 6-7 on a scale of 1 to 10.
- As a guideline for intensity, the athletes should be able to carry on a conversation while they work, but with an audible catch in their breath.

### Suggestion 4

- Coach chooses 5 moderately intense movements when performed for 5-10 reps and 5 light intensity easy cardio patterns.
- After a 2-3 warm-up of jogging around the floor the coach starts a timer and calls out one of the moderately intense movements which the athletes perform 5-10 reps of. For whatever time remains in one minute the athletes perform one of the light intensity easy cardio patterns.
- At the top of the next minute, the coach calls out the next moderately intense movement and the reps required (5-10). Athletes finish out the time to complete the next minute with the next easy cardio pattern.
- Not including the warm-up, once the athlete has completed all 5 stations, they will have done 5 minutes of cardio. Repeat the entire "circuit" another 3-4 times.
- Even though the athletes are engaging in the moderately intense movement at the top of every minute, their perceived intensity should be 6-7 on a scale of 1 to 10.

Please modify the example below to suit athletes' levels.

	<b>Moderately Intense Movement</b>	<b>Easy Cardio Pattern</b>
1	Floor cast to handstands	Karaoke
2	Burpees	Jogging
3	Leap frog over beam of moderate height	Side shuffle around floor
4	Repeat two-foot vertical jumps	Back pedal around floor
5	V-snaps	Butt-kickers around floor

## September and October pre-season – focus on anaerobic base

Goal:

- Anaerobic Base = gives the athletes the capacity to work at a high intensity for a short period of time. In this phase, the focus is on building non-gymnastics specific high intensity work capacity.

Parameters/Guidelines:



- a) Must include intervals of high to very high intensity and recovery periods.
- b) High intensity intervals (9-10 on a scale of 1 to 10) should be 30 secs – max 1 min 30 in length with a work: rest ratio of somewhere between 1:1 and up to 1:3.
- c) 2-3x's/wk. performed post training.
- d) Try to include at least 1 very general anaerobic workout/wk. with little technical thought needed (see Suggestion 1 or 3 below) for September, so the athletes can just focus on achieving the intensity required instead of having to worry about proper form in exercises.
- e) If choosing in the gym options, aim to hit all different movements through-out the week.
- f) Can vary based on equipment, gymnast level/maturity and time available.
- g) Consider using a heart rate monitor to manage intensity level.
- h) Create a Day 1 and Day 2 base session and repeat for 4 wks. Stick with the same basic formula for at least 4 weeks before changing with only minor modifications to increase difficulty. Make sure to record details in each athlete's individual Strength and Conditioning Log.

<b>Suggestion 1</b>		Time	Resistance	Intensity on a scale of 1 - 10	RPM
11- 14 min Bike Sprints					
During work intervals, keep resistance such that athlete can keep RPM's between 90 and 100.  WK 1 - 3: 3 Work intervals WK 4 - 8: 4 Work intervals	Warm-up	2min	Light	5-6	70-80
	Work interval 1	1min	Moderate-hard	9	90-100
	Recovery	1min	Light	5-6	70-80
	Work interval 2	1min30	Moderate-hard	9-10	90-100
	Recovery	1min30	Light	5-6	70-80
	Work interval 3	1min	Moderate-hard	9-10	90-100
	Recovery	1min	Light	5-6	70-80
	Work interval 4 (wks. 4-8 only)	1min30	Moderate-hard	9-10	90-100
	Recovery/Cool-down	3 min	Light	4-6	65-80



**Suggestion 2**

Work to rest ratio 1:2

1 min 30 work with 3 min recovery

- 2-3 min easy warm-up
- WORK EFFORT = 30 sec of med ball slams + 30 sec of floor jump cast handstands + 30 sec all out block pushes (9-10 on a scale of 1 to 10)
- RECOVERY = self mobility/foam rolling/active release, or basic core activation/breathing practice 3 min
- Perform 3-4 sets
- Can be done in groups or individually

**Suggestion 3**

Work to rest ratio 1:2

Shuttle run on floor mat

\* Jog warm-up for 2-3 min around the outside of the floor.

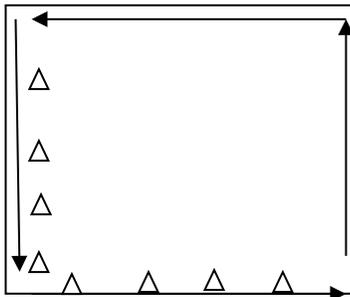
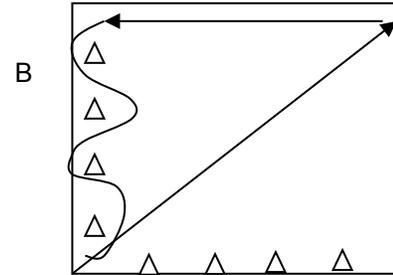
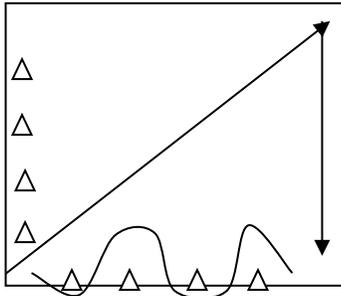
\* Have athletes run/sprint at an intensity they can maintain for 45 secs in the pattern shown in diagrams A and B (i.e. Sprint corner to corner, down one side of the floor, then shuttle around 4-5 cones. Repeat again in alternate direction).

\* Intensity during the 45 secs should be a 9-10 on a scale of 1 to 10.

\* Walk/jog for recovery, easy around the outside of the floor mat for 90 secs (diagram C).

\* Repeat entire sequence 3 x's.

\* At week 3, increase sprint/shuttle interval to 60 sec.



C

Jog recovery around outside of floor. Have athletes change direction after each lap.



\* At week 5, increase sprint/shuttle interval to 75 sec.

#### Suggestion 4

Works out to approximately 1:2 work to rest ratio

- 2-3 min easy warm-up.
- Athletes divided into 4 groups of approximately 4-5 athletes. Athletes start at one of the following four stations (3 work stations and 1 recovery station): monkey pull-ups on beam, there and back jumps over low beam, weighted block push, standing kettle bell holds for the recovery station.
- WORK EFFORT = 10 reps monkey pull-ups on beam + double leg jumps there and back over floor beam x 20-30 times + weighted block push down and back as fast as possible (9-10 on a scale of 1 to 10)
- RECOVERY = holding two kettle bells at side with good posture (the goal to increase grip strength and to teach athletes to hold good posture while using breathing skills to speed recovery in between intense bouts of exercise)
- Perform 3-4 sets.

### November and December pre/early season – focus on maximal work capacity and specialization

Goals:

- To increase the intensity that the athlete can tolerate in short bursts.
- To increase the gymnastics specific technical demand that the athlete can maintain at these high levels of intensity.

Parameters:

- a) Must include intervals of maximal intensity followed by recovery periods.
- b) Intervals of maximal intensity are of an increasingly gymnastics skill/routine based nature by the end of this phase. The first month can still include 1 day of focus being non-technical maximal effort. By the second month, both maximal intensity and gymnastics specificity must be used.
- c) All-out intensity intervals (10 on a scale of 1 to 10) should be min 10 secs to max 1 min 20 in length with a work to rest ratio of ideally 1:3, but at least 1:2.
- d) 3-5x's/wk., total.
- e) 1-2x's/wk. performed post training in the strength and conditioning context and 2-4x's/wk. performed within the context of ½ routines sets/skill repeats. In the event that the Work Capacity workouts need to happen within regular apparatus time (vs post-training), make sure that the subsequent event rotations are of lower intensity and lower volume. Do choreography work on floor or beam for example.



- f) Hit all relevant movements of appropriate gymnastics level-tumbling, cast handstands, jump/dance, parallel bar or pommel horse swings etc.
- g) Consider using a heart rate monitor to manage the intensity level.
- h) Stick with the same basic formula for at least 4 weeks before changing protocols.
- i) In the examples below, consider Suggestion 1 and 2 for November only as they are minimally sport specific.

<b>Suggestion 1</b>  Bike Sprints (November only)  WK 1-2: 3 Work intervals  WK 3-4: 4 Work intervals  ***Always only 1 long interval; increase the number of short intervals only.		Time	Resistance	Intensity On a scale of 1 to 10	RPM
	Warm-up	2min	Light	5-6	70-80
	A1. Sprint Repeats	1min (10 sec on 10 off for 1min)	moderate-hard	10	100-140
	A2. Recovery	3 min between each 1 min set of sprints	Light	5-6	70-80
	Repeat A1 and A2 another 2-3 times				
	B1. Long Interval	1min 30	Moderate-hard	9-10	90-100
	Recovery / Cool down	3-5min	Light	5-6	70-80



**Suggestion 2**

Repeat Shuttle Sprints (November only)

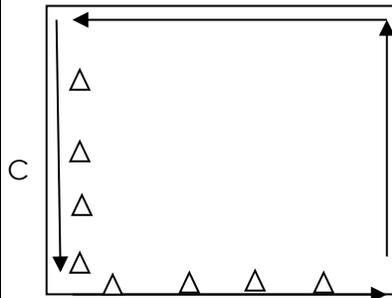
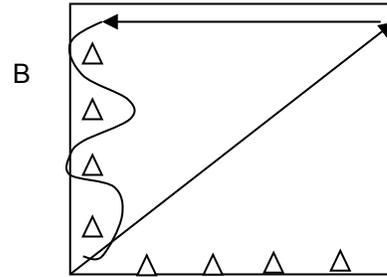
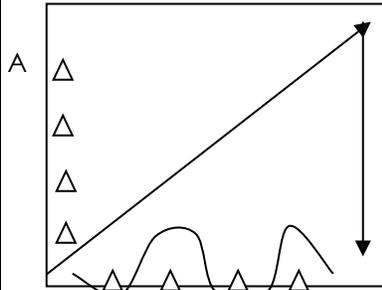
2 x 6 sprints

\* 6 sprints (3 each side with jog in between each)

\* Dynamic stretch for 3min

\* Repeat entire sequence

\* Work effort approximately 9-10 on a scale of 1 to 10



- Have the athletes sprint as hard as they can in the pattern indicated in diagrams A. i.e. sprint corner to corner, down one side of the floor, then shuttle around 4-5 cones.
- Jog once easy around the gym floor (diagram C).
- Repeat the sprint again in same formation, but in the opposite direction (diagram B).
- Jog easy recovery in the alternate direction from the first recovery jog (diagram C but go opposite direction to arrows).
- Repeat sequence until the athletes have performed 6 sprints in total. i.e. 3 in each direction.
- Dynamic stretch 2-3 min recovery and repeat entire series once above

**Suggestion 3**

Gymnastic Floor Specific: November and/or December post workout

- 2-3 min easy warm-up
- One tumbling pass onto stacked mats run back and repeat
- ½ length of the floor handstand walks + second half of the floor repeat long jumps
- RECOVERY: 1-2min30 self mobility/rolling (coaches can decrease the recovery time progressively each week)
- Repeat above sequence 4 times
- RECOVERY: 1 min self mobility/rolling
- 1 min all out jump cast hanstands on the floor
- RECOVERY: 1 min self mobility/rolling
- 1 min all out sprints back and forth across gym floor

**Suggestion 4**

Gymnastic Floor Specific: November and/or December post workout

- 2-3 min easy warm-up if needed
- One tumbling pass onto stacked mats run back and repeat
- ½ length of the floor back walk overs focusing on global extension – thoracic extension and arms fully overhead, hip shift + only then lumbar extension + ½ length of the floor tuck jump rebound long jump
- RECOVERY: 1-2min30sec (coaches can decrease the recovery time progressively each week)
- Repeat above sequence 4 times



- RECOVERY: 1 min
- 1 min all out jump cast handstands on the floor
- RECOVERY: 1 min  
1 min all out crash 10 mat tuck jumps + sprint back and forth across floor back to crash mat to repeat tuck jumps

### **Suggestion 5**

Gymnastic Bars, Pommel horse, Rings Specific: November and/or December

\*\*\*The same basic framework can be applied for uneven bars, p-bars, high bar, pommel horse and rings. To create new circuits based on this formula change one or all of the initial skill, event specific conditioning exercise, core/posture active recovery exercise and/or all out short burst exercise.

- 3-5 Kip cast handstands (initial skill)
  - Regress to kips or lower bar with spot if needed
  - Progress to spotted kip handstand pirouettes, or inbars for more advanced athletes
- Follow immediately with 5-10 leg raises (toes to bars) with pause at L (event specific conditioning exercise)
  - Regress to bent knees or ½ leg raise
  - Progress to chin-up pull-overs or pause at V
- Follow with a bear crawl forwards one length of mat and a bear crawl reverse one length of mat (Core/posture active recovery exercise)
- Then, one all out sprint down and back (all out short burst exercise)
- RECOVERY: 1-3min (coaches can decrease the recovery time progressively each week by 15-30 seconds), give athletes individualized self mobility work to do during longer rest intervals
- Repeat above sequence 4 times

### **Suggestion 6**

Gymnastic Vault Specific: November and/or December

The goal is to develop repeatable top runway speed. All out sprint down vault runway, then easy jog/power walk back and repeating while maintaining peak speed of sprint.

- Partner up athletes giving one athlete a stop-watch. 2 pairs of athletes can perform this sequence at a time.
- One partner in the pair sprints down the run-way. Optional after the sprint: add a basic jump into the pit or, for more advance athletes, perform a very simple vault. The other partner times and records the sprint time. The sprint time is only recorded from the start of the sprint to initial beat-board contact.
- The sprinting partner walks/jogs back and performs 2-3 sprints in a row while the other partner records their time (use the Strength and Conditioning log).
- The second pair of athletes is doing the same thing, just starting slightly after the first pair so there are no collisions.
- Once the first partner performs all 2-3 sprints, partners switch roles.
- The 2 pairs that were working on the vault runway move to a mobility circuit performing self mobility work specific to their individual needs and another 2 pairs of athletes move into the vault runway station.
- Athletes continue their mobility work until it is their turn to return to the vault runway. They again repeat their sprints and optional jump/vault, aiming to maintain their top speed.



- Continue all the above until all athletes have been through the vault runway sprint two to four times.
- Repeat every week for at least 4 weeks looking for both improvements in top speed (reduced time) and ability to maintain that top speed in each sprint interval.



# APPENDIX 5

## Annual Periodization

- Explanation of each phase and workout content within the Excel spreadsheets
- How to taper for specific competitions



## **Overcoming skepticism about the value of (female) gymnasts' strength training**

If you are still on the fence as to whether or not you should prioritize strength training as a part of your female gymnasts' training plan, you MUST read the article "Should Female Gymnasts Lift Weights," included as Appendix 7 at the end of this document.

## **EXPLANATION OF EACH PHASE AND WORKOUT CONTENT WITHIN THE EXCEL SPREADSHEET**

### **Exercises that you will see on the sample workouts/training plans (Excel spreadsheets)**

Not all exercises within the sample training plans/workouts (Excel spreadsheets) will work for everyone, but try to follow the exercises as much as possible. The assumption of these templates is also that you are working with injury free athletes so, if that is not the case, make sure you check with your athletes' health practitioners to ensure the workouts suggested are appropriate. The templates also assume that coaches are familiar with and are able to competently and safely teach some basic strength movements and their variations as follows.

- a) BASIC CORE and POSTURE exercises teach the athletes how to properly brace their core and shoulder girdle in order to safely support the heavy loads and impacts demanded by their sport.
- b) AGILITY nervous system training is designed to teach the athletes how to react quickly and explosively as well as to prime their bodies to better tolerate a lifting session.
- c) SQUAT and LUNGES are knee dominant push movement important for landing mechanics, maximal jump height, lower body strength and back extensor strength.
- d) DEADLIFTS and HIP THRUSTS - ideally including kettle bell swings – are hip pushing and hip pulling strengtheners that teach the glutes and hamstrings to assist in extension patterns prominent in gymnastics as well as to balance out any dominant quad strength.
- e) HORIZONTAL PULL-UP and ROWS focus on the upper body horizontal pulling strength to balance horizontal pressing strength, vertical push strength and vertical pull strength.
- f) PUSH-UPS and DUMBBELL CHEST PRESS work on the horizontal pressing strength to balance horizontal pull strength, vertical push strength and vertical pull strength.
- g) VERTICAL SHOULDER PRESSES develop overhead strength and stability which has direct relevance to performing many gymnastics skill. Additionally, vertical pushing strength is needed to balance out vertical pulling strength, as well as horizontal pushing and pulling strengths.
- h) MEDICINE BALL WORK like throws and slams in all planes are designed to teach the athletes to transfer all the strength gained from the movements above into explosive movements which mimics movement patterns seen in gymnastics.

### **How the workouts are organized**



For each phase, there is a Day 1 and a Day 2 strength workout that will include some of the exercises from the categories listed above. The Day 1 and Day 2 plans have been designed to ensure that your athletes will develop balanced strength for all the pushing and pulling movements for both upper and lower body and in all planes of movements.

### Upper body

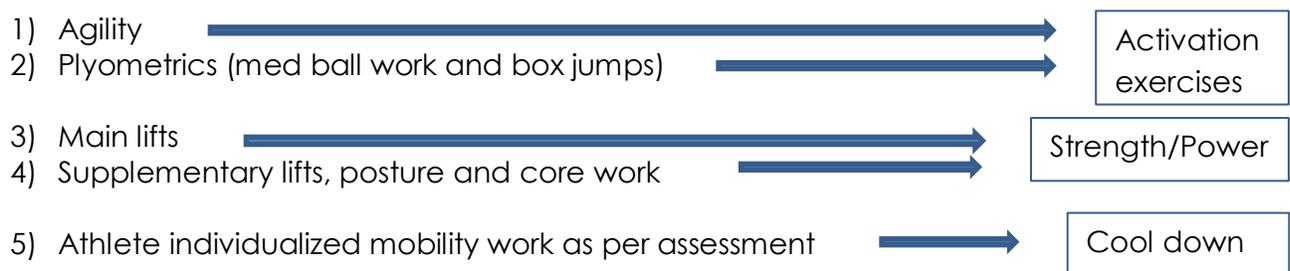
- a) As much horizontal pushing (push-up, chest press) as horizontal pulling (horizontal rows, single arm rows).
- b) As much vertical pushing (handstand push-up, shoulder press) as vertical pulling (chin up/pull up/rope).
- c) Unilateral work contributing to a right and left balance.

### Lower body

- a) As much hip dominant push (hip lift, swing) as hip dominant pull (deadlift).
- b) As much knee dominant push (squat, lunge) as knee dominant pull (hamstring curl, Nordic fall/pull).
- c) Unilateral work contributing to a right and left balance.

If you only choose to do a Day 1 or Day 2 rather than both, you could end up doing more harm than good. It would be preferable to cut the recommended sets in half and still do an abbreviated Day 1 and Day 2 strength workout. The ideal method where your athletes will see the greatest benefit is if you follow the Day 1 and Day 2 templates as they are laid out as closely as possible.

The workouts assume that the athletes are already warm and that they are done after the technical part of your practice. If that is not the case, please perform a proper warm-up prior to starting. A basic strength workout will likely follow the same approximate flow. Note that not all components below will be in the earlier phases, but all will be present during the later phases.



In general, the phases differ in terms of number of sets and reps recommended as well as tempo in the later phases where maximal strength and power development is the goal.

### **4 week/phase breakdown**

True periodization depends on systematically overloading your athletes while also allowing them recovery time to actually get stronger. Each phase or mesocycle has been broken down into four weeks.



### Week 1

The athletes are introduced to their exercises on their Day 1 and Day 2 workouts. GBC is aiming to release associated YouTube videos documenting all the exercises for each phase as well as teaching pointers. Use the Excel spreadsheets to help you understand each workout's breakdown. As a coach, your goal is to select and record weights that will really challenge your athletes within the assigned rep count while maintaining good and safe form. This weight should allow them to have one or two reps left in the tank. During the phases in which the athletes are lifting weights in the 5 rep range, it is advisable to do one or two warm-up sets using a smaller weight and a 3-6 rep range before beginning the heavier loading. Week 1 is considered light volume or intensity.

### Week 2

The Week 2 exercises are exactly the same as Week 1's, but the goal is to increase the weight that the athletes are lifting for the same number of reps; as long as it can be done safely. In some phases, the number of sets will also increase. If athletes are still struggling with form, do not increase the weight and focus on technique instead. If you have limited equipment and do not have the ability to increase the weights, then slow down the tempo to 2 - 3 counts eccentric and 1 count (or explode during power phases). Week 2 is considered medium volume or intensity.

### Week 3

The exercises are exactly the same as week 1 and 2, but again, the goal is to increase the weight that the athletes are lifting for the same number of reps; as long as it can be done safely. This may not happen all the time and that is ok. In some phases, the number of sets will also increase. If athletes are still struggling with form, do not increase the weight and focus on technique instead. If you have limited equipment and do not have the ability to increase the weights, then slow down the tempo to 3 counts eccentric and 1 count (or explode during power phases). If it appears that this is still not challenging the athletes enough with the weight you have available, add in pauses at different points in the lifts to add difficulty. For example, on a squat, take two counts to lower down, pause for one count at the bottom, then power up. Or, squat down ½ way pause for a count, squat to the bottom and pause for another count then explode up. Week 3 is considered high volume or intensity.

### Week 4

The exercises are exactly the same as week 1, 2 and 3, but the goal isn't to increase the weights. In many cases, total sets and reps drop for this week as well. The goal of Week 4 is to let the athletes recover and get stronger from the sequential overload you've been applying to their muscles. It is critical that you give your athletes this week to "de-load" because if you don't, athletes may end up overtired or even worse, injured. You should also aim to follow the same type of manipulation with the athletes' technical training in the gym to attain maximum benefit and recovery, and to give your athletes the ability to get stronger and more powerful. Week 4 is considered light volume or intensity.

### In summary

Week 1 – Light (and introduce new exercises)

Week 2 – Medium

Week 3 – Heavy

Week 4 – Light



## **What to do if you don't have weights heavy enough to challenge your athletes in 5 reps**

This was already partially explained above but bears repeating. By the time you reach month 4 in the periodization, the main lifts are ideally loaded so that the athletes only have one or two reps left in the tank by the time they reach 5 reps with good form of course. If you do not have weights heavy enough to challenge your athletes in the 5-8 rep range, consider investing in some. If that is not within your scope, then slowing down the tempo to 3 counts on the eccentric, followed by a pause at the bottom, then one count up on the concentric phase is the next best option to develop strength. You can also play around with the timing/location of that pause to challenge your athletes even further. If you are training athletes who have never been exposed to these lifts before and they are still struggling with form or perhaps you are new to teaching them, then keeping the reps within the 10 rep range with lighter but still challenging weight would be acceptable. You can consider this first year an investment in giving both you and your athletes the tools needed to create a really useful and strategic strength training program. It would not be a waste of time to spend a year perfecting the basic strength patterns of the squat, deadlift, row, lunge, thrusts and presses to give you the confidence to load your athletes heavy enough to really make an impact on their future performance. Make your first year's goal to consistently stick to a 2 day/wk. strength program and to develop great form in all the key strength movements. Again, if you still need to be swayed on the value of heavy strength training for gymnasts, please read the article "Should (Female) Gymnasts Lift Weights?". Even if it takes 1-2 years to get there, your ultimate goal with your athletes is to work towards building both the skill base and equipment base to have athletes lifting heavy within the 5 rep range.

## **How the workouts differ from phase to phase**

In order to help your athletes peak at the right time, each month has a different focus and set of exercises. The exercises are all variations and progressions of the same family as described earlier, but just differ in the sets/reps/tempo and whether they are unilateral/bilateral/rotational/kneeling/etc. While there are similarities between exercises in each phase, it is important that you follow the Excel spreadsheets to the best of your ability as the progressions are systematically designed to allow your athletes to peak for the competitive season.

Below is a breakdown of each month. Note that a calendar month has been attributed to each based on the WAG and MAG season, but the months could easily be shifted should the season breakdown change in future years or to apply this to TG. As you read each explanation, refer to the associated Excel spreadsheets that details each week's Day 1 and Day 2 workout for every month of the calendar year. Each tab within the Excel document gives you 8 workouts for the month (Week 1: Day 1, Day2, Week 2: Day 1, Day 2, Week 3: Day 1, Day 2, Week 4: Day 1 Day 2).

Month 1 – (June/Off Season) – Recovery



For the first two weeks of June, it is expected that athletes are in recovery mode from your last season. There is minimal direction on the Excel spreadsheets for strength and conditioning as it should be time off for your athletes. Feel free to use your strength and conditioning block for a half hour-hour of active release and stretching as well as some breathing review and very light postural exercises. Sometime in week 2-3, you should be assessing your athletes using the prescribed assessments (Appendix 2). During Week 4 there are some basic exercises suggested to get your athletes back into their strength and conditioning workouts.

#### Month 2 – (July/Off Season) – Anatomical Adaptation

This is the first month where you will see the same Day 1 and Day 2 workouts for the four weeks of the month. Athletes are introduced to agility in this phase as part of the “activation” before the strength exercises. The strength exercises in this phase focus on developing good basic movement patterns with good postural and core control. Have your athletes focus on performing the exercises while “breathing behind the brace” just as they do daily in their warmup breathing/core exercises. Each week the exercises are the same, but the athletes are challenged by performing more reps until the fourth week de-load. If you have time, don’t forget to practice reading each athlete’s individual assessment from June and give them their individualized mobility work to perform either at the end of the strength session or independently. Program your Energy Systems/Work Capacity training ideally 2-3 x’s wk. The focus should be aerobic base or moderate intensity (6 on a scale of 1 to 10) for long durations. Please refer to Appendix 5 for specific protocols.

#### Month 3 – (August/Off Season) – Max Strength Ramp

For this month, the workouts start with agility exercises. Note that the work duration is very short, lasting in the 5 sec range. The short work set is so that athletes go as fast as possible without saving themselves to last through the set. During the strength portion of the workouts, your athletes will follow a new protocol which is very effective at preparing your athletes to tolerate heavier loading in the coming months. Day 1 has the athletes perform 10 sets of a circuit of four different exercises and resting with active release/rolling after each round if needed. The athletes should complete 10 reps of each of the four exercises, then 9 reps, then 8 reps, then 7 reps, and so on until they are down to one rep of each exercise. If you do not have time to do the wholes drop set series, then complete as many sets as time allows. The workout finishes with 2 sets of some supplementary exercises and individualized active release. Day 2 is a more typical format of 2 circuits of main lifts - aiming to select weights that will challenge athletes for 8 reps - followed by posture/core and individualized mobility. Program your Energy Systems/Work Capacity training 2-3 x’s wk. The focus should be aerobic base or moderate intensity (6 on a scale of 1 to 10) for long durations. Please refer to Appendix 5 for specific protocols.

#### Month 4 – (September/Pre Season) – Max Strength

In addition to agility, gymnasts will start their strength training with plyometric training, in this case referring to med ball throws and box jumps (though it is not really a plyometric movement). Also in this phase, it is suggested that you take some time in the warm-up to teach kettle bell swings. Just for this exercise, the focus is not on weight, but rather proper technique. kettle bell swings teach athletes how to generate power through the posterior chain (glutes, hamstrings) utilizing the hip thrusting motion which you see in various gymnastics skills. If athletes don’t learn to harness their glute and hamstring strength, the movement’s



power is compromised and there is a risk of over reliance on the low back to get into these positions. The kettle bell swing will show up as an option in later phases, so this is your opportunity to take time to teach it to your athletes. If you don't have kettle bells, the kettle bell swing can also be performed with a single dumbbell instead. Below is a link from renowned and well respected strength coach Mike Boyle to give you some reference on how to teach the kettle bell swing:

<http://www.stack.com/video/2951702535001/elite-performance-with-mike-boyle-how-to-teach-the-kettlebell-swing>

Following the activation exercises (agility and plyometric exercises), the athletes have one circuit of two exercises must perform 3 sets of 5 reps. Choose weights heavy enough that athletes can perform 5 reps with good form leaving only one or two in the tank. Remember to give your athletes a couple of warm-up sets with lighter weight to work up to the true 5 rep weight. Next, athletes perform a small circuit of 2-4 exercises of supplementary lifts as well as some core/posture/injury prevention exercises. Finally, athletes complete the workout with their individualized mobility work. The combination of the Day 1 and Day 2 workouts have been designed to create balanced strength in all the pushing and pulling movements for both upper and lower body and in all planes without overtaxing your athletes in a single workout. Program in your Energy Systems/Work Capacity training 2 x's wk. The focus should be minimally to moderately technical high intensity efforts of a short duration. This is typically referred to as anaerobic Base. Please refer to Appendix 5 for specific protocol suggestions.

#### Month 5 – (October/Pre Season) – Max Strength 2

Month 5 is another combination of Day 1 and Day 2 max strength workouts organized just like month 4. Whereas the main lifts in month 4 were predominantly bi-lateral, the main lifts in this month progress to unilateral movements. In addition, the supplementary circuit exercises are progressed from month 4. Program in your Energy Systems/Work Capacity training 2 x's wk. The focus should be minimally to moderately technical high intensity efforts of a short duration. These are typically referred to as anaerobic base. Please refer to Appendix 5 for specific protocol suggestions.

#### Month 6 – (November Pre/Early Season) – Power

In month 6, the focus is to get athletes to transition their newly developed strength into explosive power. The activation exercises in this phase are a brief agility set (5 sec as fast as possible) followed by a 3 rep med ball throw or slam. Notice that the reps are low but the expected intensity is maximal. We want to teach athletes to recruit as much power as possible. Keep the reps in this low range unless you find your athletes are struggling to find the correct form in which case more repetitions with a lighter load just to create better movement patterns would be acceptable.

During the strength portion of the workouts, athletes will perform two circuits of two exercises each followed by an active stretch/mobility recovery. The first exercise in each circuit is a 5 reps strength movement performed with a 2 count eccentric tempo, then exploding up on the concentric phase. Immediately following the strength exercise, the athlete performs 3-5 reps of an explosive movement like a jump, throw or slam that mimics/relates to the strength movement pattern. After those two exercises, the athlete should spend at least 2 min actively rolling out the body area (upper or lower) that was just taxed. If equipment is at a premium



and you need longer than 2 min before the athlete is back at the strength/power exercises, the option is to continue rolling and/or perform the supplementary recovery exercise suggested on the Excel spreadsheet. It would not be detrimental to have 2-4 min of active rest between each set. After the 2+ min active recovery, the athlete repeats the entire sequence for a total of 5 sets. Once they have completed 5 sets, they then repeat the entire process again, but with a new circuit of exercises.

For example, on Day 2 the athlete performs 5 reps of a chin-up where they explode up to the bar, lower down for 2 counts. Then, they hop off the bar, grab a med ball and perform 5 slams. Following at least 2 min of rolling out their upper body (chest, lats, neck, forearms, and t-spine) with the optional clamshell exercise, they repeat the entire process 5 times. Next, the athlete completes 5 reps of a deadlift where they lower the bar or dumbbells down for two counts, then explode up with good form. Immediately after the 5 reps of the deadlift, the athlete grabs a med ball and does 3 reps of a single leg med ball slam on each leg. Then, for at least 2 min, they roll out their lower body focusing on the quads, IT bands, glutes, Hip Flexors and calves and even the lumbar spine. Finally, it's time for the optional floor panel postural angle exercise before they repeat the entire process again. To complete the workout, have the athletes spend an extra 10 min doing more self-mobility and stretching based on each individual's needs as identified in the assessment. Program your Energy Systems/Work Capacity training 2 x's wk. The focus should be super high intensity efforts of an increasingly gymnastics skill/routine based nature. Please refer to Appendix 5 for specific protocol suggestions.

#### Month 7 – (December Pre/Early Season) – Power

Month 7 is another combination of Day 1 and Day 2 power development workouts organized just like month 6, just with a new combination of exercises. Program your Energy Systems/Work Capacity training 2 x's wk. The focus should be super high intensity efforts of an increasingly gymnastics skill/routine based nature. Please refer to Appendix 5 for specific protocol suggestions.

#### Month 8 – (January In Season) to Month 12 (May In Season)

From month 8 to month 12, each month alternates between a max strength maintenance protocol and a power maintenance protocol. The max strength maintenance protocol months (8, 10 and 12) follow the same sort of formula as outlined in month four, however for months 10 and 12, in the thick of the season, the overall sets and volume performed during the workouts has been reduced.

For months 9 and 11, athletes will follow a power maintenance protocol, which mean the workouts will follow the same basic formula that was introduced in month five, however overall sets and volume performed during the workouts has been reduced so as not to overtax athletes during the competitive season.

As for Energy Systems/Work Capacity training, it is assumed that athletes will now be into full routines which will function as their work capacity training. Coaches are encouraged to periodize and track volume, giving an off-loading week at least every 4 weeks to allow athletes to recover. Alternate strategies for monitoring volume at a daily/weekly level which are beyond the scope of this manual, but merit mentioning. They include tracking and limiting total back extension patterns, giving athlete occasional hand care days off bar work, and



monitoring total impacts. For example, if you are doing a full beam routine and vault day, consider choreography only on floor.

### General overview of sets/ reps in annual periodization of strength program

Some coaches/strength and conditioning specialists may be interested in the following overview of global goals and associated sets/ reps for each month in the training plan. It may help give you a snap shot overview of the Excel spreadsheets that can be overwhelming to look at upon first glance. Please note that:

- a) Specific Starting Month (i.e. June) can be shifted to reflect actual training season if different than WAG/MAG 2019/2020.
- b) Remember to refer to the instructions above regarding how to modify the strength and conditioning plan during competition weeks.
- c) Set/ reps below refer only to main strength/power lifts. Agility/plyometrics and supplementary exercise reps will differ. Where Day 1 and Day 2 are not specified, please assume the same protocol on each day.

	<b>Global Goal</b>	<b>Wk1 (Light) Approx. sets/ reps</b>	<b>Wk2 (Med) Approx. sets/ reps</b>	<b>Wk3 (Heavy) Approx. sets/ reps</b>	<b>Wk4 (Light/ De-load) Approx. sets/ reps</b>
<b>1 (Jun)</b>	Recovery/ Assessment	NA	NA	Assessment	12-15
<b>2 (Jul)</b>	Anatomical Adaptation	3 sets x 12-15 reps	3 sets x 15-18 reps	3 sets x 18-20 reps	2 sets x 15-20 reps
<b>3 (Aug)</b>	Max Strength Ramp	Day 1: 10 sets x 10,9,8,7,6,5,4,3,2,1 reps Day 2: 3 sets x 8 reps	Day 1: 10 sets x 10,9,8,7,6,5,4,3,2,1 reps Day 2: 3 sets x 8 reps	Day 1: 10 sets x 10,9,8,7,6,5,4,3,2,1 reps Day 2: 3 sets x 8 reps	Day 1: 10 sets x 10,9,8,7,6, reps Day 2: 2 sets x 8 reps
<b>4 (Sep)</b>	Max Strength	3 sets x 5 reps	4 sets x 5 reps	5 sets x 5 reps	3 sets x 5 reps
<b>5 (Oct)</b>	Max Strength	3 sets x 5 reps	4 sets x 5 reps	5 sets x 5 reps	3 sets x 5 reps
<b>6 (Nov)</b>	Power	5 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A + 5 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B	5 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A + 5 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B	5 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A + 5 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B	3 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A + 3 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B
<b>7 (Dec)</b>	Power	5 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A	5 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A	5 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A	3 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A



		+ 5 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B	+ 5 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B	+ 5 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B	+ 3 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B
<b>8 (Jan)</b>	In Season Max Strength	3 sets x 5 reps	4 sets x 5 reps	5 sets x 5 reps	3 sets x 5 reps
<b>9 (Feb)</b>	In Season Power	4 sets x 5 reps Strength A + 4 sets x 3-5 reps Explosive A + 4 sets x 5 reps Strength B + 4 sets x 3-5 reps Explosive B	4 sets x 5 reps Strength A + 4 sets x 3-5 reps Explosive A + 4 sets x 5 reps Strength B + 4 sets x 3-5 reps Explosive B	4 sets x 5 reps Strength A + 4 sets x 3-5 reps Explosive A + 4 sets x 5 reps Strength B + 4 sets x 3-5 reps Explosive B	3 sets x 5 reps Strength A + 5 sets x 3-5 reps Explosive A + 3 sets x 5 reps Strength B + 5 sets x 3-5 reps Explosive B
<b>10 (Mar)</b>	Max Strength Maintenance (In Season)	3 sets x 5 reps	3 sets x 5 reps	3 sets x 5 reps	2 sets x 5 reps
<b>11 (Apr)</b>	Power Maintenance (In Season)	4 sets x 5 reps Strength A + 4 sets x 3-5 reps Explosive A + 4 sets x 5 reps Strength B + 4 sets x 3-5 reps Explosive B	4 sets x 5 reps Strength A + 4 sets x 3-5 reps Explosive A + 4 sets x 5 reps Strength B + 4 sets x 3-5 reps Explosive B	4 sets x 5 reps Strength A + 4 sets x 3-5 reps Explosive A + 4 sets x 5 reps Strength B + 4 sets x 3-5 reps Explosive B	2 sets x 5 reps Strength A + 2 sets x 3-5 reps Explosive A + 2 sets x 5 reps Strength B + 2 sets x 3-5 reps Explosive B
<b>12 (May)</b>	Max Strength Maintenance (In Season)	3 sets x 5 reps	3 sets x 5 reps	3 sets x 5 reps	2 sets x 5 reps

## **HOW TO TAPER FOR SPECIFIC COMPETITIONS**

This manual was designed to give coaches a systematic, progressive plan such that athletes should peak for their competitive season. With the exception of the recovery period in June, it is always recommended that athletes strive to maintain some consistency with their strength and power workouts, while modifying and minimizing volume as needed. Maintaining some form of strength and power training is especially important since for some, the gymnastics competitive season could span from December to the end of May and it is just not practical or useful to stop strength training during the competitive season. Inherent to this plan, is the off-loading week every fourth week which helps athletes to recover and continue to get stronger. However, this will likely not always coincide with an athlete's specific competitive schedule and a coach should understand how to modify the plan for a specific taper period prior to a competition.

Each athlete is unique and how they and their body needs to prepare for each competition should be individualized. Some things such as lowering volume while maintaining intensity are a must, but the exact layout of a taper period may differ.



Here is a recommendation on how you might modify an athlete's week going into a competition.

<b>Strength and Conditioning Activity</b>	<b>Day 1</b>	<b>Day 2</b>	<b>Day 3</b>	<b>Day 4</b>	<b>Day 5</b>	<b>Day 6</b>	<b>Day before competition</b>
Flexibility/mobility/active release	25min	25 min	25 min	25min	25 min	25min	25 min
Pre-habilitation (posture/core athlete specific prehab)	20 min	X	20 min	20 min	X	20 min	20 min
Activation (agility/med ball)	X	X	30 min	X	X	20-25 min	15-20 min
Strength	X	X	X	30-45min	X	30 min optional	X

You will notice that based on the recommendation above, some coaches/athletes may only choose to do one condensed strength workout on a competition week. In the event that athletes have several competition weeks back to back, try to make sure that you are balancing out the number of Day 1 and Day 2 workouts being done. Alternatively, adjust exercise choices to ensure that athletes are engaging in a balanced selection of all the pushing and pulling movements for both upper and lower body and in all planes of movements.



# APPENDIX 6

## Annual Periodization Excel Spreadsheets

- 4 weeks of Day 1 and Day 2 strength workouts for every month of the gymnastics year running from June to May
- Room to record energy systems/work capacity training notes on Excel spreadsheets
- Room to record notes on athletes' individual mobility and gymnastics specific performance complexes on Excel spreadsheets



[Insert periodization template here](#)



# APPENDIX 7

## Recovery and Regeneration



## **RECOVERY AND REGENERATION**

Training exerts a vast amount of energy, both mentally and physically. This can have a huge effect on the body if an adequate balance is not achieved. Some of these components include activities like self-massage and stretching, while others may be as simple as getting enough sleep. Getting ready for an event, competition, or simply trying to get fit should be viewed as having a holistic or well-rounded approach. This means that training is not the only factor in achieving peak performance. Some proven recovery and regeneration techniques include the following.

### **Nutrition**

Sound nutrition is essential for peak performance in sport. While proper nutrition alone will not guarantee athletic success, poor nutrition knowledge and habits will certainly prevent an athlete from reaching maximal physical performance capacity.

### **Massage Therapy**

Registered Massage Therapists (RMT's) are specifically trained in rehabilitation, assessment and treatment of musculoskeletal injuries, therapeutic exercise, injury prevention and acute and chronic care. Specialized massage therapy techniques have been developed to complement an athlete's program.

### **Mental Training**

Mental training encompasses teaching mental skills, techniques, attitudes or processes that lead to performance enhancement and positive personal development through systematic training. Areas of consultation include goal setting, concentration, dealing with adversity, mental imagery, mental preparation for practice and competition and effective performance evaluation.

### **Contrast Baths/Shower**

They are used to help flush blood rapidly for quicker recovery.

#### Type A

- a) Hot (as comfortable) x 2 minutes
- b) Cold (as possible) x 10 seconds
- c) Repeat 6-10 times

#### Type B

- a) Cold (as possible) x 1 minute
- b) Hot (as comfortable) x 30 seconds
- a) Repeat 8-10 times



## **Lifestyle**

Lifestyle plays a huge role in an individual's performance. Lifestyle items influencing proper recovery include adequate sleep (approx. 7.5-8 hours/day), taking an easy swim, working joints in a full range of motion without any heavy loading and maybe going out to watch a movie to relax the mind. Remember, recovery is as important as the training and if a proper balance between the two is not achieved, peak performance will never occur.



# APPENDIX 8

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# APPENDIX 9

Article: "Should Female Gymnasts Lift Weights?"



## Should Female Gymnasts Lift Weights?

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Sportscience 4(3), [sportsci.org/jour/0003/was.html](http://sportsci.org/jour/0003/was.html), 2000 (2837 words)

Reviewed by Fred C Hatfield PhD, International Sports Sciences Association, Santa Barbara, California 93101

Gymnastics coaches and administrators in the US are reluctant to include weight training with female gymnasts because they believe it produces detrimental increases in muscle mass. However, weight training based on high-intensity low-repetition sets is likely to improve the performance of most gymnasts by increasing strength with minimal muscle hypertrophy.

Gymnasts must remain on the lean side of lean to be effective competitors at the highest level (Nelson et al., 1983; Sands et al., 1992, 1995). Not surprisingly, concern about excess body weight is common in gymnastics (Anorexia/Bulimia Association, 1994; American College of Sports Medicine, 1997; Leglise, 1998; Nattiv & Lynch, 1994). Female gymnasts and their coaches in the US are therefore reluctant to use weight training, in spite of abundant evidence of the benefits of weight training for sports requiring strength. Their concern is that the gymnast will develop excessive body and muscle mass ("bulk up") and thus become too heavy to perform effectively.

Gymnasts and other athletes who must move their body weight as the primary resistance need to train for strength relative to body mass rather than absolute strength (Poliquin, 1991; Sands, Mikesky, & Edwards, 1991). As the gymnast matures, she is likely to gain absolute strength but lose relative strength as her body mass increases (Sands et al., 1991; Irvin et al., 1992; Zatsiorsky, 1995). Female gymnasts can increase reliance on motor skills to compensate for a decline in relative strength (Poliquin, 1991; Zatsiorsky, 1995), but strength training aimed at increasing relative strength is another important approach.

While some gymnastics coaches are reluctant to prescribe weight training, most include strength training in the form of repetitions of strength-oriented gymnastics skills (Howard & Evans, 1990; Hullner, 1989; Menkhin, 1978; Sands, 1990; Sands et al., 1995; Sands & McNeal, 1997; Singh et al., 1987). Many gymnastics skills have a large strength component, so separating the skill performance from strength training is somewhat arbitrary (Chu, 1994; George, 1980; Hullner, 1989). All gymnastics coaches would agree that development of strength through repetition of gymnastics skills is appropriate. However, skills at the elite level are becoming ever more difficult, and extra time for training is at a premium. Weight training would be orthopedically less demanding than extra skill repetitions and require less time for these gymnasts. In this article we will describe weight training that can develop

strength with minimal hypertrophy, and we will address coaches' concerns about the effects of weight training on muscle size and body build.



## Training for Maximal and Minimal Hypertrophy

Training prescribed to encourage muscle hypertrophy usually involves large numbers of sets of repetitions with light to medium loads, movement speeds from rapid to slow, repetitions to maximum effort, and short rest periods (e.g., Bloomer & Ives, 2000; Hatfield, 1984; Poliquin, 1991; Schmidtbleicher, 1992). In contrast, prescriptions for maximizing strength and minimizing hypertrophy usually involve heavier loads, smaller numbers of repetitions, and longer periods of rest. Table 1 shows Poliquin's guidelines for the two extremes of training.

Maximal hypertrophy				Minimal hypertrophy			
Intensity (% 1-RM)	Repetitions	Sets	Rest between sets (min)	Concentric tempo (seconds per rep)	Eccentric tempo (seconds per rep)	Total set duration (seconds)	Exercises per workout
60-80	85-100	6-20	1-5				
3-6	5-12						
2-4	4-5	1-10	1-4	4-10	3-5	40-70	<20 6-12 1-4

The guidelines in Table 1 are not a guarantee for developing or avoiding hypertrophy. Individual responses in the degree of hypertrophy appear to be related to an individual's sex, maturity, distribution of fiber types, somatotype, initial training status, duration of training, and intensity of training (Beunen & Malina, 1996; Blinkie & Bar-Or, 1996; Blimki & Sale, 1998; Goldspink, 1992; Hakkinen & Pakarinen, 1995; MacDougall, 1992; Moritani, 1992; Tittel & Wutscherk, 1992; Zauner et al., 1989). Periodization (the timing and sequencing of training) may also be an important determinant of the development of strength and hypertrophy. There are numerous types of periodization (e.g., Baker et al., 1994; Bompa, 1993; Fleck & Kraemer, 1987; Koch, 1994), but little research has been performed to determine their influence on hypertrophy. Not all gymnastics coaches use periodization, and there is no agreement on the kind of periodization that results in maximal strength and minimal hypertrophy.

## Strength Training for Gymnasts

In our long experience of gymnastics, gymnasts do not and cannot follow the guidelines for minimizing hypertrophy in Table 1 by using body weight as the only resistance. The typical elite female gymnast can perform far more than 1-5 repetitions of gymnastic-specific skills. For example, in physical-ability field tests prior to the Sydney Olympics, the US senior national team produced the following maximum numbers of repetitions: handstand push ups,  $13 \pm 8$  (mean  $\pm$  standard deviation); press handstands,  $7 \pm 4$ ; and cast handstands,  $10 \pm 5$  (unpublished data, WA Sands, 2000). Paradoxically, these results show that typical gymnastics strength training consisting of repetitions of skills is more likely to maximize hypertrophy than relative strength.

Training with added weights is the only practical way to bring the repetitions- maximum into the range for minimizing hypertrophy. Zatsiorsky recommended "training with the greatest



weights possible, with a small number of repetitions and large intervals of rest between sets" (quoted by Trifonov & Yessis, 1986, p 44).

Zatsiorsky's ideas are entirely consistent with Poliquin's guidelines for minimizing hypertrophy.

An increase in maximal strength "is always connected with an improvement of relative strength and therefore with improvement of power abilities" (Schmidtbleicher, 1992, p 384). Strength gained by any means should therefore be beneficial, as long as the strength conforms to gymnastic-specific movements. However, strength training of irrelevant muscles and movements may add size and weight to a gymnast without benefiting performance. Unfortunately, gymnastics weight training programs have often reflected a body-building approach, by incorporating too many exercises involving muscles and movements that are scarcely involved in gymnastics skills (Pearl, 1986). Gymnastics-relevant lifts and exercises may be reduced to only four: squats, presses, pull downs, and deadlifts. Two common exercise variations that can be included are a front raise and straight-arm pull down. Weight-training programs that follow the guidelines of Poliquin for maximizing relative strength are available for gymnasts (Plotkin et al., 1989; Sands & McNeal, 1997).

### **Effects of Weight Training on Body Build**

The literature on weight training and gymnastics includes conditioning programs and case studies (Chu, 1994; James, 1987; Colombo, 1999; Marina and Rodriguez, 1999; Pearl, 1986; Plotkin et al., 1989; Sands et al., 1997; Trifonov & Yessis, 1986), but there are no reports on the effects of weight training on body build. Anthropometry on gymnasts during preparation camps prior to the Sydney Olympics indicates that weight training does not cause gymnasts to bulk up (unpublished data, WA Sands, 2000). The gymnasts were 33 US national team members, 14 of whom weight trained for two or more sessions per week. In spite of being older ( $18.1 \pm 2.0$  vs  $16.5 \pm 1.0$  y), these gymnasts were lighter ( $48.0 \pm 5.4$  vs  $52.1 \pm 5.9$  kg), had a lower body mass index ( $20.3 \pm 1.9$  vs  $21.7 \pm 1.9$ ), and were slightly shorter ( $153.5 \pm 4.0$  vs  $154.9 \pm 4.3$  cm) than the members of the team who did not weight train. More detailed anthropometry on these gymnasts was not permitted, owing to concerns about body fat and the potential for triggering eating disorders (Nattiv et al., 1994; Nattiv & Mandelbaum, 1993; Noden, 1994; Rosen & Hough, 1988; Wilmore, 1996).

### **Effects of Weight Training on Adolescent Growth**

A major concern of gymnastics coaches is that weight training will magnify the increases in muscle and body mass that occur during the adolescent growth spurt. Unfortunately research has not provided clear answers to the link between growth and training-related size increases (Blimkie & Sale, 1998), and coaches can rarely determine if an increase in rate of change of size, mass, or shape is due to training or maturation. Attribution of normal growth to the effects of weight training may have led to the concerns about the effects of weight training on body build.

### **Conclusion**

Coaching folklore condemning weight training for gymnasts is probably misguided. Weight-training workouts that develop strength with minimal muscle hypertrophy are likely to enhance



the performance of female gymnasts. The current skill- repetition approach to developing strength in female gymnasts may cause more hypertrophy than a well-designed program of weight training in the short term, but the relative effect of these forms of training on muscle growth during maturation is unknown.

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