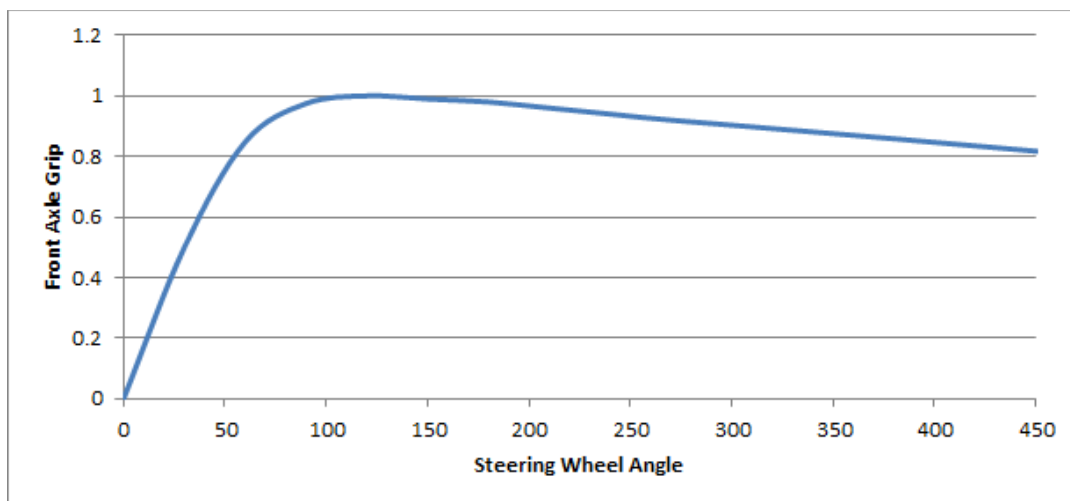


Understeer going to snap oversteer explained (kind of!) by Niels Heusinkveld, june 2012

In both simracing and real racing, it seems when drivers complain about an understeering car, the same car will likely suddenly go to oversteer on corner exit. That is provided the car is rear wheel drive and has a fair amount of power. Understeer is evil, but the associated snap oversteer is quite likely your own fault to some extent!

The most basic explanation for oversteer and understeer is to compare the cornering grip provided by the front tires with the rear tires. If the front tires produce more grip than the rears, you get oversteer. If the rears grip more than the fronts, you have understeer. With rear wheel drive, adding throttle will take away some rear end cornering grip, which may lead to oversteer. On the front, the amount of steering decides on grip levels. And there you have it, the balancing act between throttle and steering that makes driving a potent rear wheel drive car such a challenge and so much fun!

At the very least when the car understeers you want to maximize the front grip, even though there isn't enough to make the car handle neutral. Typically your steering wheel angle versus front car cornering grip looks like this:

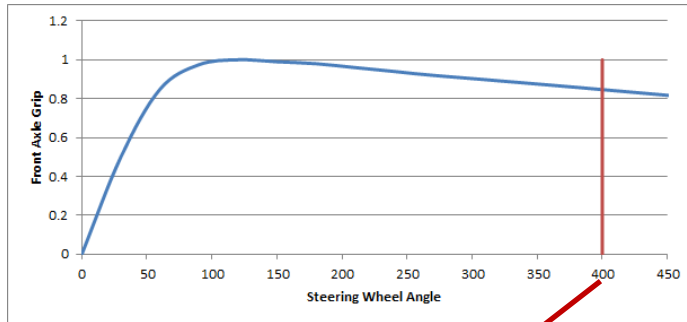


Clearly as you turn the wheel more than some 120 degrees, you will start to lose front cornering grip. It is very tempting when the car understeers, to apply too much steering. As you can see, this only reduces front grip and makes the understeer worse!

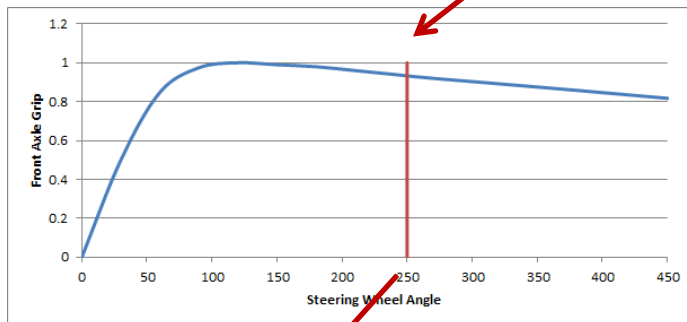
So where does snap oversteer come from? If like many drivers you can't resist applying too much steering lock when the car understeers you're in trouble. You wildly step on the throttle and now rear traction is lost because you aggressively use the power, giving us oversteer. Either you want to increase rear grip or reduce front grip to balance the car. Once you are committed to the throttle, the natural thing is to reduce front grip by straightening out the steering wheel. Let's make a few snapshots of what happens during a 'snap oversteer' situation.

Doing it wrong:

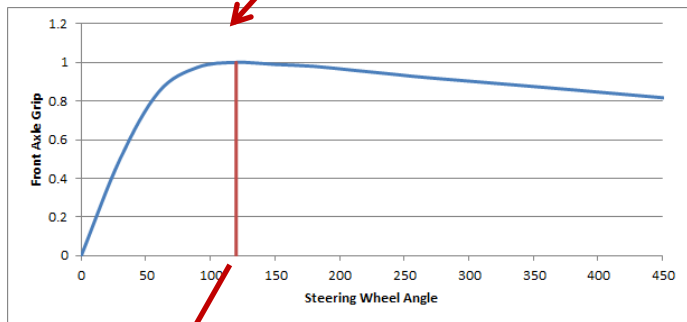
1) You apply full throttle and you notice oversteer, but you have too much steering angle applied:



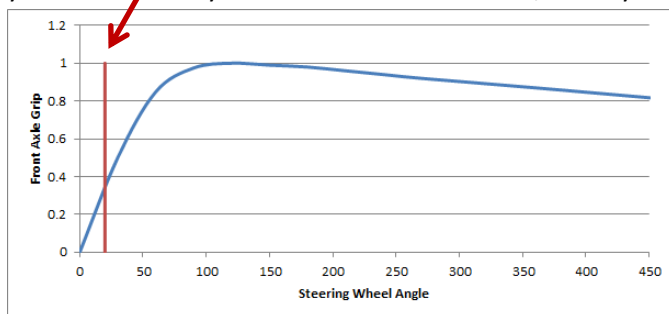
2) Noticing the oversteer, you start reducing steering angle, but o no! front grip actually **increases!**



3) Still reducing steering angle, front grip **still increases!** The back is really sliding now, this is a big oversteer moment, and for some reason your steering action only makes it worse!

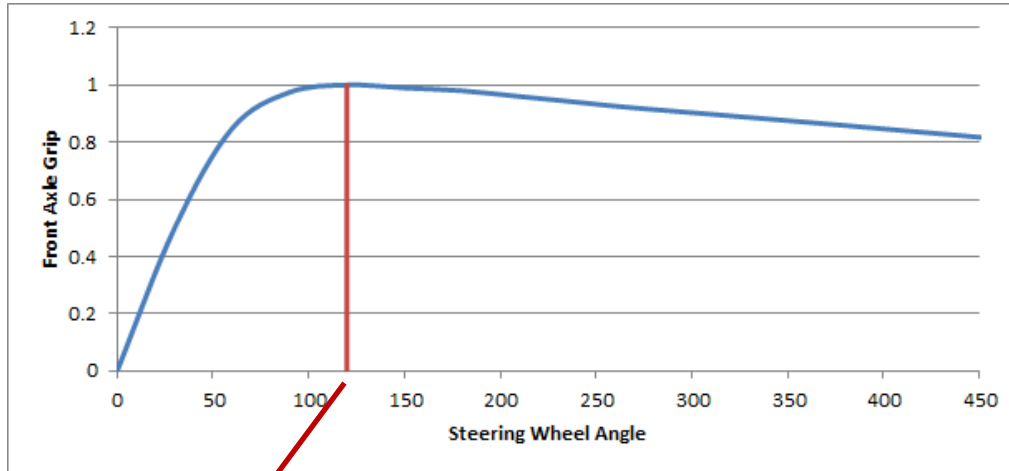


4) Finally you've taken front grip away, but by this time you're in trouble, the car is very sideways and you will need all your skills to catch the slide, and try to avoid the 'swing back' or 'tankslapper'.

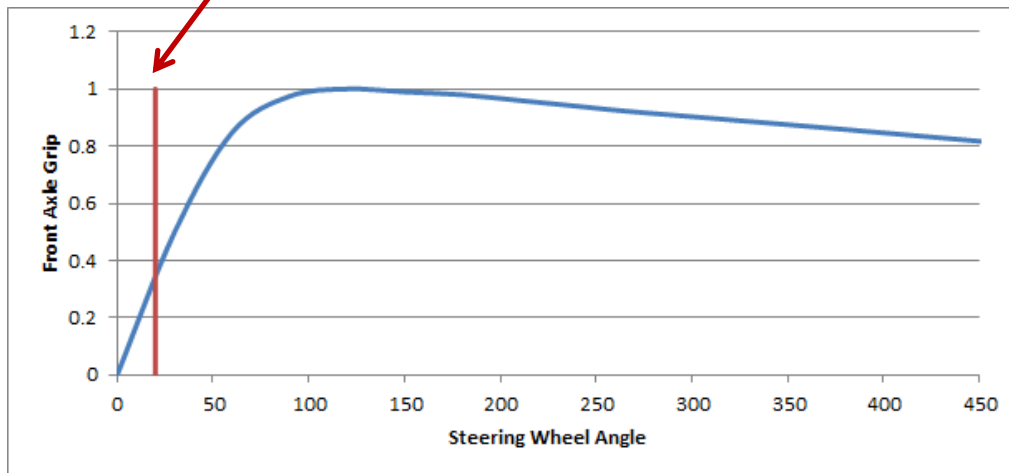


Doing it right:

You have understeer but managed to apply just enough steering to maximize front end grip. You add power and oversteer starts:



Noticing the oversteer, you reduce steering angle:



Front grip is instantly removed and you **instantly** control the oversteer with each degree of steering and each millimeter of throttle pedal movement. With no excessive steering to unwind first, the oversteer doesn't feel as harsh as you simply immediately control it.

Conclusion:

Applying too much steering lock in understeer is very common but it actually reduces front grip even more. It also means you have excessive steering to unwind before you start to correct for oversteer. In fact, when you start to unwind the steering, you actually increase front grip, making the oversteer worse. You will first increase the oversteer, before finally straightening the wheel or applying opposite lock. By this time, you may already be crashing!

Searching for the ideal steering angle that gives maximum grip will minimize the understeer. When you get oversteer in this situation, the instant you unwind the steering, you will start to correct the slide. It is much less likely to get out of hand.

It is part of the driver skill to know when to stop turning the steering wheel in an understeer situation. It depends on the tires, steering rack properties, but also what the car is currently doing and how fast it is going. There is no hard number for each car. You can get an idea if you have access to a skidpad and you have G force telemetry on your (virtual) car. Drive at a constant speed (say rev limiter in 1st gear) and very slowly increase your steering angle. Cornering G force will start to build up. At some point, steering more won't cause an increase in G force. In that situation, that is the amount of steering you must apply. On the track, it may be slightly different but it's not a bad rule of thumb to use!