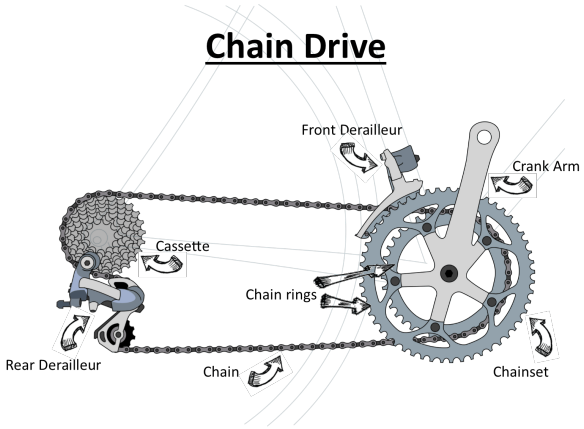
Why Do We Ride Multi-Speed Bikes?
Getting The Most from Your Gears

On a recent ride I was reminded that not all cyclists are getting the most from their multi-speed bikes. Since most of us also drive a motor vehicle, I will use them as a mirror to our cycling to help clarify concepts. So why do we have multi-speed bikes?

The reason can be summed up in one term – **mechanical advantage**. On the surface this may seem simple but achieving and maintaining mechanical advantage is not so simple. I often see a number of scenarios where cyclists are not using their gears effectively for their situation. Here are a few examples.

1. The cyclist is rocking their upper body side to side, bringing body weight over the pedal to get on top of gear that is too high. This wastes energy and sometimes leads to saddle sores as the ischial tuberosities (sit bones) slide side- to-side on the saddle.
2. The cyclist rides up to a stop sign or light without downshifting. Upon starting out several possibilities often play out.
    a. Realizing that the gear is too high upon starting out, an attempt is made to downshift under high pedal pressure, accompanied by loud protests from the rear derailleur. This has resulted in twisted chains and bent gear teeth.
    b. The rider toughs it out in the saddle or stands up to get on top of the gear. In heavy traffic this can be a serious situation since the cyclist cannot clear an intersection quickly enough.
    c. The rider just cannot get on top of the high gear, loses momentum and falls.
    d. Several false starts occur, again resulting in a cyclist not clearing the intersection promptly.
3. The rider has two or three gears that are "favourites" and uses the front derailleur to achieve those gears - effectively turning their 10-speed triple chainring drivetrain into a 3-speed or a double chainring drivetrain into a two speed.
4. A rider remains on the big chainring far too long as a hill is encountered. A too-late shift of the front derailleur under high pedal pressure results in a dropped chain.
5. A cyclist comes to the foot of a climb and immediately shifts to too low of a gear. With legs windmilling madly, their momentum plummets and their ride up the hill takes longer. Following riders are often forced to pass the rider who has virtually come to a stop.



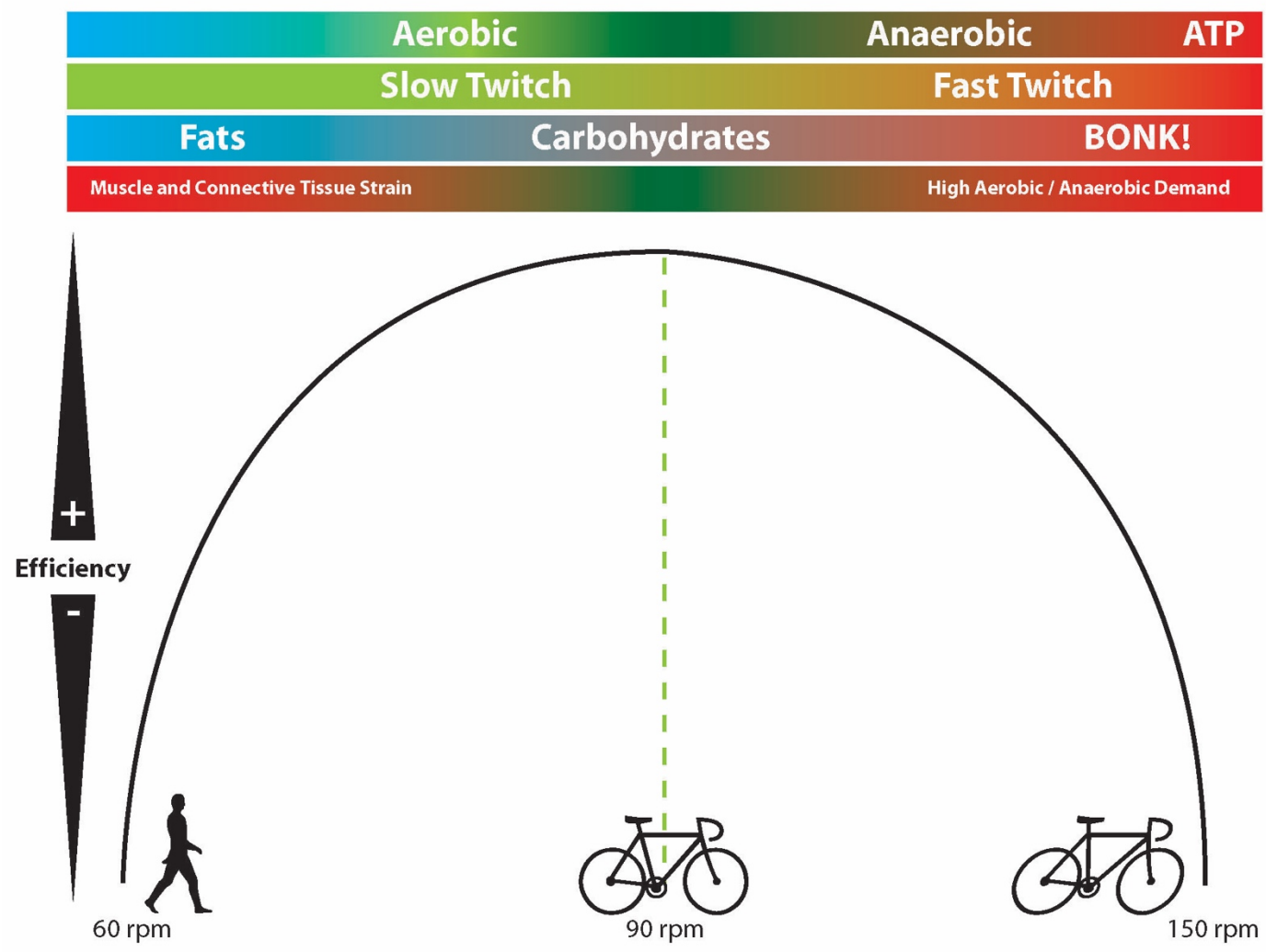
6. The rider is constantly shifting front and back derailleur searching for the "right gear," one moment the legs are whirling wildly, the next moment they can barely turn the cranks over.
7. An Electric Assist rider pays little attention to their gears letting the assist do all the work. Too high a gear – ah just turn up the assist! On some systems this can lead to accidents, especially if the rider has been using the assist on a high level and neglects to turn it down when starting out. The system sees high pedal force, low pedal rpm, low road speed and responds by applying too much assist. The bike accelerates like a top-fuel dragster and the rider crashes into other riders or an immovable object.
8. A rider only uses the small chainring and a few gears of the cassette (overgeared).

So why do these situations occur over and over to cyclists? In your automobile the automatic transmission uses a myriad of inputs to the drivetrain control system to make good decisions about what gear to be in at what time. Just think about what would happen if your car stayed in 4th gear when you came to a stop. Pulling away the car would either stall, or at the very least, the engine would strain to accelerate. Needless to say, the car would be promptly booked in with the dealership for repair. On a bicycle, the rider is the computer, considering several factors, to arrive at an appropriate gear. Bottom-line the rider needs to change.

So, how do we make best use of our gears?

In our cars the automatic transmission shifts to keep the engine in the right rpm range for the load encountered. As a cyclist we need to fully utilize our gears to make best use of our muscles, connective tissue, and cardiopulmonary system. We monitor our cadence and perceived effort to assess the load on our body. Visually, we assess the road ahead for hills and speed changes in the group and stops. We sense the wind direction and speed. We self-assess how we are feeling and adjust our gears to suit how our body feels.

Automobile engineers consider at what engine rpm it produces the most power and torque to balance out how the vehicle drives under all load conditions. For cyclists, we must balance our muscle strength/endurance and our heart rate/respiration. Simply put - we use gears to maintain our rate of exertion and energy levels within limits. The diagram below represents the balance we must achieve to be effective cyclists. The **Energy Pathway** (top), **Muscle Fibre Type** recruited (2nd), **Fuel Source** (3rd) and costs to the body (4th) are all factored in.



Going back to my observations, what actions can be taken to make our cycling lives easier and more effective.

1. Assess which gears you are using. As stated earlier only using the small chainring and a portion of the cassette almost exclusively means that your bike is over geared for your current strength.
    a. Weight train or ride lots of hills to improve leg strength.
    b. Switch out a 2-speed front crankset to a 3-speed crankset. NOTE that the 3-speed crankset is both heavier and dropped chains are more common.
    c. Look into what options you have to changeout your gears. The most dramatic changes are achieved by changing the front chainrings (e.g., a traditional 53/39 to a 50/36 or 50/34). This will also mean changing the crankset in most cases.
    d. Change the cassette (e.g., 10-21 to a 12-34).
    e. Change both cassette and crankset chainrings. NOTE these changes may require changing the derailleur(s). Derailleurs have a maximum tooth range that they can accommodate, so if your new cassette exceeds the tooth range of the current derailleur you must change to a longer cage derailleur.
    f. Finally, consider an electric assist bike. The new electric assist road bikes are very sleek with, albeit lower capacity (size) batteries.

2. Look at your front derailleur as being 2 or 3 ranges of gears. On a 3-speed crankset:
    a. the smallest gear (granny) is for the steepest terrain (5 to 10 percent +) or when winds are very high. Allow for additional weight (loaded touring) being carried when selecting a granny gear.
    b. the mid-ring will be where you will live most of the time as it offers the range of gears you would use in rolling terrain where climbs are relatively short and are 2 to 5 percent.
    c. the big ring is for relatively flat conditions (1 to 2 percent), light loads, and higher speeds.
    d. your cassette is where you fine-tune the range you are in and will get shifted often using the entire range of gears if they are appropriate.

A two-speed crankset simply means the elimination of the granny gear, so the gearing selected must accommodate the full range of conditions that you expect to encounter.

3. Break the habit of “favourite” gears. If your gears are properly selected for your strength and endurance, then experience the full range of your gears and learn where you need to be - considering:
    a. Load – weight, hill steepness/length, and wind direction and speed.
    b. Speed of the group that you’re in.
    c. When upshifting the front derailleur first, quickly downshift your cassette a couple of gears, then shift the front derailleur. This reduces the difference in cadence between your gear on the small chainring and your new cadence when you shift to the big chainring. The opposite, when downshifting the front derailleur, is to upshift the cassette a couple of gears just before you downshift to you smaller chainring. Also, when you go to stand up to pedal upshift your cassette a gear or two. Using body weight (standing) will result in a faster pedal speed that will break your pedal rhythm (cadence).

4. Speaking of hills. Learn to actively scan ahead and judge the length and grade of a hill. Cycling computers that can display the percentage of a grade and can be valuable here. Learn to recognize a 2 percent grade (rails to trails are generally 2 percent or less, as locomotives in the past couldn’t pull a typical train on grades of 2 percent or more). Many of the paved bike path climbs out of the Saskatchewan River valley are 10 percent or less – however there are a few exceptions. You can check the planned route on Ride With GPS™ to see where the climbs are and their grade. Ride the route and take note of what each hill looks and feels like.

5. Be ready for the hill ahead by being in the correct range (front chainring) that you expect will allow you to successfully climb the hill – this will come with experience. Remember to upshift your cassette a couple of gears to avoid those windmilling legs, as you move to a smaller chainring, Then move through your cassette as the grade increases or decreases. DO NOT try to change the front derailleur on a steeper grade, as very few groupos will manage this and a dropped chain is a real possibility.

6. Make full use of the cassette on an Electric Assist bike downshifting and upshifting the same way you would on a regular bike. The system was designed to provide smooth assist under most conditions. The current lithium-ion batteries have a full-charge cycle life, meaning that the number of times that a battery can be taken from completely dead to full charge is limited. Partial recharges are aggregated to count as a full charge. Essentially, many smaller recharges are better than fewer deep recharges. By fully utilizing the gears on the bike you use less charge from the battery, so the battery life, before replacement is necessary, will be extended.

To get the most pleasure, reduce injuries and get the most life from your drive train simply make full use of it the way it was designed. Sounds simple - and it is.