

Flat Pedal Revolution Manifesto

“How to
improve your
riding
with **Flat
Pedals**”



STRENGTH TRAINING SYSTEMS

RIDE HARDER, RIDE FASTER, RIDE STRONGER

Manifesto (noun): a written statement declaring publicly the intentions, motives, or views of its issuer.

The Flat Pedal Revolution Manifesto is the result of a long and unintended journey. As a strength coach with a passion for mountain biking I never wanted to become a leader of the Flat Pedal Revolution, much less put together this manifesto for the cause. However, it is a cause that I have embraced and feel is worth fighting for.

At the heart of this revolution is **a fight to debunk the common myths about the value and drawbacks of both flat and clipless pedals**, especially for new riders. Everyday mountain bike riders are told by people at bike shops and trail heads that you can't pedal nearly as efficiently or effectively without clipless pedals. Plus, every magazine and website you read has countless ads and articles touting clipless pedals and shoes, reinforcing the message that they are *essential* to mountain biking bad assery.

I know this because I've experienced it firsthand. When I started riding mountain bikes I was told that I *needed* to get into clipless pedals ASAP - only beginners and downhillers used flat pedals. I saw the charts showing how I needed to be attached to my pedals to allow for the most efficient pedal stroke. **Although I was having fun and making progress on every ride I also felt that I was somehow holding myself back by riding flat pedals.**

Eventually I decided to take the plunge and try clipless pedals for a few trial runs around my neighborhood. After falling over at a stop sign because I couldn't get unclipped I figured I would have died if that had happened on the trail and decided to go back to my flats - they were way more fun and less stressful.

I figured I would take flats as far as I could and switch to clipless pedals when I felt that my pedals - and not my fitness and skills - were holding me back. After more than 10 years of riding I'm still waiting for that day...

These myths also keep a lot of riders trapped using clipless pedals despite the fact that they don't like the mental stress of using them. I get emails every week from riders thanking me for "giving them permission to try flats" (their words, not mine). **They tell me how they have rediscovered their passion for the trail because of flats, otherwise they might have simply quit riding.** Plus, they all report no decrease in speed on the trail, simply more fun and less stress.

Over the years I've not only seen how well you can perform with flat pedals - both with myself and with other amazing flat pedal riders I have met - but I've also come across a lot of information that explains why that is. **This info debunks the common myths surrounding the pedal stroke and how clipless pedals supposedly enhance it**, shedding new light on a subject that is still misunderstood by the vast majority of riders.

My hope is that this Flat Pedal Revolution Manifesto will serve as the jumping off point for a lot of thought and conversation about this subject. I created it as a resource for both myself and other riders to point other riders to quickly get them up to speed with core principles of the cause - flats can make you a better rider in some ways, just like clipless can make you better in others. Knowing the facts about each is the key to being the best rider possible.

As the only resource in the world that both debunks the common myths surrounding the pedal stroke and gives essential advice to help riders improve their performance on flat pedals **I hope that those of you who are already part of the revolution will point your friends and riding buddies to it when they ask why you wear flat pedals.**

If you are reading this because you are curious about flat pedals and haven't tried them yet I hope that this info will give you the confidence and tools you need to take that plunge. **Once you see that there is no magical pedal stroke only allowed by being attached to your pedals you'll be shocked to find out just how fast you can be on flats.**

So, in conclusion, remember that this is not about flat pedals being better than clipless pedals, it is about understanding the real value and application of both systems specifically for mountain bikers.

Being pro-flats isn't the same as being anti-clipless and misapplying either pedal system in the name of blind ideology isn't helping advance our sport as a whole.

Ride Strong,

James Wilson
MTB Strength Training Systems

p.s. I need to ask your help get this information to the riders who need to hear it. **Please post it on Facebook, Tweet it, post a link to it in the mountain biking forum you frequent - anything that will help spread the word about the Flat Pedal Revolution.** Like any true revolution, the only way it can be won is to work together on a grassroots level. My voice is nothing compared to our collective voices and this is information a lot of riders around the world need and are looking for.

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Part 1

Debunking Common Myths About Clipless Pedals

Being Pro-Flats Doesn't Mean I am Anti-Clipless

This article is one that sums up my overall position on this whole "flats vs. clipless pedals" debate. The internet is a double edged sword for me on this subject because, on one hand, it allows me a platform to easily get my ideas on this subject out there to riders who need the info but, on the other hand, **it is easy to read one thing I write and take it out of context.**

I have created a couple of dozen articles and videos over the last few years explaining the multiple layers of my position but **I understand that not everyone has read/ seen more than a couple of them, making it easy to misunderstand my ultimate position.** To add even more confusion, my blog has seen me flesh out my ideas and positions in front of a live audience and those things have evolved over the years.

I realized after my article on Which Muscles are Really Used During the Pedal Stroke (found on page 4 of this manual) that a lot of riders still think that I dislike clipless pedals and **every time I point out a myth about them or promote the use of flats I am, in essence, saying that clipless pedals suck and are worse than flats.** I think that some riders even envision me harassing everyone I see about the subject and will only ride with someone if they are on flats. However, this is far from the truth.

I wrote this in a response to a comment and I'll repeat it here because it sums up my overall position perfectly-

I am not anti-clipless pedals, I am pro flat pedals. I think that both have their place in riding, specifically I believe that flats make you better and that clipless can make you faster.

This is a very important distinction because it means that I am not saying that one is better than the other, simply that both have pluses and minuses and, unlike the vast majority of the cycling world, I champion the advantages of flats. I do believe that there are a lot of myths and half-truths surrounding the subject - mainly on the perceived disadvantages of flats - and **riders deserve to know both sides of the story before making a decision about which is better for them.**

I think that there are pluses and minuses to both pedal systems but for too long the deck has been stacked firmly against flats, **with a downplaying of any disadvantage to clipless pedals and no mention of any advantage for flats.** There were even some pluses being stacked on the clipless pedal side that simply weren't true, like the need for them to use the hamstrings during the upstroke.

All I am trying to do is help bring the whole story to the table, which means that I have to point out the advantages of flats, the disadvantages of clipless pedals and clear up the myths surrounding the whole subject. Taken out of context of the bigger picture that I am trying to even out an argument that is decidedly one sided it is easy to take those things and interpret my position as being "anti-clipless". **I almost have to come across as "anti-clipless" just to start dragging this debate back to center but I am really not a "flat pedal only" zealot.**

This really hit home for me a few weeks back when I found myself actually defending the use of clipless pedals for racing. **Clipless pedals do have advantages in high performance situations like racing and when someone started going down the road of flats being the best choice for everybody, all of the time I found myself defending their use,** given that whoever was using them could ride flats in the first place.

Which brings me to my last point - **what I am against is the use of clipless pedals before someone can ride at a proficient level with flats.** I think that there is a process for learning how to pedal and maneuver your bike on the trail and that it begins with flats and, even if you do use clipless pedals, you should retain your ability to ride at a reasonable level with flats. Flats keep you honest and force you to learn good technique and clipless pedals should make you faster by enhancing that good technique, but this is not the case with most riders on clipless pedals.

Most riders have never spent any real time on flats, much less a good set of flats and flat specific shoes like 5-10s, and instead went into clipless pedals right away. My message to them is not that they should throw their clipless shoes and pedals away but that **they will get more out of them and be better overall riders if they took a break from them and re-learned how to ride with flats.** After learning how to ride without them you'll find clipless pedals to make you even faster when you go back to them.

Before I close, I do think that it is important to point out the elephant in the room - **clipless pedals do contribute to crashes and scare new riders away.** I have spoken to too many riders who start their injury story off with "I couldn't get unclipped" and other cyclists who talked about how they tried mountain biking but being clipped in scared them to pretend that this isn't happening.

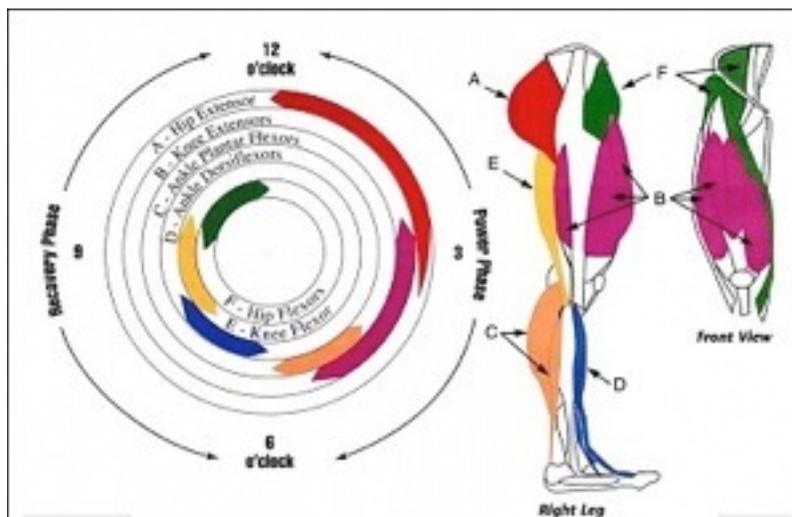
I think that new riders should spend at least 6-12 months learning on flats before considering the switch to clipless pedals. **The snobbery of riders who are able to ride clipless pedals at a high level and then dismiss people's very real fears and concerns with an "I've never had any problems so neither should you" attitude as they continue to tell every new rider they meet that they need to get clipless pedals ASAP is ridiculous.**

So ride clipless pedals, I honestly don't care. If you took the time to learn on flats and are using them for high performance/ racing situations then they can offer an advantage. **Just don't tell me that there are not very real disadvantages to clipless pedals for the new and average rider (especially for mountain biking) and that you can not be a very good rider on flats,** doing everything with them that you can with clipless. Being pro-flats isn't the same as being anti-clipless and misapplying either pedal system in the name of blind ideology isn't helping advance our sport as a whole.

Which Muscles are Really Used During the Pedal Stroke?

One of the most persistent myths in the mountain biking world surrounds the pedal stroke and goes something like this - without being attached to the pedals you can not use your hamstrings properly which forces you to rely too much on the quads to power the pedal stroke. By not being able to curl the knee joint during the upstroke of the pedal stroke you create muscular imbalances and tire out the quads faster, or at least that is what most of us have been told. **However, this understanding of which muscles are used and how they are used during a pedal stroke is completely wrong and potentially dangerous over the long run.**

When I ask why someone thinks that the muscles are used this way during the pedal stroke I am invariably led to some variation of this picture/ chart:



CLICK ON IMAGE FOR LINK TO HIGHER RES IMAGE

According to this theoretical model of muscles used during the pedal stroke the hamstrings are used maximally from 8 o'clock to 10 o'clock position while the glutes and quads are responsible for the downstroke part of the pedal stroke. **This paints a completely false picture of the situation and leads a lot riders to assume that the hamstrings are only there to flex the knee joint on the upstroke**, which would be impossible to do if you weren't attached to the pedals. This, of course, would mean that it would be impossible to optimally pedal without clipless pedals, which is where the faulty logic that tells riders that it is impossible to pedal optimally without them stems from.

The problem with this whole notion is that this chart is completely theoretical and based on how the muscles work in isolation from each other. Unfortunately, **the reality of how the muscles work together to create the actual pedal stroke movement is much different than what this chart tells us**. The model this chart is based on also assumes that all muscles that cross a joint are there primarily to flex that joint, as if the muscles on the front side mirror the actions of the muscles on the backside.

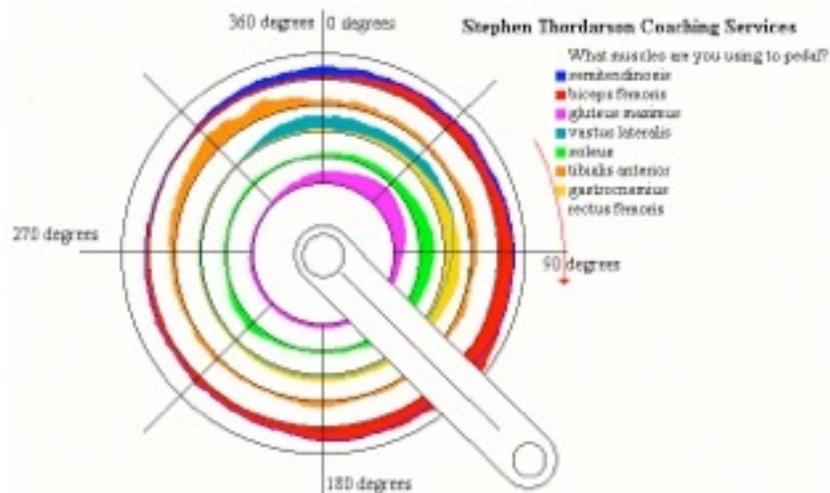
The human body is not set up so that the muscles are mirror images of each other - the hamstrings are not the "backside" quads. The hamstrings are made to powerfully extend the hips while less powerfully flexing the knee, the quads are made to powerfully extend the knee while less powerfully flexing the hip. Together they both work with and counteract each other to produce lower body locomotion. **Train the hamstrings to extend the hips and stabilize the knee and the quads to extend the knee and help stabilize the hip joint** - that is how those muscles function in real life and how we should train them, not based on the old model of training each muscle that crosses a joint to powerfully flex it.

In fact, trying to have a rider curl their hamstring to produce force on the upstroke is unnatural and asks the knee to produce force in an unstable position. **Your hamstrings are not made to produce power by curling at the knee** and instead are made to produce power at the hips while helping to stabilize the knee joint. The idea that you need to curl your leg through the bottom and upstroke portion of a pedal stroke is simply wrong and based on old and faulty logic - you want to extend the hip to push the leg through the bottom of the pedal stroke, not flex the knee.

Just like when running you don't want to produce power by flexing the knee, you simply use knee flexion to get the leg back into position for the next "push". The human body is made to push, not to pull, and **trying to apply pulling (curling the knee is a pull) to lower body locomotion isn't the most effective thing to do**.

You want to produce your power at the hips, not the knee joint. **The reason that a lot of riders have the knee issues is because the knee joint lacks stability, not strength**. On a side note this is why I am an advocate for standing up more to pedal because it forces the knee and hips joints to act and stabilize more naturally than seated pedaling does.

As an interesting side note, I came across this chart of a pedal stroke while researching this article. It looks like it was based on actual EMG readings, not a theoretical model.



CLICK ON IMAGE FOR LINK TO HIGHER RES IMAGE

As you can see the Biceps Femoris (fancy talk to hamstring) is most active on the downstroke and least active on the upstroke. In fact, **where first chart shows the hamstring to be most active is actually the place it is least active according to the EMG in the second picture.** In other words, the first chart is flat out wrong and in no represents what is actually happening during a pedal stroke.

Take another look at the second picture and you'll see how the downstroke finds all of the muscle groups lighting up and the upstroke sees very little activity by comparison. This also underscores the findings in the [Mornieux and Korff studies](#), which was that **a powerful downstroke with the lead leg and a more passive return of the trail leg was the most powerful and efficient way to pedal.** You shouldn't be worrying about trying to create power on the upstroke, which means that you can create the most powerful and efficient pedal stroke without being attached to your pedals.

So what does this mean for you?

1 - You can (and should) be able to pedal your bike very effectively with flat pedals. This myth is one of the most common ones I hear from riders as to why they don't want to try flat pedals when in fact flat pedals will actually clean up and improve your pedal stroke. I have written extensively about this on my site and before you assume that I hate clipless pedals I suggest you read the article [Just Because I am Pro-Flats Doesn't Mean I am Anti-Clipless.](#)

2 - You should train your legs to produce a powerful downstroke using the hips as the primary power source, not the knee joint. This means that leg curls and leg extensions are bad exercise choices since they reinforce this "knee powered" pedal stroke. Exercises like [single leg deadlifts](#) and [single leg squats](#) are much more effective since they train the legs to drive from the hips, not the knees.

3 - When riding don't worry about "spinning circles" or "keeping equal pressure on the pedals" or whatever else someone has told you that essentially means you need to curl the hamstring through the return portion of the pedal stroke. While a good, efficient pedal stroke may feel like you are spinning circles the reality of what your muscles are doing to produce that feeling are much different. Your body has one way to optimally produce lower body locomotion and you simply want to apply it to the pedal stroke.

The idea that you can not optimally use your hamstrings during a pedal stroke without clipless pedals is based on faulty logic and theoretical models. Now that we have a more accurate insight into what is actually happening we see that models like the first picture/ chart need to stop being used as a way to think about pedaling our bikes. The hamstrings are one of the more important muscles used during the pedal stroke but **it is how they work in concert with the other muscles of the lower body on the downstroke - not by themselves on the upstroke - that form the reality of pedaling your bike.**

Why you don't want to push through the ball of your foot **when you pedal.**

Your feet are an important contact point with the bike. Without your feet being in the right place you will pedal with less power, be less stable through technical trail sections and set yourself up for an overuse injury.

How we answered the engineering based vs. movement based question led us to a very different view of where we should place our foot on the pedal.

The problem is that most riders have been given the wrong idea about where to place their foot on their pedals. You see, we forget that at one point someone took a guess about where to place the foot on the pedal and today we simply take it as gospel.

But what if the original “pedal stroke theorists” were wrong? What if they didn’t realize that they were looking at things the wrong way and applying the wrong logic sequence to the problem?

In other words, what if the current advice about where to place your foot on the pedal is based on faulty logic in the first place?

But before we can even start getting into the logic sequence of where you want to place your foot on the pedal we need to back up and answer an even more important question...

Does pedaling a bike require an *engineering based* or a *movement based* solution?

For a lot of people this is the first time they have ever heard this question. They’ve always assumed that there was just one logic sequence you could use to arrive at the perfect pedal stroke so let me explain the difference.

And once I do you will see how important this question really is.

The engineering based solution looks at pedaling the bike from the bikes point of view – if we were going to design a machine to power this bike, what would we want it to do?

However, the movement based solution looks at things from the human organism’s point of view – how do we take the way the body is hardwired to optimally move and apply it to the bike?

For a long time the engineering based solution has been the dominate train of thought in pedal stroke theory. When you do that you can come up with all sorts of nifty ideas on how to add power to the pedal stroke.

The two most common pieces of advice from the engineering based solution are to pull up on the backstroke to keep even tension on the pedals and to place the ball of your foot over the axle of the pedal so you can push and pull through the ankle.

Both of these things make sense... in theory. If I was designing a machine from scratch to pedal a bike I'd have it pulling and pushing at the same time while also extending and pulling with every joint to add to the potential power.

The problem is that the human organism isn't a machine and comes pre-wired with ways it likes to move. For example, when you push down hard with your lead leg there is an automatic activation of the muscles that retract the other leg. Your body is pre-hardwired for you to focus on pushing hard and letting the Passive Mechanics of the body reset the other leg to push down hard.

Runners know that and this is why they don't try to add forward power with the return of the trail leg. They instead focus on simply driving their lead leg into the ground.

You waste energy and start to lose power when you try to overcome the body's pre-wired Passive Mechanics. And this is exactly what you see in the Mornieux (et al. Int J Sports Med 2008; 29:817-822) and Korf (et al. Med Sci Sports Exerc 2007; 39:991-995) Cycling Efficiency Studies I have referenced in the [Flat Pedal Revolution Manifesto](#).

This idea of a movement vs. engineering based solution extends to foot placement as well. From the engineering perspective you would want the ankle to extend so you could push through the ball of the foot. Heck, it even looks like how you run or walk so it has to have some basis in movement as well, right?

Again, not so fast.

When you look at the foot and lower leg from a movement based perspective you see that there are two very different ways for the lower leg to act.

The first is running, walking or jumping. In these activities you are wanting to move your center of gravity from over your base of support so you can change position in space. These does require a push off through the fore foot to "jump" in order to break contact with the ground so you can.



Pushing through the ball of the foot to propel ourselves forward.

But this isn't the only way that we move. We also need to move in a way where our center of gravity stays on top of our base of support. Squatting and deadlifting in the gym are good examples, as are bending over to pick up a box or standing up from a chair in the everyday world.

When we move this way we want our feet to stay solidly planted to the ground for maximum balance, muscle recruitment and power transfer. We don't want to come up on the ball of the foot because it will actually decrease strength and balance.



Feet staying firmly planted on the ground.

The foot and lower leg act very differently in these two situations and so we should figure out which most closely resembles pedaling so we can apply it. And when we are pedaling our bikes we are not actually moving our center of gravity forward – we are pushing the pedals away from us and the bike is carrying our center of gravity with it.

Pedaling your bike is much more like squatting or deadlifting than running or jumping. And when you look at the lower leg and foot mechanics of this type of movement you see that you do not want to be balancing on and pushing through the ball of your foot.

This is why you naturally go to a mid-foot position on flat pedals. If you don't have someone telling you that it is wrong and strapping your feet to where they “should” go most people would naturally find this foot position themselves and stick with it.

Your body, which is infinitely smarter than all of the experts who are “lecturing birds on how to fly” in this matter, instantly recognizes what they don't – that you are far more balanced and powerful in that mid-foot position than you are trying to balance on your toes.



Don't place the ball of your foot on top of the pedal axle, look to place it in front of it.

When you are squatting or deadlifting you want to keep your weight balanced on your feet. Your calf is helping to stabilize the ankle by isometrically contracting to help with the power transfer through the feet into the ground. If you try to have the calf stop stabilizing isometrically and ask it to move so you can push through the ball of your foot it will result in much less power and force being transferred into the ground.

So, this means that when we pedal our bikes we also want to have a mid-foot position. This foot position will automatically allow for better recruitment of the hips, which are the strongest muscles in the lower body and the real secret to pedaling power. You'll also be more balanced and stable when you stand up to pedal or get into the attack position for technical sections and downhills.

And since this mid-foot position doesn't require us to strap our feet into what your body recognizes as an unnatural position, it is yet another reason that you don't need clipless pedals. Anyone who tells you that you need them for finding the perfect foot position and forcing your feet to stay there is selling you an engineering based solution that doesn't work with your body's natural ways of moving.

Another problem with the engineering based solution for foot placement is that machines are inherently fragile and hate disorder. You want to smooth out as many rough edges as possible and look for symmetrical, repeatable movement.

But, like I pointed out earlier, the human body is not a machine, it is an organism. And organisms that move are inherently Anti-Fragile. This means that, up to a certain point, they actually benefit from some disorder and "noise".

Your body literally uses this disorder to improve and when you try and take it away by smoothing out all the rough edges you actually fragilize the system.

In other words, your feet were never meant to be put in the exact same position every time they touch your pedals. They also aren't supposed to be strapped down so they are in the exact same position for your entire ride. Yes, your feet working to maintain position uses more energy compared to strapping them into clipless shoes and pedals but that movement is needed to keep the system healthy.

Quick side note - this is another reason that I advocate that riders who do use clipless pedals still ride flats at least part of the time. It will keep your pedal stroke and skills sharp while also allowing for the feet to move more naturally.

This need for "noise" and disorder is something that the engineering based solutions doesn't account for. Organisms thrive off of some disorder, machines break because of it and so there is a much different mindset and logic sequence used for each.

So don't fall for someone trying to sell you on the need to find the "optimal foot placement position" and then forcing your foot in that exact same position every time you ride. This is actually much worse on the body than letting your foot have slight variations in how it is placed on the pedals despite the engineering based theories of how this "wastes energy".

As you can see, how we answered the engineering based vs. movement based question led us to a very different view of where we should place our foot on the pedal. It is kind of like Alice's rabbit hole – you can get sucked pretty far down it before you know it so make sure you choose the right one in the first place.

When you start to look at pedaling and maneuvering your bike as requiring a movement based solution you start to see things in a much different light. Instead of trying to force the body to move in way it doesn't want to in the name of some engineering based theory, learn how to work with your body's natural ways of movement and apply them to the bike.

It will open up the door to much higher levels of performance and while placing much less wear and tear on the body in the process.

BTW, I'm not the only coach who advocates this mid-foot position on the pedals. I can point to [Joel Friel](#) and [Greg Choat](#) as two other high level coaches who don't think pushing through the ball of the foot is the right thing to do.

Why you don't need pedal float on flat pedals

One of the biggest obstacles I face when trying to discuss clipless vs. flat pedals with riders is that there are a lot of pseudo-technique that has been developed by the clipless pedal industry and sold to the cycling world. For example, **one of the common things I hear as an argument against flats is that they don't allow for "float"** since the rubber of the shoe sticks to the pins of the pedal and does not allow for lateral rotation of the shoe. This is said as if that is a bad thing since the shoe and pedal makers all promote "float" as an essential element of a pedal.

However, what gets lost is that **float is not a natural thing** - the two dimensional activity allowed by float in no way resembles the three dimensional action the foot takes when walking or running. Float was created because it was better than the simply locking the foot into place and allowing for no movement at the foot, which wreaks havoc on the knees.

If you look at how your foot works off the bike then you see that the contact patch with the ground at the point of pushing off does not move laterally and instead stays planted. Your foot, on the other hand, went through a whole series of movements in all three dimensions as it struck the ground mid-foot, bent and rolled through the arch to the forefoot and then pushed off from there. **Your foot needs this specific movement sequence, not some manmade mish-mash of crap created by "optimal float"**.

You can not just look at the end of a movement and disregard how your body got to that point in the first place. The clipless pedal and shoe does just that - the attachment point is placed based on maximizing the push off point of the foot and severely restricts the action the foot normally takes to get there. **Float is simply an attempt to minimize the damage from such a disregard for natural foot movement.**

So yes, flat pedals don't have float which is actually another reason that I ride them. **Float is a sad trade off for the natural foot movement my body needs to stay healthy** as I rack up the miles/ hours on the trail. Again, use clipless pedals for what they were intended to be - a performance enhancer on race day, not as a fall back crutch for a lazy pedal stroke and riding technique. And don't let industry created hype terms scare you from trying flat pedals and seeing how much better your joints feel and your riding improves.

Why you don't need a stiff soled shoe for flat pedals

Most riders get confused on the subject because they assume that since clipless pedals have stiff soles, they need stiff soled shoes for their flat pedals as well. The problem is that **we think that clipless pedals have stiff soles strictly for performance reasons when, in fact, it is an attempt to solve the problem of how unnatural the clipless pedal interface is with the foot.**

While having a stiff sole can help in some situations that I'll go over later, in general there is a huge difference between the foot and pedal interface on flats vs. clipless pedals. In short, **on flat pedals your foot is able to drive into the pedal itself while with clipless pedals the sole of the shoe must provide the platform for your foot to drive into.**

The reason that you must have a stiff soled shoe for clipless pedals is that the attachment point with the pedals is too small to drive your foot into (your foot is actually touching less than one square inch on the pedals) so the soles of the shoe itself become that platform your foot needs. **Without a stiff sole providing some sort of platform your foot would be forced to balance on and drive into the attachment point itself,** which would be very uncomfortable and inefficient. The stiff sole acts as an intermediary of sorts, allowing the foot to drive into it and then transferring that force into the attachment point with the pedal.

On flats a very different dynamic is allowed to take place. Because the actual interface with the pedal is so large (you have several square inches of actual contact space with flat pedals) your foot can use it directly for support and to drive into. Just like running, **your foot is allowed to naturally interact with the surface it is touching instead of relying on an artificial means of support and energy transfer.** Because of this difference, a stiff soled shoe is unnecessary and, one could argue, actually counterproductive from a natural movement point of view.

Your body is designed to let the foot articulate as needed so it can interact directly with the ground and this doesn't change when you sit on a bike. **When you stiffen the sole of the shoe to act as the support for the foot you also change how the foot can articulate** - the stiffer the sole the more you are "locking" the foot into place and interfering with how it would naturally articulate. You can not change how one joint moves without placing more stress on some other joints and over time that locked up foot can come back to haunt you.

Now, with all that said **a stiff soled shoe can improve performance and safety in certain situations.** For example, I like to ride with 5-10 Impacts when riding downhill or freeride type trails because the thicker, stiffer sole will provide more cushioning if I have to eject mid-air and come down hard on my feet. I don't like them as much for trail riding because I find the sole too stiff for lots of pedaling and my feet feel more comfortable with a more minimal soled shoe like the 5-10 Spitfires or Freeriders.

A stiff soled shoe can also provide a more efficient power transfer into the pedals for racing situations - but at the expense of altering how your foot moves which can cause problems over the long run. **While the idea that the same shoes that make you faster can also hurt you over the long run is new in cycling, it is not a new idea in sports.** In fact, I originally learned of this idea that shoes that can increase performance can also cause long term overuse injuries while running track in high school.

In the track world we all knew that even though your racing spikes made you run faster, you didn't train in them. They were for race day and high performance practices (which were rare) because **the same things that those shoes did to give you a short term performance increase on race day would tear your down eventually if you used them too much in training.**

In other words, just because something made us faster didn't make it "better" and understanding how to juggle what would allow us to train injury free with what would make use faster was part of the game. The truth is that **having a super stiff sole on a riding shoe is not only unnecessary, it is potentially harmful if used exclusively over the long run.** Find a pedal and shoe system (flats and 5-10's work real well) for your everyday riding that allows your foot to move freely and drive directly into the pedal interface itself and save the stiff soled shoes for specific racing/ performance applications.

Part 2

Maximizing Your Performance on Flat Pedals

5 Tips for Learning to Ride Flat Pedals

When learning to ride flat pedals you may suffer what is called "The Dip". This is where you suffer a short term decrease in performance while you work on something new that will lead to substantial increases in performance when you get it down. It is very common in sports and **one of the things that separate great performers in any category from everyone else is the desire to find better ways to do stuff and suffer through The Dip** so they can continue to improve.

With that in mind here are some tips for helping you to minimize the dip and get to where you are able to ride flat pedals with more speed and confidence as quickly as possible.

1) Stick with them for at least 12 rides. You want to commit to riding flat pedals, and only flat pedal, for several rides in row as this will force you to learn how to use them. This is especially important if you have ridden clipless pedals in the past because the temptation will be to give up too soon and go back to them or to switch back and forth between clipless and flat pedals. Use the tips in the this manual and by your 12th ride you'll probably be riding up and down stuff you've never cleaned before thanks to the kind of rider flats force you to become.

2) Stand up more. I am a huge fan of standing up more to pedal for several reasons, not the least of them is because it easier to keeps your feet "heavy" on the pedals. When you sit down you unweight your feet and this makes it much more likely that you feet will fly off the pedals when you hit a rock or bump in the trail. This doesn't mean that you need to stand up all the time but you should try to stand up when descending or laying down power to the pedals, which are the two most common times that most riders lose their feet on the pedals.

As an added bonus, standing up is much easier on the knees and lower back than being hunched over in the seated position. It also forces a co-contraction of the hamstrings and quads at the knee joint to stabilize it at the bottom position, which is something that doesn't happen as effectively when you are sitting down. You should be able to go out on a 2 hour trail ride and stand up during all descents and most powerful pedaling efforts, using the seated efforts for when you can spin it out and recover for your next standing effort.

3) Get some shin pads. Keeping your feet planted on your pedals will require you to stand more and to actively "ground" your feet into the pedals, two skills that will take time to develop. Another skill you will pick up as you ride flat pedals is how to slip a pedal and get your shin out of the way. In the meantime, just get some bright yellow shin pads and freak people out on the trail...oh wait, that's what I did. You don't have to go with yellow but you will freak some people out when you blast by them on a climb with your flats and shin pads. Eventually you will get comfortable enough to ride without them but just be realistic about the fact that you will try to blow your shins up more than once.

4) Use running to "reset" your pedal stroke. This sounds a bit strange but one of the best drills I use at clinics to instantly improve a rider's pedal stroke plus make it more flat pedal friendly is to get them off their bike and run a few sprints. Several lab tests have shown that the vast majority of your power is produced on the downstroke and that the upstroke is primarily to get the trail leg back into position to drive down again, not to add power to the pedal stroke.

This is exactly how you run and by engaging the running mechanics you groove the lower body movement you need to pedal more effectively, especially when standing. Try sprinting 15-20 yards, repeating 4 times, and then jump on your bike and make your standing pedaling "feel" the same way - just be ready for an instant increase pedaling power and foot stability.

5) Get a good pair of shoes and flat pedals. This can not be stressed enough - most riders who say that they don't like to ride flat pedals have never tried riding with a good pair of flat pedals and shoes made specifically for flat pedals. You should spend about \$100 on a good pair of riding shoes with a sticky rubber sole (like those found on 5-10 brand riding shoes) and \$50-\$100 on a decent pair of flats. I go over some more specific pedal recommendations on page 17 of this manual but getting good shoes and pedals is so important it bears repeating here as well.

Shoe, Pedal and Foot Placement Tips for Flat Pedals

I get a lot of questions from mountain bikers about how to keep their feet planted on their flat pedals and I have found that it usually boils down to 3 things – Shoes, Pedal Selection and Foot Placement. If even one of these things is wrong you will struggle to feel comfortable on your flats or really maximize their performance.

1) Shoe Selection: The #1 thing to know about riding flat pedals is that a good pair of flat pedal specific shoes is a must. If you are trying to ride flat pedals with your tennis shoes then you'll never feel confident on the trail. You need shoes that are made specifically for riding flat pedals, preferably with a sticky rubber compound like that found on the soles of 5-10 brand shoes. I wrote an article going over the different model shoes 5-10 makes and the types of riding I use them for that you can read on [page 21 of this manual](#).



2) Pedal Selection: If you have a good pair of riding shoes then you can get a mid-level pedal and be just fine. While some pedals are definitely nicer and hold up longer than others no one has really cornered the market on the "best" pedal so I prefer to go with a couple of guidelines when recommending pedals.

- *Make sure it has a relatively thin profile.* A thinner profile pedal lowers your center of gravity on the bike and improves your power transfer into the crank arms.

- *Make sure that it is wide enough to comfortably get the majority of your foot on it.* If more than ½ inch of your foot is hanging over the edge of the pedal then it is not wide enough and can result in a numb pinkie toe.



3) Foot Placement: The first thing that you will notice on flat pedals is that your feet naturally go to a mid-foot position where the ball of the foot is placed in front of the pedal axle. This is much different than the foot position where most clipless pedals want to put you, which is with the ball of the foot directly over the axle. However, having the ball of the foot in front of the axle is actually a more natural and, one could argue, better position for your foot.

From a functional movement point of view, trying to place the ball of your foot directly on top of the pedal axle is not the best position for your foot to be whether you are on flats or clipless pedals. Driving through the ball of the foot is what you want to do when you are propelling your center of gravity forward - like when running or jumping - but this is not what is happening when we pedal out bikes. When pedaling you are driving the pedals away from you, much like when you squat or deadlift, and that type of leg drive is much better delivered from a more mid-foot position. This more mid-foot position also allows improved recruitment of the hips during the pedal stroke, especially when standing.



You'll also find that this mid-foot position will also allow you to better *drop your heels when standing up in your "attack position"* to flow through rock gardens or other trail features. By dropping your heels you will sit back into your hips more, getting your center of gravity lower and further back, and also keep your feet pressing into your pedals when you hit rocks and bumps in the trail instead of getting pushed off the top of them.



Below you'll find a link to a video in which I go over each of these 3 tips. If you feel like your feet are bouncing off your pedals more than you want – especially if you've spent a lot of time on clipless pedals before trying flats – then this is the video you've been waiting for. Watch as I reveal what you need to know about shoes, pedals and foot placement to get the most out of riding flat pedals.



http://www.youtube.com/watch?feature=player_embedded&v=Y31azZdx1gI

Stuff I Like: 5-10 Sticky Rubber Shoes

There are few pieces of gear that changed my life as much as my 5-10's did. I ride platform pedals and while I love them I always had issues with keeping my feet planted on them.

For a while I was buying some \$10 skateboard style shoes from Payless that would work for about 2 months before the soles got ripped apart and then I would buy a new pair. I tried more expensive skate shoes as well but I still had issues, especially if they got wet.

I lived in Hawaii at the time and getting your feet wet and muddy as part of the ride was not uncommon. No shoe I tried would work worth a crap if they got wet or muddy and I had some pretty hairy situations thanks to that fact.

Enter the Intense Sticky Rubber shoe. I first saw them at Interbike and knew I had to try a pair. The soles looked durable and the dude at the booth said they were made of the same rubber they used in mountain climbing shoes. Sticky rubber sounded very promising to me...

I ordered a pair and when I got them I knew that my riding was about to change. I put them on and went for a pedal around the parking lot and found that I literally couldn't get my feet to slide off the pedals. In fact, I had to pick my foot up just to twist it a little so I could adjust the position. It was a pretty insane after experiencing all the other shoes and their pathetic attempts to keep me on my pedals.

After Intense stopped carrying them I lost track of how to find those magical shoes for a few years and was even forced to buy another pair of skate shoes when my original sticky rubber shoes finally wore out. One day my wife was on the internet and found a pair of sticky rubber mountain biking shoes from this company named 5-10.

Seems that this mountain climbing shoe company made the original shoes for Intense and they started to sell them on their own after Intense stopped carrying them. I was stoked and ordered 2 pairs, just to be safe in case they stopped making them again for some reason.

I can not recommend these shoes enough - they will completely change your riding experience with flat pedals. I think that every new rider should start out on platform pedals and that every rider on platforms should use these shoes. They stand up to a lot of use and you'll get at least 1+ years use out of a pair, making them a great value as well.

While they now come in a pretty wide variety of styles and colors I mainly use 3 styles for the types of riding I do:

Spitfires - These are a very light, thin soled shoe that doubles really well as an everyday shoe. These shoes are really light and comfortable and I really like the thin sole on this shoe. I really like it as my overall trail riding shoe but the lack of protection from the uppers makes it a less than stellar choice for areas that have a lot of rocks.



Freeriders - These shoes are pretty light but they are a bit more sturdy than the Spitfires, making them a good shoe for pedaling around in areas that a lot of rocks that can catch your feet. They also make good dirt jumping shoes since the sole is a little thicker than the Spitfires but the overall shoe isn't as overbuilt as the Impacts. These are also some good everyday shoes and are very comfortable to wear around before and after a ride.



Impacts - These are the most commonly recognized type of 5-10 riding shoe and it is their heavy duty DH shoe. This shoe is overbuilt and has a thicker sole with a bit more stiffness to it, although it is still very pliable. The thicker soles help a lot when you have to eject mid-air and come crashing down feet first and the overbuilt toe box takes the edge off of rock impacts to the feet. What makes them so great for heavy duty use also makes them less optimal for long distance pedals and wearing them around all day - the extra stiffness in the uppers doesn't let the shoe conform as well to the foot and that extra "wobble room" starts to catch up to your feet after a while.



Ladies also need to keep in mind that while there is a women's specific DH shoe they can get any of the other 5-10 shoes in their sizes, they just need to order the corresponding men's size.

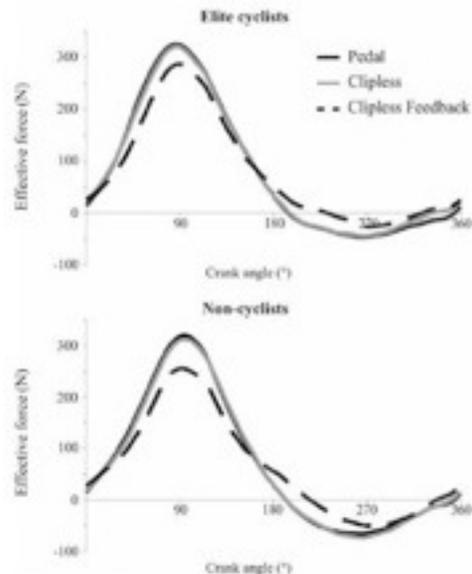
If you haven't tried 5-10s for trail riding then I highly recommend giving them a shot, especially if you're still rocking the old skate shoes...

Part 3

Slides from the Mornieux and Korff studies

Pattern of force application in elite cyclists vs. non-cyclists

Fig. 1 Right effective pedal force during one crank revolution at 50% of the maximal aerobic power and 90 rpm for the three different pedalling conditions (Pedal: simple pedals without toe-clips; Clipless: clipless pedals; Clipless Feedback: clipless pedals with feedback). Data were averaged on all subjects for each elite cyclists and non-cyclists group. The standard deviations have been purposely omitted for better clarity.



Mornieux et al. Int J Sports Med 2008; 29:817-822

CLICK ON IMAGE FOR LINK TO HIGH QUALITY IMAGE

- Note how both untrained and trained cyclists pattern of force application are practically the same.
- Note how the level of force being applied and the pattern of force application stays the exact same for flats and clipless pedals.
- Note what happened when people where given feedback on how to use clipless pedals (I'm assuming the usual pedal in a circle instructions) their force application pattern changed and their peak force *dropped off*.

This study shows that there is no special pedal stroke allowed by clipless pedals. In fact, since force application at the pedals was the same for both you should be able to pedal in a similar manner with either pedal system, suggesting that if you can't ride flats you may have some issues with how you apply force to the pedals.

Effect of pattern of force application on efficiency

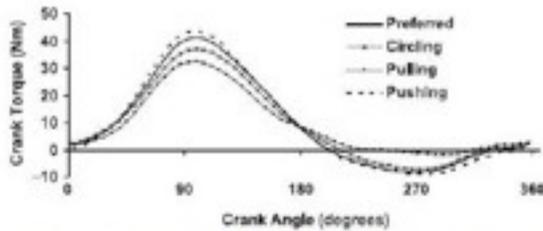


FIGURE 1—Torque profiles for different pedaling conditions. The profiles shown are the averages across all participants for each pedaling condition.

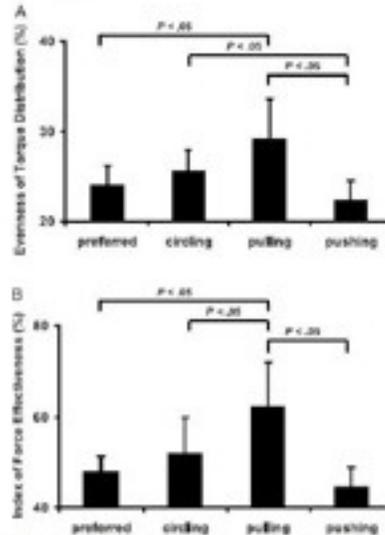


FIGURE 2—Effect of pedaling technique on the evenness of torque distribution (ET) (A) and the index of force effectiveness (IFE) (B). Group means and standard deviations are shown.

Korff et al. Med Sci Sports Exerc 2007; 39:991-995

[CLICK ON IMAGE FOR LINK TO HIGH QUALITY IMAGE](#)

- Note how the preferred pedaling technique (letting people pedal how they wanted) and the pushing technique (telling someone to purposefully push down harder) look very similar.
- Note how pedaling in a circle decreased torque.
- Note how pulling through the top resulted in a large decrease in peak torque.

Effect of pattern of force application on efficiency

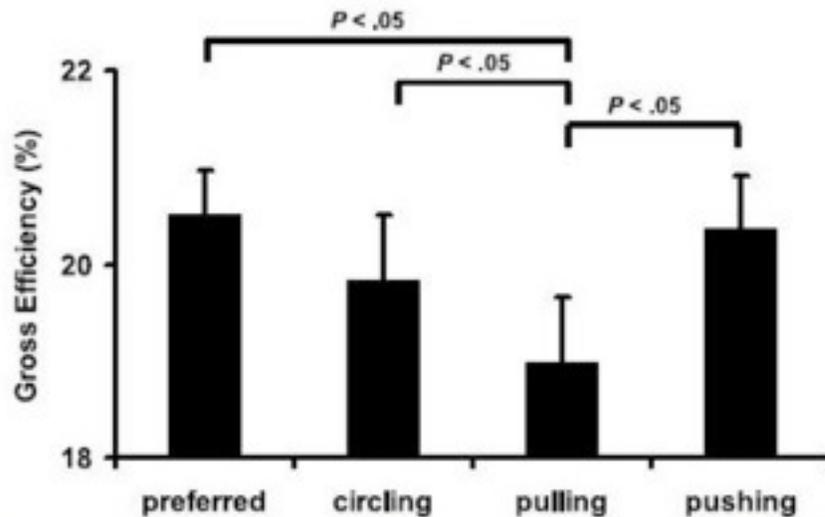


FIGURE 3—Effect of pedaling technique on gross efficiency (GE). Group means and standard deviations are shown.

Korff et al. Med Sci Sports Exerc 2007; 39:991-995

CLICK ON IMAGE FOR LINK TO HIGH QUALITY IMAGE

- Note how the preferred and pushing pedaling technique are the most efficient.

These 2 slides suggest to me that we naturally want to pedal in the strongest, most efficient way which is to push hard into the down stroke with no consideration as to what the trail leg is doing. When we start trying to outsmart instinct (you want to spin in circles and/ or pull through the top) we literally decrease pedaling power and efficiency.

Part 4

Bonus Podcast Interviews

How Flat Pedals Improve Your Riding - Interview with MTB Star Ryan Leech

One of my most popular podcasts interviews was with trials rider and over all mountain biking stud Ryan Leech. At the end of our conversation I mentioned something about the tragedy of seeing new riders pressured into using clipless pedals so soon after starting to ride and Ryan was surprised to hear that most riders did not understand the value of learning to ride on flat pedals.

Ryan was nice enough to join me for another podcast and in this one we dive into the use of flat pedals and how they enhance your balance, pedal stroke and skills as a rider. More importantly they enhance the FUN factor, which sometimes riders forget about. Ryan also gives us his advice for riders looking to make the switch from clipless to flat pedals and what you need to look for in a pedal and shoe to make it work.

All in all, Ryan does a great job of dispelling a lot of myths surrounding clipless pedals and reminds us that if trials riders – the most technically proficient riders in the world – don't need to be attached to the pedals then few of us really do.

<http://www.bikejames.com/strength/why-flat-pedals-improve-your-riding-interview-with-mtb-star-ryan-leech/>

Interview with Barefoot Training Expert Andy Clowers

In this episode of the MTB Strength Coach Podcast I interview Andy Clower, an athletic trainer and strength coach based out of Berkley CA. Andy is a true expert on the mechanics of the foot and made some interesting points in a recent article he wrote concerning the difference between true barefoot training and minimalist shoe training so I knew I had to get him on the podcast to share his insights into what really happens when you restrict natural foot movement.

In this interview we discuss the impact the natural foot movement has on balance, reaction time and the efficiency of muscular contractions in the legs, something that most mountain bikers have never thought about as part of their training. He also makes a great case for spending some training time off the bike completely barefoot as well as giving us some ideas on how he integrates barefoot training into new clients programs so they don't get hurt by getting into it too fast.

I'd love to hear your thoughts on this interview, please post a comment below if you have any...

<http://www.bikejames.com/strength/interview-with-barefoot-training-expert-andy-clower/>

Applying Functional Movement to Your Bike - Interview with International Bike Fit Expert Greg Choat

In this episode of the MTB Strength Coach Podcast I talk to Greg Choat who is one of the top bike fit professionals in the world – yes, I said a bike fit guy! I ran into Greg at a Functional Movement Screen Lv. 2 seminar a few weeks after running my blog post on the [real value of bike fits](#) and found out that he actually shares my feelings on the subject. After hearing more about how he uses the FMS to enhance his bike fits I knew that I had to get him on the podcast to talk more about it.

In this interview we talk about how the FMS has changed how he views and uses bike fits, how our everyday lives affect the dysfunctions we bring to bike, how those dysfunctions affect how we perform on the bike and why the bike industry in general has missed the boat on applying functional movement to the bike in favor of marketing hype.

We also talk about pedaling technique and why strength training, especially the deadlift and swing, are essential to building a strong, efficient pedal stroke. Grip strength and neck pain come up as well – in short, we cover a lot of ground and this is a “must hear” podcast from one of the top cycling coaches in the industry.

<http://www.bikejames.com/strength/applying-functional-movement-to-a-bike-fit/>