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The Back-Up Plan: A Guide to Cross Training

Tips and Tricks for Injured Runners with Performance Goals

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Introduction

So, you're injured. Unfortunately, you're in good company- research suggests that anywhere from 30-80% of runners become injured each year!

As an Olympic runner, I've had my fair share of injuries - a stress fracture, tendonitis, sprains, strains, tears, dislocations, even a concussion! Through these, I've learned that even for world-class athletes, training is rarely perfect and there is always more than one path to achieving a goal. I've qualified for multiple national teams and set a national record shortly following major injuries by working my butt off and keeping my head on.

Training while banged up can be tough to navigate, and I want to share my thoughts on cross training in hopes of helping others – I've accrued too much experience *not* to!

Every injury and every athlete are different. This document is based solely on my experiences and is meant to empower you with knowledge as you recover from your injury. Injuries should **always** be diagnosed and managed in consultation with a medical professional, and health must **always** be prioritized over performance.

This guide is written primarily for those who complete regular structured training including harder interval sessions ("workouts") as well as easy recovery days, and likely have performance goals such as a race. Enjoy!

My Story:
Injuries and My Athletic Career

I started training with a track and field club in Grade 11 after competitively Irish dancing all throughout grade school. In my early running days, I "recovered" from track sessions with my dance practices, spending hours a day pounding my feet against hard wooden floors, asphalt, track, etc. During those years, the worst injury I ever suffered was a sprained ankle and I naïvely believed that I was indestructible! Turns out I hadn't been blessed with a unique gift of invincibility - I was just *young*.

After a promising high school track career that included competing in the World Junior Championships, I accepted an athletic scholarship to West Virginia University. There, I became well-acquainted with cross training after dealing with injuries highlighted by a serious bout of achilles tendonitis and a shoulder dislocation after being hit by a car. I remember being devastated while unable to train and compete with my team! I was willing to do anything to get back to racing but didn't know how to cross train properly and felt exhausted and unsettled. Was I doing enough? Too much? I graduated with an All-American accolade but felt I hadn't reached my potential.

After graduation, I returned home and began a Master's degree in Exercise Physiology while continuing to train. Fortunately, I was able to string together a solid stint of healthy running and progressed greatly. I've since run a personal best of 15:06 in the 5000m, am the Canadian record-holder in the indoor 3000m (8:46.50) and have represented Canada more than 15 times including at the Olympics and the IAAF World Championships in cross country, indoor, and outdoor track. What these stats don't showcase, however, is the array of injury niggles that have continued to plague my training.

In 2015, the year before the Rio Olympics, my training was going phenomenally...until disaster struck. At the end of a typical practice – a 25 minute tempo run and some strides – my achilles suddenly twinged, HARD. Putting weight on my leg was excruciating and finishing the session was definitely not an option. I withdrew from my first senior World Championships in order to heal after an ultrasound showed a few small tears in my tendon. I wasn't back to normal training for nearly four months, instead spending lots of time in the pool and gym in desperate efforts to maintain fitness for Olympic qualification which was only a few months away.

Returning to running was shaky after my long layoff, but within weeks I was as fast as prior to the injury. However, I wasn't in the clear. Later that spring I suffered a calf strain, a remarkably pesky injury that makes running impossible. I returned to the pool and gym, furiously training alongside grannies in aquajogging classes in order to give myself the best chance to run under 15:24, the Olympic qualifying time. I wasn't ready to compete until the last opportunity to race, only a week before the qualification deadline. Thankfully, my cross training regime paid off and I managed to run 15:23.15, three weeks after returning fully to running, and was later named to the Canadian Olympic team.

2017 was healthier, though I missed about two months of typical training after colliding with another athlete and suffering a concussion. In 2018, hamstring tendonitis again confined me to the pool. With this injury, I missed a month of running workouts but was still able to run 15:18 in the 5000m two weeks after my return to regular training and hit a PB in the 1500m a few weeks after that.

I've been injured quite a bit, but in between these lowlights I've run some pretty fast races and made some pretty big national teams. I credit my success despite disruptions to an amazing team of coaches and therapists paired with a very robust cross training regime which I've fine-tuned over the years. Injuries are very annoying but no longer devastating as I've learned to leverage what I *can* do, rather than fixate on what I *can't*.

Cross training is rarely glamorous, but it works. As athletes, we know that when in the pursuit of a major goal, the grind is worth it! I've put together this document to help other injured athletes as I know how hard it can be to find trustworthy information on how to implement cross training successfully and confidently. I'm sharing what works for me and hope that it can inspire ideas and hope in you!

Cross Training and The Injury Cycle

What is "cross training", anyways? I'd define it as aerobic training, other than running, that is performed with the intent of enhancing running ability. Cross training can be used to improve fitness as a supplement to training or to allow the body to remain active during a period of recovery from injury, which is primarily addressed here.

Bodies become injured when they are no longer able to handle a load. This often happens with a change in training that is too aggressive and hasn't been adequately adapted to.

"Change" can be as subtle as:

- switching to a different type of running shoes
- transitioning to shorter, faster intervals in anticipation of racing season (i.e. running 1500m pace instead of cross country paced workouts)
- training on snowy pathways after a storm
- wearing spikes in a race that you rarely use in training
- increasing mileage during a training camp or when weather improves in the spring
- compensating form because of a blister

These scenarios represent a change in the forces applied to your body, and an injury occurs when your body isn't yet durable enough to handle the variation.

Injuries are often attributed to a specific moment but likely have been building over the preceding weeks or months. It's important to think long-term when reflecting on the causes of an injury rather than fixating on the "straw that broke the camel's back" – the moment where pain was first felt.

Most injuries are caused by a failure to adapt to training, caused by:

- Overloading the body (too much training volume or intensity)
- Poor recovery, especially:
  - low sleep (<8 hours/night)
  - undereating, causing a chronic calorie deficit or otherwise poor nutrition

As such, it is important to implement cross training carefully to ensure that it doesn't contribute to an over-stress/under-recovery cycle. For example, someone working a full-time job with a long commute to a gym trying to fit in double-day cross-training sessions may be under-recovered and better served by shorter single sessions and more down-time or sleep. Similarly, an athlete who is unfamiliar with a new mode of cross training may overstress their body while performing the new activity and should build volume and intensity gradually.

Over-working or under-recovering may prolong injury healing as the body has a finite amount of energy to delegate. I recall the story of a fellow athlete sidelined with a stress fracture in her foot. She completed characteristically long, intense water running sessions as she was preparing for the World Track and Field Championships with a short timeline. Unfortunately, she accidentally worked *too hard* and despite not loading her foot as instructed, her stress fracture showed no signs of healing on a bone scan at a six-week follow-up appointment. Unknown to her, energy she needed to heal her foot had been monopolized by her cross training regime – a truly tragic mistake which ultimately caused her to miss the World Championships. Cross training is a great way to maintain or improve fitness, but the demands it places on the body must be respected for it to be useful.

In the same way, cross training introduces a new stimulus to the body. Whenever possible, incorporate a variety of different cross training modes to challenge your body in different ways without overloading. This prevents too much adaptation towards one certain mode – you don't want to become a quadzilla from biking excessively, for example, if your goals ultimately relate to running performance. It's also important to build into cross training over a few days – a cross-training overuse injury would be an ultimate low blow!

When reading this document, consider a few initial practical recommendations:

- Trying to gain or maintain fitness while injured can potentially slow injury healing IF you become over-stressed or under-recovered. Prioritize recovery and injury healing, even if that means reducing training.
- Consider lifestyle factors when making a cross-training plan. Account for work, family obligations, and time demands such as commutes to the gym, rehab exercise time, and medical appointments.
- When adapting to the new training load imposed by cross training, use the same principles that you would with running. Build up a base of “mileage” before adding intense interval work and increase volume and intensity gradually.
- It may be helpful to integrate some form of cross training into your regular run training when healthy in order to offload the repetitive act of running and to become accustomed to other modes of exercise

Weekly Training Structure

When training for performance, a week of running normally includes a mixture of "hard" intense interval workout/speedwork days and "easy" recovery/mileage days of varying duration. A cross training schedule should be no different.

It can be helpful to think of the purpose of each exercise session as a "dose" of some parameter of training. Each different type of training session, whether it be hard or easy, provides a different dose of stimuli to create physiological changes and adaptations within the body, all of which are important for improving fitness and running ability. When planning cross training, simulating a normal run-training week ensures varied doses of training where no stimuli are neglected.

Some athletes tend to make ALL cross-training sessions extremely hard in efforts to "maintain fitness", to "get a better workout", or simply to burn off the anxiety that accompanies an injury. This isn't necessary and can be counterproductive. Like any structured training program, a weekly cross training schedule should be polarized with a balance of high-intensity sessions and recovery sessions. Otherwise, you risk becoming too tired to perform harder days well while failing to recover and grow stronger on easier days.

In a typical week (once adapted to cross-training), I'll do two or three hard interval sessions, always alternated with lower intensity recovery ("easy") days. One day a week will typically be longer, mimicking a long run. I also take at least one day off to allow my body to rest and recover. This schedule allows me to get similar doses of training stimuli as with typical running training.

Here is an example of a week that I did while returning from an achilles injury:

Monday Sept 16th	AM	30 min Alter-G, working up to 90% body weight. *(easy effort)*
	PM	75 min water run workout: 2 sets of 8x2:30 mins hard/:30 sec easy. Weights. *(hard effort)*
Tuesday Sept 17th	AM	50 min bike ride outside. *(easy effort)*
	PM	60 min elliptical. *(easy effort)*
Wednesday Sept 18th	AM	90 min elliptical. *(easy effort)*
	PM	Weights, yoga.
Thursday Sept 19th	AM	60 min elliptical workout: 6x5 mins hard/1 min easy recovery. *(hard effort)*
	PM	45 min water run. *(easy effort)*
Friday Sept 20th	AM	30 min Alter-G, working up to 95% body weight + 15 min bike ride. *(easy effort)*
	PM	60 min water run, weights. *(easy effort)*
Saturday Sept 21st	2 hour "long" day – half elliptical, half water running. Elliptical included 4x8 mins hard/2 mins easy. *(hard effort)*	
Sunday Sept 22nd	OFF!!!	

*Note that I am a full-time athlete who runs about 70 miles/week when healthy. This should serve as an example, not a template!

Another example of a week for someone who runs about an hour a day, five days a week could look something like this:

Monday	60 minute elliptical *(easy effort)*
Tuesday	Pool workout. 5 min warm up, 5x5 mins hard/1 min easy. 5 min cool down. *(hard effort)*
Wednesday	OFF!!!
Thursday	Elliptical workout: 10 min warm up. 3 sets of 4 mins hard (2 min easy) 2 min hard (1 min easy) 1 min hard (2 min easy). 10 min cool down. *(hard effort)*
Friday	30 minute elliptical + 30 mins of strength exercises. *(easy effort)*
Saturday	"Long" day. 45 min elliptical + 45 min water run. *(easy effort)*
Sunday	OFF!!!

Notice that both sample weeks have a mixture of activities and durations spread out between more and less-intense days imitating "regular" training – whatever that means for a given athlete.

Cross Training Quirks

There are a few rules of thumb to follow when substituting runs for cross trains.

Because cross training is less weight-bearing than running, it's safe to somewhat **increase your training volume so long as you can recover adequately**. I don't believe in a magic equation like "7.5 minutes on the stair stepper is worth 884m of running" but will often add on a reasonable amount of time to a session. For example, rather than running for an hour in the afternoon, I might cross train for 70 or 75 minutes. That said, logging extra cross training minutes should never come at the expense of rehab and strengthening exercises assigned for injury healing and prevention.

During intense interval workouts, the **length of hard intervals can be increased and/or rest reduced**. While cross training, it is nearly impossible to work at as high an intensity as you would while running so it is important to adjust interval workouts accordingly These workouts should be very hard and require focus and motivation.

Monitoring Intensity with Heart Rate

Wearing a heart rate monitor while cross training can be very helpful to monitor intensity and ensure that you are exercising at an appropriate rate.

Exercise that is more full-body or against gravity is most similar to running and will evoke a greater heart rate response. For example, it would be expected to have a higher heart rate riding an elliptical than arm biking at a given perceived effort. Heart rate targets should be adjusted lower for activities that are less weight-bearing/full body. Note that monitoring heart rate doesn't work as well with exercise in water, as explained in greater detail in the "water running" section below.

Heart rate on easy days should be similar to that during easy runs. If you don't track your heart rate while running regularly, you can roughly estimate an upper boundary for training on easy aerobic days with the formula: 180-your age. Aim to keep your heart rate no higher than that number during easy sessions, and no lower than about 15-25 BPM below that number. For me, this range is around 130-150 BPM.

Monitoring heart rate during interval sessions can be very motivating. When I'm in the belly of a tough session and desperate to slack off a bit, I remind myself that I am giving myself a dose of minutes spent at a heart rate of, say, 175 BPM, and I know that time

working in that zone leads to fitness gains – it justifies the effort and inspires confidence that this uncomfortable hard work is meaningful and productive.

The heart rate response for each type of cross training is a bit different and you will learn your own responses with time. This is helpful for discovering which cross training mode works best for you! For example, I am an expert elliptical-er but the stationary bike exhausts my legs while my heart rate stays abysmally low, but I've spoken with friends who find the opposite.

Experiment with your heart rate "norms" on different cross training modes and establish boundaries and thresholds that make sense for you, based on the perceived effort required to meet the objectives of the session.

Cross Training Modes

There is no gold standard “best” mode of cross training as your injury, sporting history, preferences, and equipment availability should all be considered. However, it is important to avoid activities that cause pain as this can prolong the injury. A few of my preferred cross training modalities are described below.

Elliptical

The elliptical is one of my favourite cross training modes. The elliptical is a weight-bearing machine, meaning that you are loading your muscles, bones, and joints to support your body weight against gravity, though to a much lesser degree than running. Weight bearing exercise is ideal if it doesn’t aggravate your injury but is bad choice for injuries that need to be unloaded such as stress fractures.

- **Models:** Not all ellipticals are created equal, and I greatly favor machines that allow the user to adjust the incline, which I normally lower to as flat as possible. That way, my legs move more horizontal than vertical, similar to cross country skiing (or running). A non-adjustable elliptical will do in a pinch but may feel awkward and wobbly, especially when attempting an intense interval workout.
- **Workouts:** I find the elliptical very handy both for easy "mileage" days and interval workouts - typically mid-length intervals with short rest. To increase the quality of intervals, I like to challenge myself to get my heart rate as high as I can and to try and maintain a high cadence. For example, if I'm doing hard intervals at, say, Level 9, I may try and keep my cadence above 200 strides per minutes for the entire interval. These numbers are arbitrary but setting small goals can be a productive distraction.

Elliptical workouts can be very hard if you make them. I've been told by kind strangers at the gym that I look like a "bat out of hell" and leave training sessions drenched in sweat – the elliptical works!

During "easy" mileage elliptical sessions, I'll sometimes let go of the handles and pump my arms like I am running. Riding the elliptical hands-free entices more of a "running" motion by encouraging a slight forward lean, rotation through the t-spine, core stabilization, and weight placement in the forefoot rather than heel. Give it a careful try, if you can stay balanced!

Water Running

If you haven't water ran, are you even a runner?? Water running can feel like a mortal punishment to injured runners due to its loneliness and monotony, but it's a great option when instructed to do non-weight bearing exercise.

- **Form:** Many athletes focus on water running form, taking care to mimic a running stride. While this is important to some degree (especially with longer injuries), my philosophy is that land running and water running are different enough that getting a strong workout should be prioritized over form. As a general rule, aim to keep your chin above the water and torso as vertical as possible.

  Other parts of my body have occasionally become sore during or after a water run, especially my hips and shoulders. Overusing uninjured muscles to the point of pain would be a good reason to be more conservative in your form and to increase the length and intensity of sessions gradually.

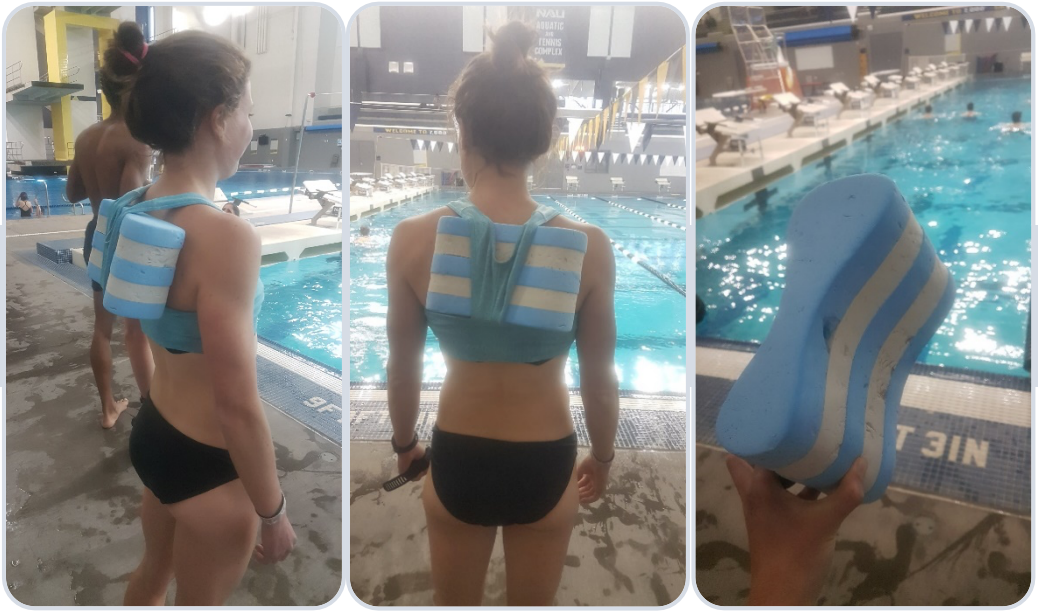
  Don't worry about how fast you move around in the pool. Water running speed depends entirely on form, specifically torso position – the more you are leaning forward, the faster you go. I tend to stay quite vertical, so I move very slowly!

- **Heart Rate and Intensity:** Heart rate will always be lower in water during exercise and is difficult to compare directly with land values. This is because water pressure in the pool pushing against the body improves venous blood return, allowing the heart to work more efficiently. As well, heart rate monitors don't transmit very well in the water. Heart rates also drop to resting levels very quickly during rest breaks, making it difficult to accurately take your pulse manually.

  Instead of using heart rate, I monitor intensity with water running subjectively. I typically work in only two effort zones: "hard" and "moderate". Intervals = hard. Everything else (recovery/mileage days/rest between intervals) = moderate.

  The number one mistake I see in water running is athletes accidentally going too easy during a "mileage" day, basically floating and kicking their legs. It's important to focus on the task and make sure to exercise moderately hard, breathing heavily enough that chatting with a friend is certainly possible, but a bit laboured. Similarly, “hard” water running should feel like hard land running. It is rare to "hit a wall" during an intense interval, so don’t worry too much about pacing for a long workout.

- **Equipment:** The decision to use a floating belt or go without is very individual as different buoyancies and water running techniques will affect how well someone floats. Another flotation technique to try involves stuffing a pull buoy inside a sports bra or bathing suit as pictured below (credit to Heidi See). I like this set up as it allows for more natural arm movement. Sorry boys – I have no suggestions for you!



Another option to increase the challenge of a pool workout is to attach a bungee cord or TheraBand tubing to a flotation belt, tying the other end to the pool deck. Tethering creates resistance as you work to run away from the elastic cord, increasing effort. This is also convenient when the deep section of a pool isn't very long.

Sometimes my shins and feet will get stiff from being rocked about in the water current after a long session, so I'll wear ankle brace socks to keep my ankles more stable. I also find that this makes water running a bit more difficult. You can find brace socks in the first aid section of any drug store.

Pro tip: I strongly suggest asking the lifeguards to blast music, purchasing a waterproof mp3 player, or clipping an old iPod shuffle to your hair (if you're feeling particularly daring!). Water running can be pretty darn boring, and music or podcasts are a very welcome distraction.

Alter G

The Alter-G anti-gravity treadmill is an incredible tool when full body weight is just a bit too much. The Alter-G treadmill permits running at anywhere from 20-100% of body weight using a harness and varying air pressures. This machine is especially handy when reintroducing running into a training program by adjusting body weight load to allow the user to remain below the pain threshold. Alter-Gs for public use can be found at some physio clinics or universities.

Load: If possible to do so pain-free, keep runs at a body weight of 85% or greater in order to preserve running mechanics - otherwise it feels a bit like bounding on the moon. If you are using the alter-g to reintroduce running gradually, you may need to run at a lower % body weight to remain below the pain threshold. This is fine - gradually increase % body weight over time to return to regular running smoothly and safely.

It can be tempting to run faster on the Alter G than on land because of the reduced body load - be careful not to go too fast for too long as this again places different forces on your body, creating another opportunity for injury.

Biking/Swimming

Biking and swimming are great options, especially for those who are already proficient. I failed swimming lessons three times as a child and I've never dappled in road biking so they aren't my first choices, but I absolutely see their value.

- **Biking:** Stationary bike interval workouts can be a great hit of intensity for injuries that prevent you from putting force through your calf such as achilles tendonitis. Spin classes are also great intensity days – they are HARD, and it can be refreshing to be instructed in a group environment rather than constantly grinding solo. I personally find that bike intervals beat up my quads

and leave my muscles feeling very fatigued, so I pick and choose when I do them.

Biking outside is an invigorating change from the gym. Long rides at a high cadence can be great easy "mileage" work and repeat intervals up hills can be very intense with a very satisfying downhill recovery.

- **Swimming:** Swimming is great low-impact full-body exercise, particularly for those with a swimming background. Because swimming biomechanics are so different from running, swimming can be very useful to unload the body and allow it to recover from the pounding of running miles.

Brisk Hikes, Incline Walks, and Stair Stepper Machine

Walking uphill (aka hiking) is an underrated form of cross training, especially when done briskly. Treadmill walks at an incline or a stair stepper are similarly good options. The biomechanics and loading patterns of uphill walking are comparable to running, and it's possible to get your heart rate quite high if you walk quick and steep enough.

Arm Bike

Been there, done that, would not recommend.

Injury and Mental Health

Injuries are tough, no doubt about it. Running is an activity that promotes endorphins, social interaction, and a sense of accomplishment and self-identity - all important for well-being. Big injuries can come coupled with feelings of anxiety, sadness, loss, and guilt for experiencing so much stress over something so "trivial". In honest conversations with other athletes, it's evident that these feelings are very common. The first injury can be the most difficult to manage as you learn how to cope, but I promise that the resilience you develop pays dividends when managing other injuries and adversity along your path.

I can't stress enough how important it is to take care of yourself. Remember and believe that injuries are temporary. In the vast majority of cases, you DO heal. Find comfort in the fact that you CAN still train in a worthwhile way with cross training, and that this rough period will pass. Take advantage of your time off from running to do other things -spend more time with friends, attend a wedding or concert you wouldn't have been able to otherwise, try new fitness classes, etc.

Research shows that stress and anxiety hinders healing and increases inflammation, so maintaining a positive attitude can actually help with recovery. Try not to dwell on the annoyance of cross training and frustration of missing running - just put on your work boots (or sneakers), get 'er done and move on!

Healthy readers: go hug an injured runner and treat them to an ice cream cone!

Tips to Expedite Healing

Cross training can be a real time-consumer and runners have a nasty tendency to think that aerobic exercise is the be-all end-all. That said - don't neglect the little things!!

+ **Exercises:** A good therapist will give you exercises to strengthen key areas in order to heal your injury or prevent future occurrences. My physio claims that only 1 in 14 people do their assigned physio exercises – make that person be you. You've invested way too much time, energy, and money into the sport to not devote 10 minutes a day to something that will make a difference.

  A period of injury can be a great chance to reflect on why you became injured and devote some of your modified exercise routine to strengthening vulnerable areas in your body to become more durable in the future. Sometimes an injury can be a blessing in disguise as it creates an opportunity to address neglected areas in your training, bringing you to another level when you are healthy again.

+ **Lifestyle:** Don't neglect sleep, hydration, and a healthy diet. Your body is working to repair itself, so give it the tools it needs. Calories should never be restricted during an injury; rather, a healthy, nutrient-dense diet meeting energy needs should be emphasized.

+ **Footwear:** Supportive footwear is key! Thank your lucky stars that we live in a time where sneakers and Birkenstocks are considered fashionable. Ditch those flip flops, pronto!

Returning to Running

Clearance to begin running again unfortunately isn't a green light to jump back into regular run training full-throttle, and reintegrating running safely is a challenge. The action of running is much more aggressive than cross training as each running step transfers a force equal to 6-8 times body weight through muscles, bones, tendons, and ligaments. Since your body will not be used to it, returning to running must be done **gradually** to avoid reinjury.

One downside to cross training is that it is SO effective that you can become more cardiovascularly fit than your body frame is ready to handle. You are then predisposed to another injury because your body isn't ready to tolerate the speed that your aerobic system is ready to unleash- like having a Ferrari engine in a 2003 Chevy Cavalier chassis (my car!). This is seen in athletes who train well following an injury, only to become injured again soon after.

Vigorous cross training and a quick comeback to running may be a worthwhile calculated risk if training for a major event that is quickly approaching. More ideally, running should be reintegrated mindfully and with discipline to allow the body to become strong enough to eventually tolerate running as you wish (ie. MORE GRADUALLY than you want to!)

Start with slow, short, easy runs before gently reintroducing intensity. Build the length of runs before progressively adding speedwork as it is much more demanding on the body.

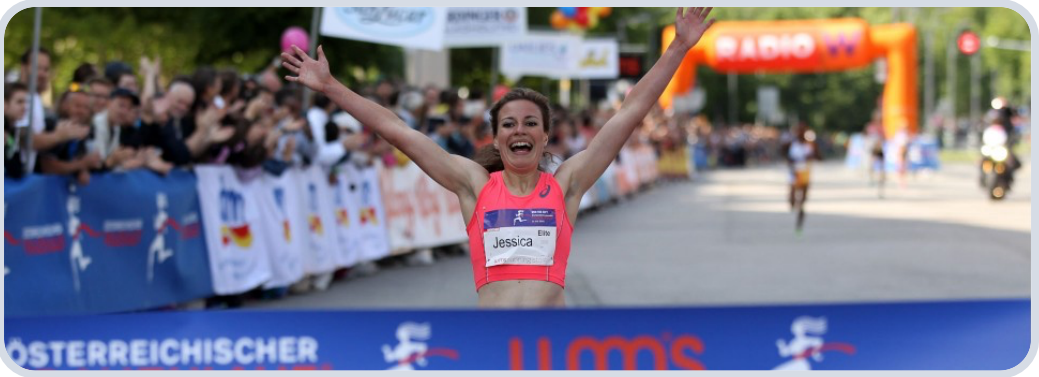
While transitioning back into running, cross training remains relevant. "Easy" days can initially be done part-running and part-cross training to meet volume needs. Until a base foundation of easy running has been established, any "hard" workouts should be done with cross training. Running may feel awkward or unnatural at first, but this will fade with practice and doesn't mean that your cross training was ineffective.

If you feel like your return to running is frustratingly slow and that you are being held back by your therapist or walk-run program rather than by your symptoms, you are probably actually nailing your progression and improving the odds of a healthy, safe return to the sport you love!

Summary

- Cross training WORKS and can be a great way to maintain fitness
- Structure training like you would when healthy with interval workout sessions, easy mileage/recovery sessions, and longer sessions
- Work hard but don't beat yourself up. Your body needs energy to heal.
- Heart rate monitors are a great tool to monitor intensity
- Always make gradual changes and introduce cross training modes slowly
- Use a variety of cross training modes if possible and never cross train through pain
- Prioritize rehab exercises and therapy appointments over training
- When reintroducing running, begin with slow easy runs and gradually reintroduce intensity
- This too shall pass – take care of your emotional and physical well being
- Healing comes above all else

All the very best with your recovery!



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