Bike Ready

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Who's biking

- 12 million Canadians (30%)
- More younger than older cyclists → 82% < 14 years and 27% > 50 years
- More males than females (46% vs 34%)
- Equal urban and rural bikers
- Those with post-secondary education and higher socioeconomic status are more likely to bike (44% vs 28%)

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Stats Canada 2017 Report. https://www150.statcan.gc.ca/n1/pub/82-003-x/2017004/article/14788-eng.htm

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Who’s getting hurt

- Mean age 35 years
- More males (86%) than females
- 42% intermediate > 40% expert > 18% beginner cyclists
- 73% bike park vs 18% trails
- Most common mechanism is fall over handlebars (aka. “the endo”)

Biking is risky!

- Injury rate per **1km of road cycling = 26-68x motor vehicle travel**

- BMX and mountain biking have the **first and third highest injury rates** of any summer Olympic sport → 38% and 24%, respectively

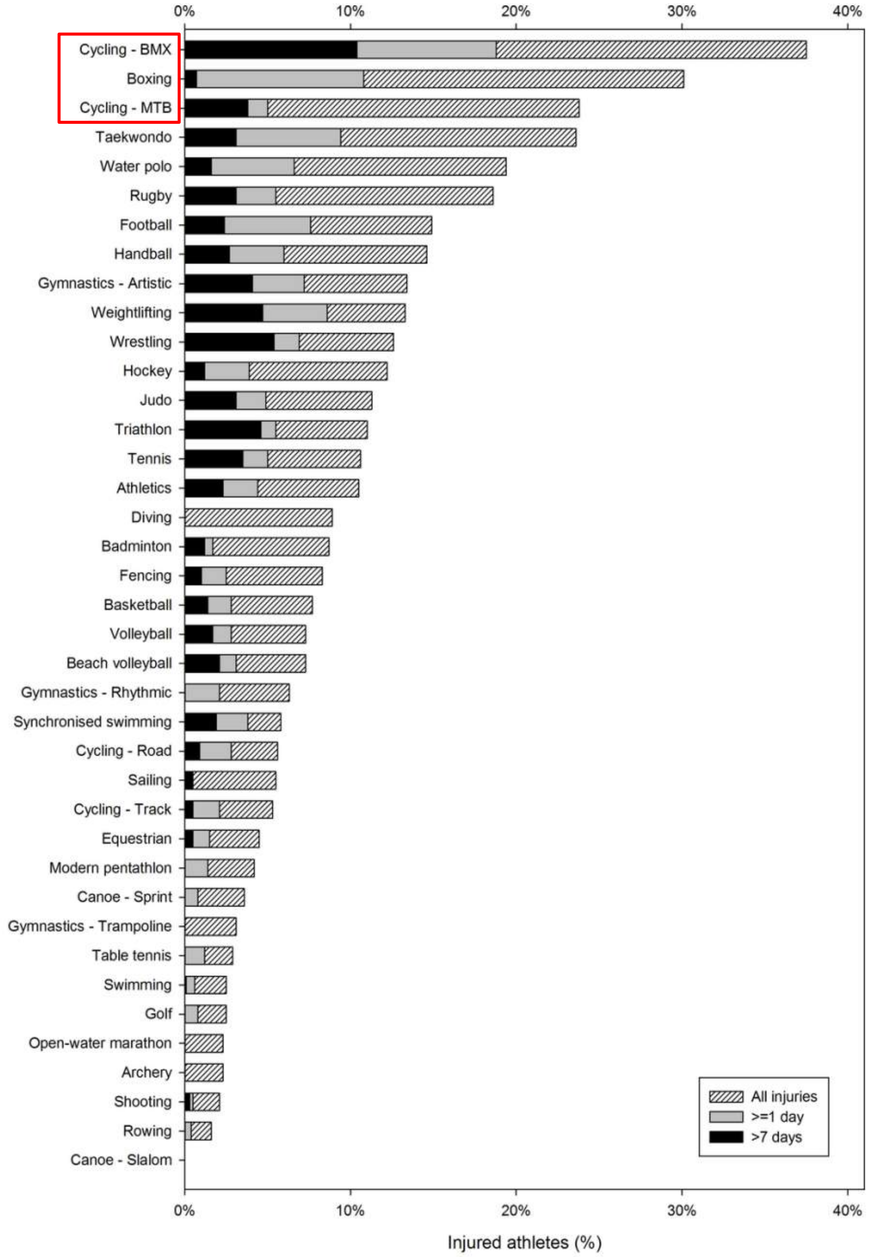

Figure 1 Proportions of athletes (%) in each sport with injury, injury with estimated time loss ≥1 day, and injury with estimated time loss >7 days.

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Aultman-Hall et al, Accid Anal Prev, 1999
Soligard et al, BJSM, 2017

Severe street and mountain bicycling injuries in adults: a comparison of the incidence, risk factors and injury patterns over 14 years

- Calgary-based study of severe biking injuries from 1995-2009
- Mechanism = car (road) vs cliff/jump (mtn)
- 86.4% males; mean age 39 years
- Head (67.4%) > spine (45.7%) > extremities (38.4%) > chest (34.1%)
- 33.3% required surgery
- 26.4% required ICU stay
- 17 deaths

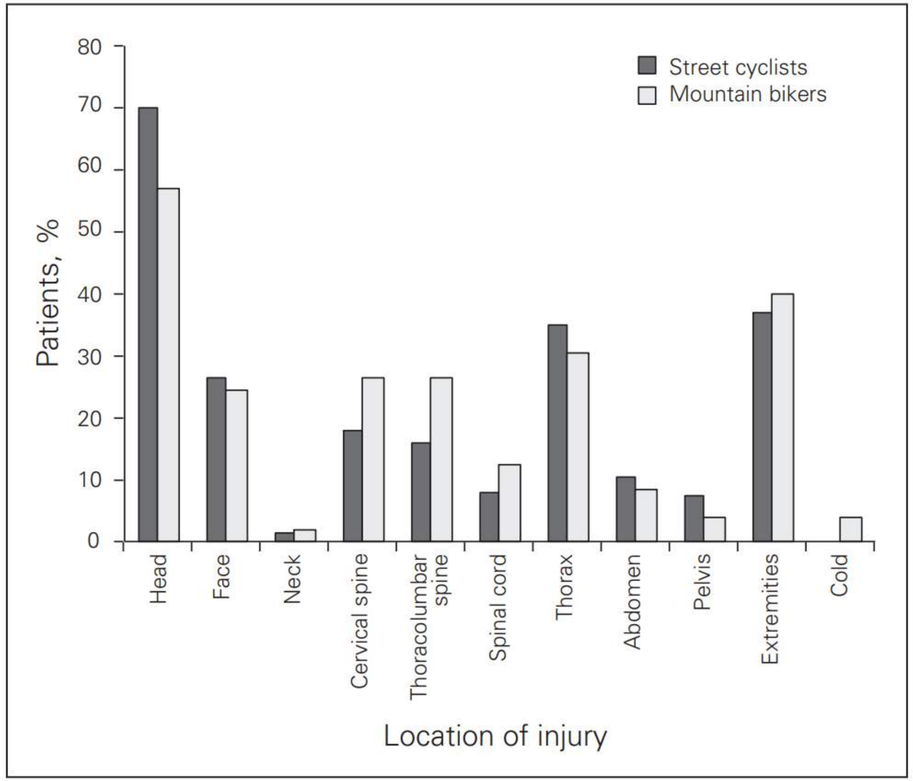

Fig. 2. Anatomic injury distribution for the 258 severely injured street and mountain cyclists. Injury rates were all similar between both groups (all $p > 0.05$).

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Roberts, CanJSurg. 2013

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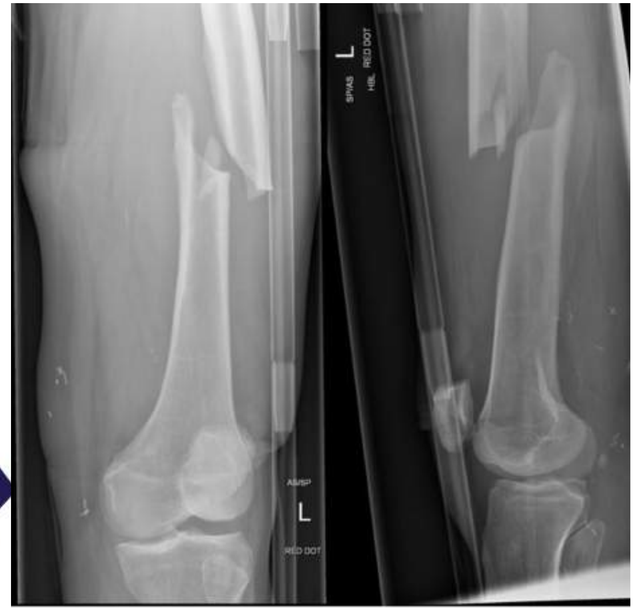
Vancouver trauma registry 1992-2002

- 1092 bike injuries
- 3 fold increase in injuries over 10 year period of study
- 46.5% fractures > 12.2% TBI > 12% spine > 10.3% chest
- 66% of patients required surgery



Whistler data

- 772 injuries
- 86% male; mean age 26 years
- 42.5% fractures → 75.4% upper extremity (clavicle > hand/wrist)
- 11.2% TBI
- **10% required surgery or ICU care**

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Banff Sport Medicine data…

- Mountain biking most common cause of traumatic injury in the summer
- Fractures most common injury → clavicle > wrist > lower leg
- Fracture healing = 6 weeks immobilization + 6 (or more) weeks rehab
- Surgery often necessary

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How to prevent injury…

- Ask this guy…

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Recap

Mountain biking injuries are often season ending

Avoiding injuries = more time spent biking/training, more fitness gains, more fun!

- Don’t crash ✓
- Proper bike fit to reduce overuse injuries ✓
- Increase your fatigue resistance and tissue tolerance
  - Train effectively (periodization)
  - Strength programming – The secret weapon to prevent injuries, and increase cycling power and efficiency
  - *Aerobic and anerobic fitness – very important but a topic for another day*

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Periodization: Planning Your Season

What is your season goal?

- Amount of **volume**, **intensity** and **technique** training may vary
- When do you want to **peak?**
- What ”**get in the way**” of training? Illness, work, family commitments?

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Periodization: Volume, Intensity, Technique

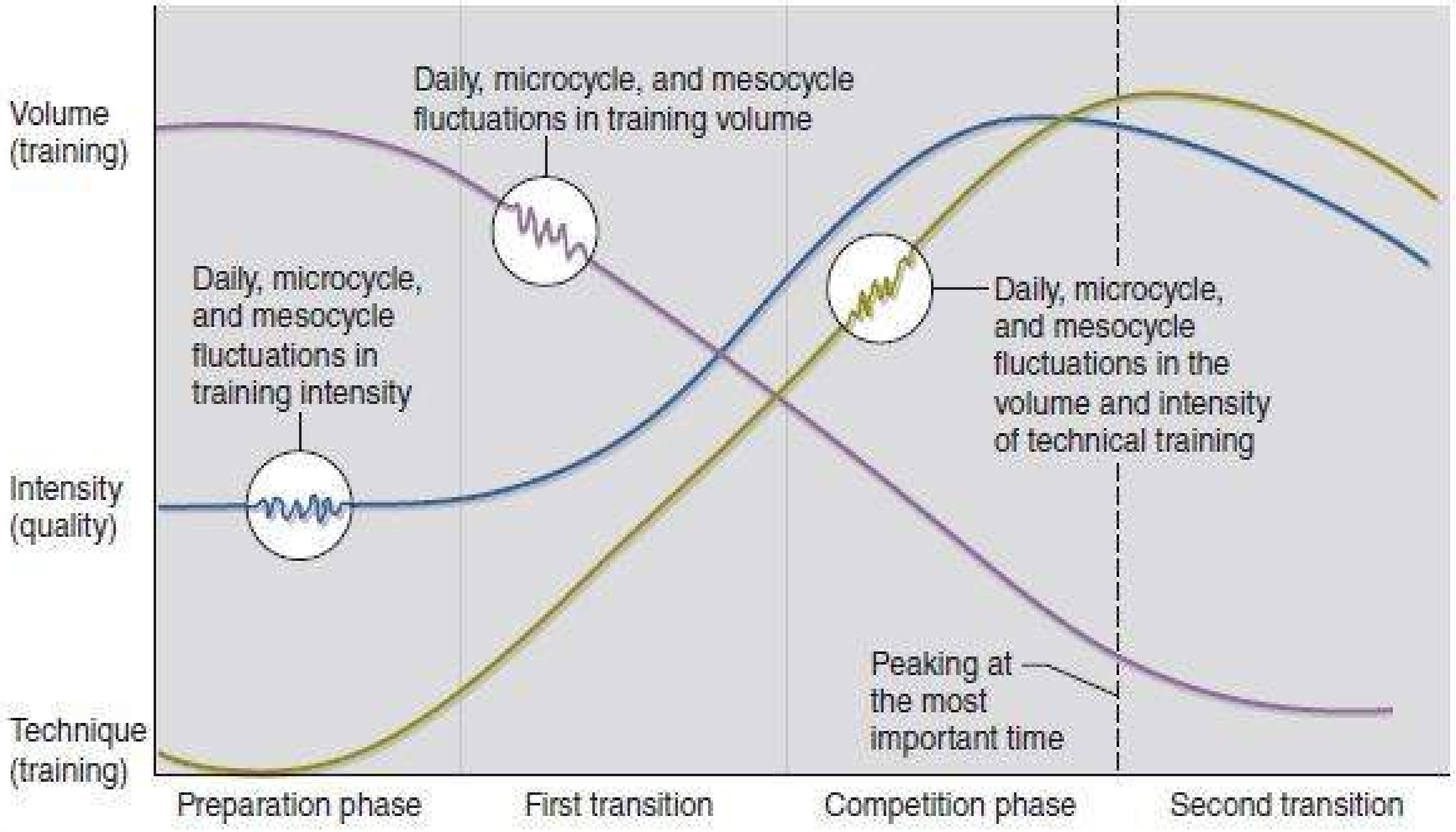

FIGURE 21.4 Matveyev's model of periodization (appropriate for novices).

Reprinted, by permission, from G.G. Haff and E.E. Haff, 2012, Training integration and periodization. In *NSCA's guide to program design*, edited by J. Hoffman (Champaign, IL: Human Kinetics), 223; adapted from figure 11.7, p. 2239. Reprinted from *Weight training: A scientific approach*, 2nd edition, by Michael H. Stone and Harold St. O'Bryant, copyright © 1987 by Burgess.

Season goals anyone?

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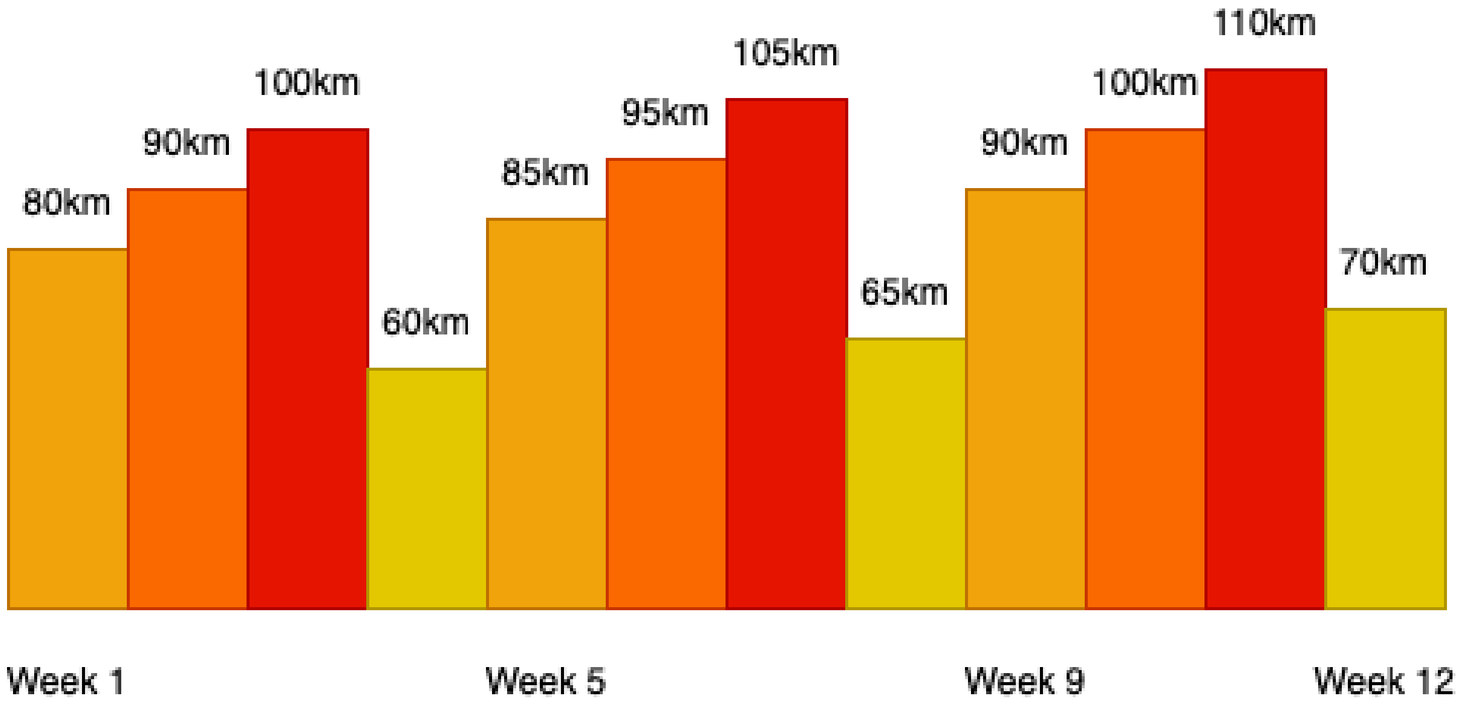
Periodization: Recovery Week



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Strength Training: The Research

- Participants:
  - 18 healthy untrained males between 25 and 34 years old
- Methods:
  - Performed 8-12 repetitions of upper body exercises (bench press, push-ups, lat pull-downs, arm curls) and 15-20 repetitions of lower body exercises (knee extension, hip flexion, back squats) with a 30-second rest between exercises.
  - Measured cycling time to exhaustion, VO2 Max, blood lactate.
- Results:
  - Significant reductions in lactate concentration at exercise intensities ranging between 55 and 75% of max VO2.
  - Improved endurance performance was associated with a 12% increase in lactate threshold
  - Significant improvements of strength: 31% increase in knee extension and 35% in knee flexion
- Conclusions:
  - **Strength training improves cycle endurance performance as related to increases in lactate threshold and leg strength.**

Marcinik, E. J., Potts, J., Schlabach, G., Will, S., Dawson, P., & Hurley, B. F. (1991). Effects of strength training on lactate threshold and endurance performance. Medicine and science in sports and exercise, 23(6), 739-743.

Strength Training: The Research

- Participants:
  - 16 competitive male and female road cyclists between 23-47 years old
- Methods:
  - Measured cycling economy and work efficiency at 70% VO2 max, and time to exhaustion at maximal aerobic power (progressive test to measure maximum watt output possible over a 5 minute period)
  - Performed half-squats using a smith machine, 4 sets of 4 reps, 3x/week x 8 weeks as a supplement to their normal endurance training.
- Results:
  - Significant improvements in 1RM, Rate of Force Development (16.7%), cycling economy (4.8%) (the oxygen cost for a given power output), and time to exhaustion at pre-intervention maximal aerobic power (17.2%).
  - Strength training did not change VO2 max, cadence or body weight.
- Conclusions:
  - **Maximal strength training improves cycling economy, efficiency and time to exhaustion at maximal aerobic power in competitive road cyclists.**

Sunde, A., Støren, Ø., Bjerkaas, M., Larsen, M. H., Hoff, J., & Helgerud, J. (2010). Maximal strength training improves cycling economy in competitive cyclists. The Journal of Strength & Conditioning Research, 24(8), 2157-2165.

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Strength Training: The Research

- Participants:
  - 20 well-trained male and female cyclists (25-32 years old). Divided into two groups: usual endurance exercise + strength and usual endurance exercise only.
- Methods:
  - Measured mean power output in a 5-min all-out trial following 3 hours 5 minutes of submaximal cycling at 44% of maximal aerobic power output.
  - Four lower body exercises were performed 2x/week x 12 weeks for 3 sets × 4–10 reps. **Strength program**: Half-squat in a Smith-machine, single leg leg press, single leg hip flexion, and calf raise. 1 sec concentric, 3 sec eccentric
- Results:
  - Improved 1 RM in half-squat ($P \leq 0.001$), reductions in oxygen consumption, heart rate, blood lactate concentration, and rate of perceived exertion during the last hour of cycling.
  - Increased mean power output during the 5-min all-out trial (from 371 to 400 W), while no change occurred in the exercise only group.
- Conclusions:
  - **Adding strength training to usual endurance training improves leg strength and 5-min all-out performance following 185 min of cycling in well-trained cyclists.**

Rønnestad, B. R., Hansen, E. A., & Raastad, T. (2011). Strength training improves 5-min all-out performance following 185 min of cycling. Scandinavian journal of medicine & science in sports, 21(2), 250-259.

Strength Training: The Research

- Participants:
  - 15 competitive cyclists without history of performing core exercises more than 1x/week.
- Methods:
  - First test: Performed an exhaustive cycling protocol consisted of cycling at 25.8 km/hr while the grade was increased 1% every 3 minutes.
  - Second test: Subjects performed a 32 minute circuit of 4 sets of 7 exercises (40 seconds effort, 20 seconds rest) designed to target core stabilizer muscles in multiple planes of motion, followed by second cycling test.
- Results:
  - Frontal plane knee motion (test 1: 15.1°; test 2: 23.3°), sagittal plane knee motion (test 1: 69.9°; test 2: 79.3°), and sagittal plane ankle motion (test 1: 29.0°; test 2: 43.0°)
  - No significant differences were demonstrated for pedaling forces.
- Conclusions:
  - **Core fatigue altered cycling mechanics that might increase the risk of injury because the knee joint is potentially exposed to greater stress. Improved core stability and endurance could improve alignment of the lower extremity when riding for extended durations.**

Abt, J. P., Smoliga, J. M., Brick, M. J., Jolly, J. T., Lephart, S. M., & Fu, F. H. (2007). Relationship between cycling mechanics and core stability. The Journal of Strength & Conditioning Research, 21(4), 1300-1304.

Needs Analysis

Movement patterns and muscle involvement:

Cycling flats and uphill

- 10 - 110 degrees knee flexion
- 30 - 70 degrees hip flexion
- Minimal ankle movement
- Core tension prevents excess spinal movement forward backwards, side to side and rotational

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Needs Analysis

Movement patterns and muscle involvement:

Mountain biking downhill

- One foot forward
- 45 - 90 degrees hip flexion
- 10 - 50 degrees knee flexion front leg, 30-70 degree knee flexion back leg
- 45 - 90 shoulder horizontal abduction.
- 45 - 90 elbow flexion.
- Minimal wrist or ankle movement
- Core tension to maintain neutral spine

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Needs Analysis

Common sites for overuse injury despite proper bike fit:

- Lower back pain (cycling uphill or downhill) – core stability, tight hips
- Tight or painful hip musculature (weak, poor control or poor flexibility)
- Patellar tendonitis (quad dominance, quads tight/weak)
- Neck pain (poor thoracic mobility)
- Forearm tendinitis: golfers or tennis elbow (over gripping, underuse of lower body and weight shifting)

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Goal Exercises: *Let's move!*

- Warm up (5-10 minutes)
  - Muscle mobility and control (10 for each side)
    - Spider lunge stretch (hip flexor, glutes, calves, thoracic, shoulder)
    - Single leg hip hinge (hamstring and balance)
    - Standing pigeon stretch (glutes and balance)
    - Release or strengthen individual problem areas (e.g. thoracic mobility, tight hips)

Goal Exercises: *Let's move!*

- Primary strength (40 minutes)
  - Half back squat (90 degree depth) – **barbell or smith machine**
  - Bent over barbell row - **barbell**
  - Kickstand deadlift - barbell, dumbbell
  - Chest press (elbows at 45) – **barbell**, dumbbell, elastic band, push up
  - Step up - barbell, dumbbell

- Accessory strength (10 minutes)
  - Front plank
  - Hamstring curl variation
  - Side plank variation

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Goal Exercises: *Let's move!*

BONUS!

Rolling!

- Summersault:
  - Forward
  - Slight lateral to the right
  - Slight lateral to the left

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1) Prepare for Training

- How often: 2-3x/week
- How long: 4 weeks
- Load: Light (40-60% 1RM) progressing to moderate (70-80% 1RM)
- Sets per exercise: 3-5
- Reps per set: 15 reducing to 10
- Rest between sets: 1 minute increasing to 2.5 minutes

- Accessory Strength: 2 sets to fatigue

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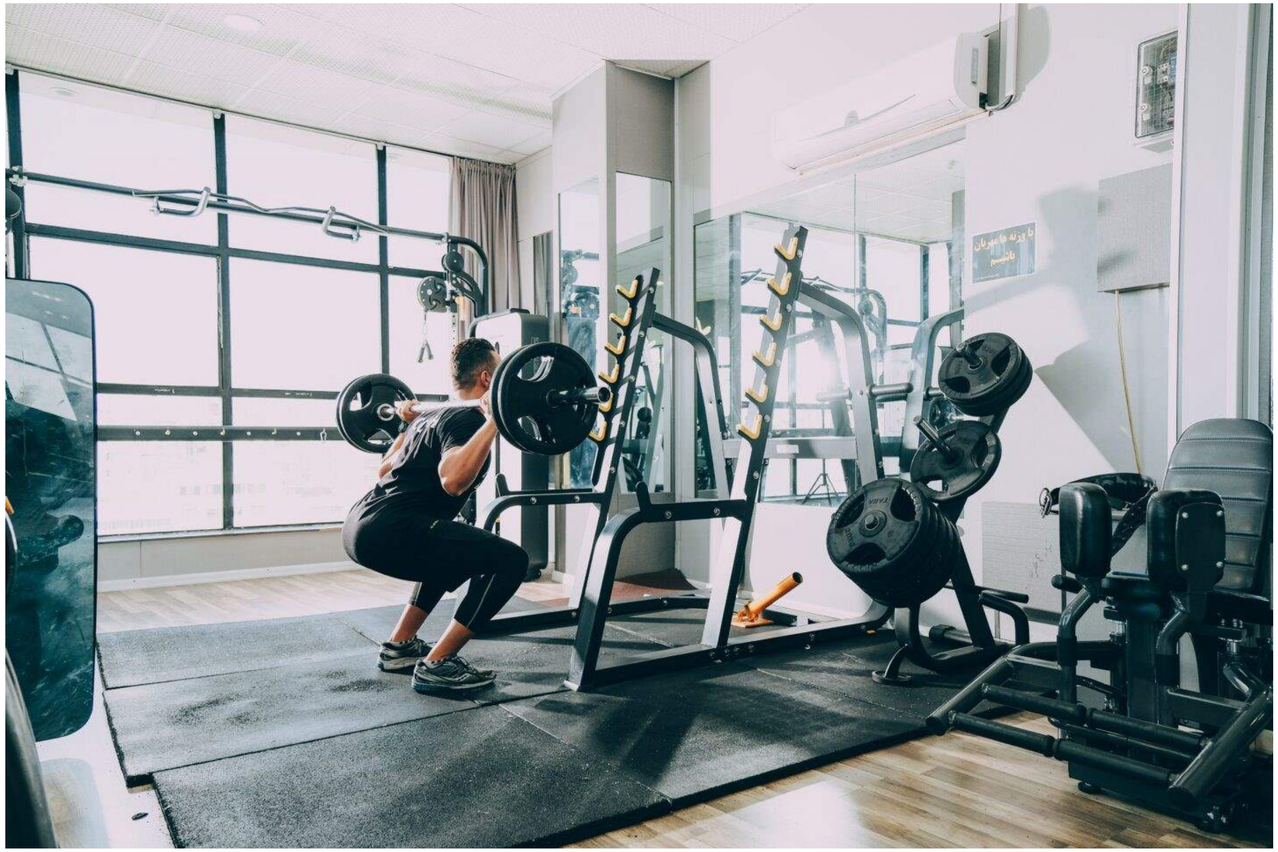
2) Base Training

- How often: 2-3x/week
- How long: 4-6 weeks
- Load: Heavy (85-95% 1RM)
- Sets per exercise: 3-4
- Reps per set: 5
- Rest between sets: 3 minutes

- Accessory Strength: 2 sets to fatigue



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3) Maintain The Base & Focus On Bike Fitness

- How often: 1x/week
- How long: The remainder of your season
- Load: Moderately Heavy (60-85% 1RM)
- Sets per exercise: 2
- Reps per set: 8
- Rest between sets: 1.5 minutes

- Accessory Strength: 2 sets to fatigue

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Thank you – Q & A

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