

A person wearing a grey hoodie, a black backpack, and black pants is performing a lunge on a grassy field. They are leaning forward with their right knee on the ground and their left leg extended. The background shows a grassy field with some trees and a fence.

ISOMETRICS IN SPORT PERFORMANCE:

NO GYM? NO PROBLEM!
A GENERAL PREPARATION PROGRAM FOR CONTACT,
COLLISION AND COMBATIVE SPORT ATHLETES

PART 2

COPYRIGHT



COACH BOTT

DISCLAIMER

All contents copyright © by Carmen Bott, MSc. All rights reserved. Limit of Liability and Disclaimer of Warranty: The publisher has used its best efforts in preparing this document, and the information provided herein is provided “as is.” Neither the publisher nor the authors are engaged in rendering professional advice or services to the individual reader. The ideas, procedures and suggestions contained in this book are not intended as a substitute for consulting with a physician. All matters regarding health require medical supervision. Neither the authors nor the publisher shall be liable or responsible for any loss of damage allegedly arising from any information or suggestion in these programs.

PRACTICAL IMPLEMENTATION OF ISOMETRICS

Like all training methodologies, isometrics have their place in the physical development of the athlete. And, isometric training protocols expand much further than developing strength at specific ranges of motion (2). They can be a stand-alone training session or incorporated vertically into a fully integrated exercise prescription regimen. Isometric protocols can also progress athletes along a continuum of development with the most basic exercises and prescriptions serving as a foundation of strength for future physical challenges.

Ultimately, the position in which the isometric exercise is completed in, is the location at which the strength gain will be realized (2). Well, essentially this is the thought process. However, to expand on this further, when an isometric exercise is performed in a lengthened (stretched) position, transfer of strength to other joint ranges of motion is much greater than those executed in a shortened position (2). Also, strength gained in a lengthened (stretched) position is associated with hypertrophy as compared to a shortened position.

But also keep in mind, there are key joint angles for specific movement tasks in sport, like rebounding from a jump. So those angles might need to be trained more specifically. These specific angles must be analyzed and exercises to target them prescribed and integrated into the training program. A critical joint angle typically occurs with some level of the muscle placed in a stretched position, but almost never in a fully lengthened position (2).

Generally speaking, it is a good plan to train isometrically at different joint angles throughout the full ROM and this may possibly induce similar strength gains to dynamic training throughout a full ROM.

FREQUENCY

Some coaches suggest isometrics daily (1) (5) with several different exercises. “If you are after all-purpose strength a variety of exercises with fewer contractions per exercise are in order. Bogdasarov’s (1991) popular among Russian martial artists routine consists of fourteen exercises” (1). Others integrate isometrics with other qualities to develop so the frequency might be less. It does depend on the needs of the athlete and the expertise of the physical preparation coach.

INTENSITY & TIME

Some evidence from earlier times suggests, the duration of a contraction may be more important than the contraction's intensity (5). McDonagh & Davis (1984) reviewed a number of studies of isometric strength training and concluded that the total time under tension, or the time of the combined contractions (e.g., 3 sets x 10 sec = 30 sec or 10 sets x 3 sec = 30 sec), is the loading variable of primary importance in isometric strength and muscle training (1).

**For maximal efforts, it appears favourable to execute isometrics of approximately 3-4 seconds (eg. 3-4 reps x 3 seconds)*

Generally speaking, it appears that you should favor more contractions if you emphasize strength and longer contractions if you stress mass gains (1).

According to some, all out efforts do not seem necessary for all out gains. Hettinger (1961) and Medvedev (1986) recommended 40-50% of perceived max efforts. Incidentally, capillaries do not get completely shut until the intensity of the contraction reaches 50% max. Recall that this blood occlusion is important for bathing the muscle in its metabolites for growth (1) (2).

Also 50% intensity, does not refer to trying half of your best throughout the set. It means you start out with 50% of your max strength and hold it. As you get tired, you will be working harder and harder to maintain that level of force. Just like lifting a 50%1RM weight for reps (1).

Isometrics are hard to monitor. If isometrics are performed by pressing a bar into pins or safety catches, it is near impossible to gauge the amount of tension the athlete is developing without a force plate. Because this is the case, in order to best monitor isometrics, it might be advisable to use a given RPE and time frame for which the isometric has to be held. Athlete education will be paramount here.

Isometrics are also hard to progress; it is not a straightforward model to follow. Thus, some type of monitoring is key before progressions should be implemented and as programs become individualized.

TYPE / MODALITIES

Most carryover of strength takes place in the range of plus-minus 20 degrees from the exercised angle (Knapik, Mawdsley & Ramos, 1983). Other coaches suggest 15 degrees. Generally, it seems a wide range of angles must be trained to optimize this method.

Traditionally, isometric exercises are done in three positions: near the bottom of the movement, in the middle, and near the top (1). In the case of the military press, you would press the bar off your clavicles, at your eye level (the typical sticking point), and a couple of inches short of the lockout (1). However, coaches can be even more creative than this.

In a Russian study by Zatsiorsky & Raitsin (1974) the subjects who isometrically trained the lengthened/stretched position improved their full squat poundage 50% more than those who did their isometrics near the lockout. Another reason to emphasize the stretched position is flexibility. Isometric contractions of shortened muscles have been known to reduce flexibility (1). Stretched position isometrics, on the other hand, happen to be on top of the list of most effective stretching techniques (1). Training the stretched position can also stimulate muscle hypertrophy as well (1).

HOW SHOULD ONE BREATHE?

First rule is Do Not hold your breath. Breathe shallow, through pursed lips while keeping your abs hard. Pavel Tsatsouline recommends to “Breathe Behind the Shield” of rock hard abs.

EXERCISE ORDER

The placement of critical joint angle isometrics within the training day depends heavily on the type of isometric exercise selected. A multi-joint isometric exercise, such as a squat against the safety racks, will be much more demanding compared to an isometric exercise of single-joint at a specific joint angle, such as an isometric knee flexion exercise in a lengthened position. Thus, multi-joint, position specific isometric exercises might be best placed at the beginning of the workout as opposed to a single joint isometric exercise, which might be best placed later on in the training day.

PAIRING OF EXERCISES

After an Isometric set, pair with 2-5 reps of a target movement pattern. This concept is derived from Yuri Verkhoshansky's use of contrast training and the process of integrating new motor patterns to develop a skill (5). Isometric exercises can be paired with dynamic exercises to take advantage of 'post-activation potentiation' where nervous system is hyper excited and can produce greater outputs (eg. a better jump) than without a stimulus (5). They can also be paired with non-competing exercises or assistance exercises (such as core/trunk) exercises as a filler to preserve rest period (5).

SAFETY

Overcoming isometrics can be a good option because the athlete has control over how much force to exert and can end the rep if they feel discomfort" (1).

GENERAL TRAINING SESSION GUIDELINES

- Ensure that a proper warmup is performed prior to isometric training
- If doing plyometrics & speed on the same day, perform plyometrics/speed before an isometric training session, or 6-8 hours afterwards
- Isometric training sessions can be done on alternating days
- Perform at least a warm-up set of each exercise and slowly ramp up your intensity (muscle contraction)
- Remember that for lower body exercises, you're trying to PUSH down into the ground, not pull up
- For maximum effort exercises, gradually build up intensity over the rep instead of going from 0-100% intensity instantaneously
- Respect rest periods during the workout; remember that we're trying to train maximal outputs, not do fatiguing circuits.
- Get a minimum of 2 training sessions per week, 3 is ideal.
- Take advantage of the time you have to work on sport specific skills, learn more about the tactical demands (systems) of your sports.

- Take advantage of the time you have to build good LIFE habits - eg. drinking more water, sleeping, improving diet & nutrition

HERE IS A SAMPLE TRAINING WEEK

| Day | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|-----------|---|--|--------------------------|--|--------------------------|--|--------------|
| Session 1 | Speed & Day 1 Isometrics | Sport specific skill work & low intensity work | Speed & Day 2 Isometrics | Sport specific skill work & low intensity work | Speed & Day 3 Isometrics | Sport specific skill work & low intensity work | Recovery Day |
| Session 2 | Aerobic work, tempo runs, sport-specific movement technical movement drills or a Muscular Endurance Circuit with higher reps, less rest and low intensity | | | | | | |

EQUIPMENT REQUIRED

- A medium length towel
- A chair
- Either a moderate kettlebell or a loaded rucksack
- A doorframe
- A bench or heightened surface

Note: This program is intended to be executed with minimal to no equipment. If you are unsure on how to correctly load the movement, either use as close a resemblance as possible (e.g. for a suitcase carry you may not have access to a kettlebell, but a loaded rucksack would work) or play it safe and speak to one of the coaches.

TRAINING PROGRAM TERMINOLOGY

Throughout the program, upon reading the desired loading for the given movement, there are training variables that should be adhered to, most noticeably; “RPE” translating to Rating of Perceived Exertion. Rated on a 1-10 scale with 1 being a rating of exertion that barely registers as exercise, and 10 being that of a 1 repetition max of a deadlift for example - as hard as possible. In the loading for certain movements, it’s asking for a given rating (RPE) - based upon how difficult the intention should be for example; an RPE8 refers to the set feeling an 8 out of 10, meaning you could maybe get another 2 repetitions before failure.

Here are 2 examples of how this should be interpreted in the use of isometrics: 1) Yielding - For the desired repetition range and duration of the isometrics, the total set once completed should reflect the intended RPE. 2) Overcoming - If the intended RPE is 10, this is a max effort lift - anything less like an RPE 8 for example translates to producing an 8/10 effort.

The other training variable is Tempo. Tempo is the desired speed of the movement in seconds. A tempo of 4:3:x:1 for example is to be executed as follows:

- 4 - The duration of the eccentric portion (lowering down phase) of the lift
- 3 - The duration of the isometric hold
- x - The concentric, ‘lifting part’ means as fast as good form allows
- 1 - The duration of rest at the “top” or “rest” portion of the lift

Isometric exercise are also typically programmed using ‘seconds.’ The term seconds has been abbreviated into ‘s.’

FOLLOW THESE WARM-UP DRILLS BEFORE YOU BEGIN:

| Follow Sequentially | |
|--|---|
| Squat routine 10x each side | https://www.youtube.com/watch?v=dLLgaZEFTns |
| Downward dog into cobra (elbows locked) 10x | https://www.youtube.com/watch?v=TB6YFQj67gl |
| Scapula pushups 10x | https://www.youtube.com/watch?v=v0bEqK07vS8 |
| Air squats 10x | https://www.youtube.com/watch?v=94p9AcTndtQ |
| Inch worm 10x | https://www.youtube.com/watch?v=v0ANJ5fs0el |
| Perfect stretch 5-10x each side | https://www.youtube.com/watch?v=MEyAoMyiK3c |
| Swimmer drills 10x | https://www.youtube.com/watch?v=zaX5gPijw4M |
| Clam shells 10x each with 10s hold | https://www.youtube.com/watch?v=U_vLPXzuSN4 |
| Half squat jumps 10x | https://www.youtube.com/watch?v=xT4I2WWLHOM |
| RKC Planks front + Sides 2x20-30s | https://www.youtube.com/watch?v=VDLxNTB3qhc |



GENERAL PREPARATION PHASE 1: WEEKS 1-4

DAY 1

| | Exercise & Video Link (click to watch) | Coaching Instructions | Week 1 | Week 2 | Week 3 | Week 4 |
|----|---|---|---|---|--|--|
| A1 | Towel overcoming ISO deadlift below knees | Make sure you stand in the middle of the towel and to keep weight on the middle of foot. Main focus is to keep back straight while pushing with legs. ***Another option is to perform 2-3 sets of isometric contractions at the bottom, mid and top position of this key movement. So, a 6 x 4 seconds would be 2 sets at the bottom, 2 at the mid-thigh pull position and 2 at the finish (lockout) | 5 x 3s RPE 8 | 5 x 4s RPE 9 | 5 x 5s RPE 10 | 2 x 5s RPE 10 |
| A2 | Compression leg raises | Brace abs keeping legs fully locked and straight. Point the toes and raise the leg as much as possible. Cramping is expected in the beginning. | 6 x 10 each side Rest: 120s after A2 | 8 x 10 each side Rest: 120s after A2 | 6 x 10 each side w/ 5s iso hold on last rep Rest: 120s after A2 | 2 x 10 each side w/10s iso hold on last rep Rest: 120s after A2 |
| B1 | Bent over, overcoming ISO row | Make sure to focus on pulling with elbows back to work the upper back. Another option is to perform 2-3 sets of isometric contractions at the extended position, the mid and flexed position of this key movement. | 6 x 4s RPE 8 | 8 x 4s RPE 8 | 6 x 5s RPE 9 | 2 x 5s RPE 10 |
| B2 | Press up ISO hold | Stay tight throughout the body. Ensure your head is also aligned (strong neck) The bottom iso hold is just off the floor and not relaxing on the floor. Another option is to perform 2-3 sets of isometric contractions at the bottom, mid and top position of this key movement. You can also elevate feet onto a chair for a variation. | 6 x 5s RPE: 7 Rest: 120s after B2 | 8 x 5s RPE: 8 Rest: 120s after B2 | 6 x 6s RPE: 9 Rest: 120s after B2 | 2 x 6s RPE: 9 Rest: 120s after B2 |

| | Exercise & Video Link (click to watch) | Coaching Instructions | Week 1 | Week 2 | Week 3 | Week 4 |
|--|---|--|--|--|--|--|
| C1 | Towel hamstring Isometric | With bent legs, lift your hips up and then aim to straighten the legs while keeping hips | 4 x 5-8 reps 2:1:2:1 tempo | 5 x 5-8 reps 3:1:2:1 tempo | 6 x 5-8 reps 4:1:2:1 tempo | 2 x 5-8 reps 4:2:2:1 tempo |
| C2 | Dive Bomber Press up | The down up is more circular here; aim to be smooth and controlled. | 6 x 5 reps Rest: 90s after C2 | 8 x 5 reps Rest: 90s after C2 | 6 x 5 reps w/1s hold in each position Rest: 90s after C2 | 2 x 8 reps w/2s hold in each position Rest: 90s after C2 |
| Perform 4 rounds of the following drills only resting as needed | | | | | | |
| D1 | Side Plank | Ensure great alignment through entire body. Lift up and hold as if you are supporting weight on your frame, Maximize tension. Relax between bursts of effort | 4s max tension, relax 4s, repeat for 6. Both sides | 4s max tension, relax 4s, repeat for 6. Both sides | 4s max tension, relax 4s, repeat for 8. Both sides | 4s max tension, relax 4s, repeat for 6. Both sides |
| D2 | Straight Leg Bridge | Lift your hips up and then holding pelvis level, slowly lift one leg up, pause and lower, alternating sides. | 5 reps per side | 6 reps per side | 8 reps per side | 6 reps per side |
| D3 | Neck Bridging | It is very important to keep your neck in a straight position for these drills. Use a pad to protect the forehead and back of skull. | 20s each position | 25s each position | 30s each position | 35s each position |

DAY 2

| | Exercise & Video Link (click to watch) | Coaching Instructions | Week 1 | Week 2 | Week 3 | Week 4 |
|----|---|--|--|--|--|--|
| A1 | Iso Split Squat | Move into split squat and loop towel under base of front foot. Pull up on towel while rooting feet into the ground. | 3 x 5s/side Rest: 120s after A1 | 4 x 5s/side Rest: 120s after A1 | 5 x 5s/side Rest: 120s after A1 | 3 x 5s/side Rest: 120s after A1 |
| B1 | Press up with pauses | Stay tight throughout the body and make sure hips and chest move together down and up. Keep your head in line with your body | 5 x 20 reps 2:1:x:1 tempo | 5 x 15 reps 3:1:x:1 tempo | 4 x 10 reps 3:2:x:1 tempo | 2 x 20 reps 3:2:x:1 tempo |
| B2 | 3 Position Iso Hold with Towel | Move into half kneeling and perform a one arm pull from three different position on each side. | 3 x 5s/side Rest: 120s after B2 | 4 x 5s/side Rest: 120s after B2 | 5 x 5s/side Rest: 120s after B2 | 3 x 5s/side Rest: 120s after B2 |
| C1 | Pistol Squat | Go barefoot. Root foot into ground and start at the top. Get tall and reach unsupported leg away from the body. Lower body with control and then push the earth away to rise to the top. To improve performance at first, it is Ok to hold onto something for balance. | 3 x 4/side Controlled tempo | 3 x 5/side Controlled tempo | 4 x 3/side Controlled tempo | 3 x 4/side Controlled tempo |
| C2 | Single Leg Deadlift | Start from standing upright, and hinge hips back with a slightly bent leg. Do not allow rotation or losing control. Do this barefoot to train your foot muscles as well. Notice how slow the down phase is of the drill. 5 seconds down. | 4 x 5/side 4:1:x:1 tempo Rest: 120s after C2 | 4 x 6/side 4:2:x:1 tempo Rest: 120s after C2 | 5 x 6/side 5:2:x:1 tempo Rest: 120s after C2 | 2 x 6/side 5:2:x:1 tempo Rest: 120s after C2 |

| | Exercise & Video Link (click to watch) | Coaching Instructions | Week 1 | Week 2 | Week 3 | Week 4 |
|--|---|---|--|--|--|--|
| Perform 4 rounds of the following drills only resting as needed | | | | | | |
| D1 | Toe Press for Ankle Spring | Find a stair or step and place ball of foot on it. Place a tennis ball or a towel between the lower legs. Pressing into the step, raise the heels up to full range of motion and then slowly, with control lower them below the height of the step. | 10 reps Controlled Tempo | 15 reps Controlled Tempo | 20 reps Controlled Tempo | 25 reps Controlled Tempo |
| D2 | Push-ups | Hold body in a straight line and repeat at a consistent even tempo to build muscular endurance | Maximum reps but leave 2 in the bank | Maximum reps but leave 2 in the bank | Maximum reps but leave 2 in the bank | Maximum reps but leave 2 in the bank |
| D3 | Copenhagen side plank | Straight leg is hard variation, if you put more of the foot on the box, it is easier. Focus on being straight and not rotated. Keep the head in line with your body and head up (not shown in video) | 20s/side | 25s/side | 30s/side | 30s/side |
| D4 | Neck Bridging | It is very important to keep your neck in a straight position for these drills. Use a pad to protect the forehead and back of skull. | 20s each position | 25s each position | 30s each position | 35s each position |

DAY 3

| | Exercise & Video Link (click to watch) | Coaching Instructions | Week 1 | Week 2 | Week 3 | Week 4 |
|----|--|---|--|--|--|---|
| A1 | Towel overcoming ISO deadlift - 3 position holds | Make sure you stand in the middle of the towel and to keep weight on the middle of foot. Main focus is to keep back straight while pushing through the feet to maximize force production. Total sets are 6, as you are doing 2 per position. | 2 x 3s each position start position below knees above knees RPE 8 | 2 x 4s each position start position below knees above knees RPE 8 | 2 x 5s each position start position below knees above knees RPE 9 | 2 x 3s each position start position below knees above knees RPE 10 |
| A2 | Inverted Shoulder Press | Either at the wall or on the box, push head forward to straighten the back and when going down into a tripod position for an up-side-down shoulder press. | 4 x 5 reps or max 2:1:x:1 tempo Rest: 120s after A2 | 4 x 5 reps 3:1:x:1 tempo Rest: 120s after A2 | 5 x 5 reps 3:2:x:1 tempo Rest: 120s after A2 | 2 x 5 reps 3:3:x:1 tempo Rest: 120s after A2 |
| B1 | ISO Full Body Push | Find a sturdy wall and stagger your stance and push into it with your hands. Try arms extended and arms bent for each rep and switch your stance as well. | 4 x 3s each position RPE 8 | 4 x 4s each position RPE 8 | 4 x 5s each position RPE 9 | 4 x 3s each position RPE 10 |
| B2 | Towel Inverted Row | Make sure to focus on pulling with elbows back and feel the upper back. Instead of a door, you can also use the table or any other immovable, fixed object. Another option is to do tug-o-war with a family member: do one arm at a time. | 4 x 10 reps 2:1:x:1 tempo Rest: 180s after B2 | 4 x 10 reps 3:2:x:1 tempo Rest: 180s after B2 | 3 x 10 reps 3:3:x:1 tempo Rest: 180s after B2 | 2 x 10 reps 3:3:x:1 tempo Rest: 180s after B2 |
| C1 | Towel Hamstring Isometric | With bent legs, lift your hips up and then aim to straighten the legs while keeping hips up. Control the extension of the knees. | 3 x 5-8 reps 2:1:2:1 tempo | 4 x 5-8 reps 3:1:2:1 tempo | 5 x 5-8 reps 4:1:2:1 tempo | 2 x 5-8 reps 4:2:2:1 tempo |

| | Exercise & Video Link (click to watch) | Coaching Instructions | Week 1 | Week 2 | Week 3 | Week 4 |
|--|---|---|---|---|---|---|
| C2 | Flying Lunge | Find a stair or step and stand with ball of foot on it. Do not allow the heel to drop to much and move into a flying lunge as shown. Try not to put too much weight onto the trailing leg; just use it for balance. | 2 x 4 reps/ side controlled tempo Rest: 60s after C2 | 3 x 4 reps/ side controlled tempo Rest: 60s after C2 | 4 x 4 reps/ side controlled tempo Rest: 60s after C2 | 3 x 4 reps/ side controlled tempo Rest: 60s after C2 |
| Perform 4 rounds of the following drills only resting as needed | | | | | | |
| D1 | Hollow body hold | Brace and tighten the abs. Upper back is off the floor. | 30s | 30s | 45s | 60s |
| D2 | Side Plank | Ensure great alignment through entire body. Lift up and hold as if you are supporting weight on your frame, maximize tension. Relax between bursts of effort | 4s max tension, relax 4s, repeat for 6. Both sides | 4s max tension, relax 4s, repeat for 6. Both sides | 4s max tension, relax 4s, repeat for 8. Both sides | 4s max tension, relax 4s, repeat for 6. Both sides |
| D3 | Straight Leg Bridge | Lift your hips up and then holding pelvis level, slowly lift one leg up, pause and lower, alternating sides. | 5 reps/side | 6 reps/side | 8 reps/side | 6 reps/side |
| D4 | Neck Bridging | It is very important to keep your neck in a straight position for these drills. Use a pad to protect the forehead and back of skull. | 20s each position | 25s each position | 30s each position | 35s each position |

COACHES' BIOS

JURE SMERDELJ

Jure Smerdelj is from Slovenia/Europe. He is an experienced Strength and Conditioning coach with a versatile background in different sports and all manners strength related. Started with judo at age 4 and continued with wrestling, BJJ, muay thai and MMA till age 25. Jure started coaching at the age of 16 as an assistant coach and now has over 15 years of experience. He lived in Middle East from 2015 where he worked with combat\contact and weightlifting athletes. He was a head coach and also collaborated with Physio clinics in Bahrain and Abu Dhabi for rehabilitation protocols. In 2019, he moved to Vancouver, Canada; where he currently resides and works with weightlifting/powerlifting and aspiring athletes. Coach Jure has provided much of the video footage here.

Contact Info: smerdelj.jure@gmail.com

ELLIOT RICHARDSON

Elliott Richardson is originally from Toronto, now living in Nova, Scotia, Canada, has 9 years in the field and is currently the Head S&C Coach and Manager of Sports Performance at Acadia University, Nova Scotia, Canada. He oversees a multi-disciplinary staff to maximize the overall performance of 300 Varsity athletes across 10 teams as well as a revenue generating service to local athletes in the community. He earned his Masters of Science in Strength and Conditioning (with Distinction) from St. Mary's University - Twickenham, London, where he earned his classes top research award titled: The effect of 5% difference in training intensity on strength gains in collegiate football players. Prior to his role at Acadia, Elliott played 3 years in the Canadian Football League as a Safety, where he earned outstanding Canadian Defensive & Canadian player of the week honours. His mission is to help provide athletes the tools, skills, and coaching that he wished he had as a developing athlete.

Contact Info: elliott.richardson5@gmail.com

CARMEN BOTT

Carmen Bott is a Vancouver based Performance Coach and University Professor. Coach Bott has over 24 years of practical coaching experience and has trained several CFL draft picks, CIS basketball champions and world medalists in freestyle wrestling. Carmen has a Master's of Science degree and is currently pursuing a mental performance designation. Carmen oversees undergraduate projects and enjoys teaching applied Kinesiology and Sport Science and is an International Educator and Keynote Speaker.

Contact Info: www.coachbott.com

WORKS CITED

1. Pavel Tsatsouline, Personal Communication
2. Isometrics for Performance E-Book by Matt Van Dyke and Max Schmarzo
3. Fisher, B. E., Southam, A. C., Kuo, Y., Lee, Y., Powers, C. M. Evidence of altered corticomotor excitability following targeted activation of gluteus maximus training in healthy individuals. Neuro Report. 2016; 27:415-421.
4. Siff and Verkhoshansky, Supertraining. 2001
5. Special Strength Training Manual for Coaches, Verkhoshansky, 2013
6. <https://www.just-fly-sports.com/modern-speed-training-alex-natera/>
7. Jacob James, Personal Communication