



Adjusting Your Racing Simulator Cockpit

Using Body Mechanics and Muscle Leverage to Your Advantage

Introduction

While there are many guides describing the proper distance to the steering wheel and the pedals, none of those guides describe the proper positioning of the seat, steering wheel or pedals. The reason for this is partly because the positioning of these items is not adjustable in a real car. This turns out to be quite the contrary in a simulator chassis. Many simulators are either built with too much adjustability and have no indication of what the proper positioning is, or the simulators are not built with sufficient adjustment to put you in the proper driving position.

The human body can adjust and get comfortable in a multitude of driving positions. After all, we can easily climb out of a Porsche and step into a van and be just as comfortable driving either one. In order to truly get the most out of sim-racing, the proper 'sports car' driving position is important. Besides making the whole experience more authentic, it can reduce fatigue and improve accuracy.

Body Mechanics

Body mechanics and muscle leverage play a large role in fatigue and accuracy. Consider weightlifting for a moment. The body can more easily lift and control the barbell when it is at mid travel. It is more difficult to lift the barbell when it is close to the chest and also difficult to lift and control when the arms are near their full

extension. It is somewhere in between that the body has optimum strength and control over the barbell. The same applies while driving. The easier it is to press on the pedals, turn the wheel and shift the gears, the longer you can last in a race. It is common knowledge that we become less accurate as our muscles fatigue, so anything we can do to prolong the accuracy, the more likely you are to out-drive your opponent.

The Driving Position

We will begin by adjusting the heights of the seat, wheel and pedals. All these measurements are taken from the virtual floor of your simulator chassis. The virtual floor is the horizontal plane where your heels rest on. If your pedals have a heel plate, then this will be the virtual floor. For example, if your heel plate is 3 inches off the floor, then all your measurements should be taken starting at 3 inches off the floor. You may find it helpful to find an object like a box or a stack of books that has the same height and take all your measurements from the top of that object.

We are going to start by setting the height of the pedals. The pedal heights are measured from the heel plate to the center of the brake pedal pad. This is where the ball of the foot makes initial contact. (See dimension C in figure 1) This height should be between 7 to 7.5 inches (17.5 to 19 cm). Generally, a shorter driver will prefer to be lower in the range and a taller driver will prefer to be higher in the range. You will find that most floor mounted

consumer-grade pedals will not adjust to these dimensions. One way to resolve this problem is to invert the pedals, another is to add pedal arm extensions.

The next adjustment is the seat height. Since there are many factors at play when determining the 'effective' height of a seat, we will be taking this measurement to the underside of the knee (see dimension B in the figure) while sitting in the seat and resting the heels on the heel plate. This way, the seat cushion thickness and seat rake can be accounted for in one simple measurement. This measurement should be 8.25 to 11 inches and should be measured from the underside of the knee to the height of the virtual floor.

The next adjustment we will make is the height of the steering wheel. The wheel should be between 23 and 27 inches from the virtual floor to the center of the steering wheel (dimension A in figure 1). We measure to the center of the wheel because various wheels have different diameters. You may find the wheel position to be low at this height, but keep in mind that is simply an illusion since most sim-racing wheels are smaller than the real thing.

After you have the steering wheel to the right height, it is time to set the angle of the wheel. The wheel should be perpendicular to your shoulders. In other words, imagine the steering column continued through the steering wheel and should hit you at the top of your chest (line D in figure 1). This puts the wheel rotation in line with your shoulder rotations for optimal control.

After the heights are set, we move on to setting the distances of the wheel and pedals relative to the seat. If the seat reclines, set it so that you are comfortable yet upright enough so you are not straining your neck to look ahead. The upper back should be resting fully on the seat back while the shoulders should be 1 to 2 inches away.

The distance to the steering wheel should be set by extending the arms around the side of the steering wheel and setting it so the wheel touches the arm midway between the wrist and elbow. This will give the best flexibility and control over the wheel.

The distance to the pedals should be such that you can press all the pedals as far as they will go without fully extending your legs. You should be using the smallest amount of ankle rotation possible to accomplish this, the ankle muscles are not as strong as the knee and thigh. The ankle muscles are great for small precision movements, but should not be used for bulk pedal movements and therefore should not be used when determining pedal position. In other words, be sure you can press the brake fully and firmly without fatiguing your ankle by using your leg.

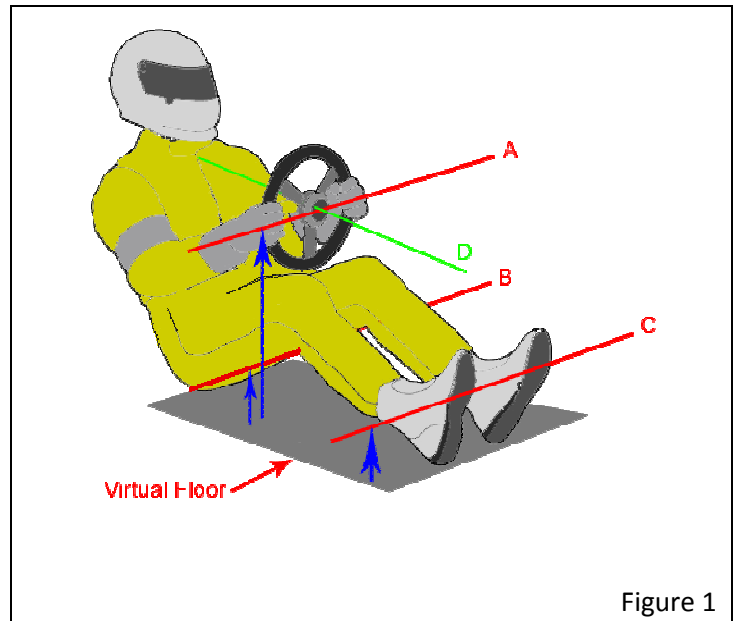


Figure 1

Table 1: This table shows the heights of the steering wheel, seat and pedals taken from various performance vehicles.

Vehicle	Pedal Height (C)	Seat Height (B)	Wheel Height (A)
2015 VW GTI	7"	11"	26"
2014 BMW M4	7.5"	9"	23"
2011 BMW Z4	7.5"	9"	22"
2013 Dodge Challenger	7.5"	10"	27"
2014 Mazda MX-5	7.5"	8.25	23"

The last item to adjust is the position of the shifter. The shifter has the greatest range of position options. Generally, its height should be no higher than the center of the steering wheel, and no lower than the bottom of the steering wheel. For the sake of speed, it should be as close as possible to the hand position on the steering

wheel. The distance from the driver should be such that only a rotation of the shoulder should be required to grab it when it is in the neutral position. You should not have to bend your elbow to grab it. In other words, the distance from the shoulder to the grip position on the steering wheel should be the same as from the shoulder to the shift knob.

After the distances have been set, you may need to verify and adjust the heights as they may have changed slightly. Repeat all the previous adjustments until nothing needs to be moved any more.

Monitor Positioning

Lastly, we will set the height and, in the case of triple monitors, the angle of the side monitors. The main monitor should be positioned so that its center is at the height of the driver's eyes. This is not only required for best posture, but monitors also render the best image when they are viewed on-axis. A simple aid can be constructed to help with placing the monitor correctly. (figure 2) Take a sheet of paper and fold it down the center lengthwise. Tape the paper as shown with the fold in the exact center of the monitor. The driver should be able to look down the fold from the seated position.

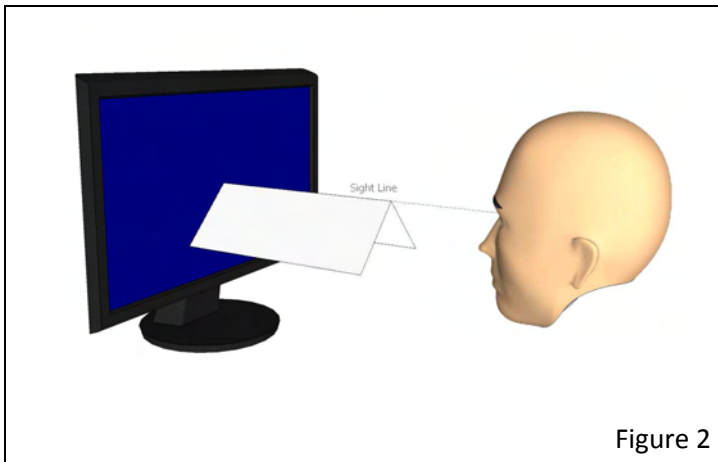


Figure 2

If triple monitors are used, the vertical alignment becomes even more critical. The two side monitors should be positioned so that all three are at the same height. The side monitors should be angled toward the

driver such that the driver is able to view those monitors on axis as well. To do so, take two additional sheets of paper then fold and apply to the side monitors to establish the sight lines on them. (figure 3) All the monitors are properly aligned when the driver can sight all three monitors by looking down the fold while only turning their head.

The angle the monitors will be to each other will vary based on the distance of the center monitor from the driver. The closer the monitors are, the greater the angle. Also, placing the monitors closer to the driver will allow the side monitors to 'wrap around' the driver's head and create a greater angle of view.

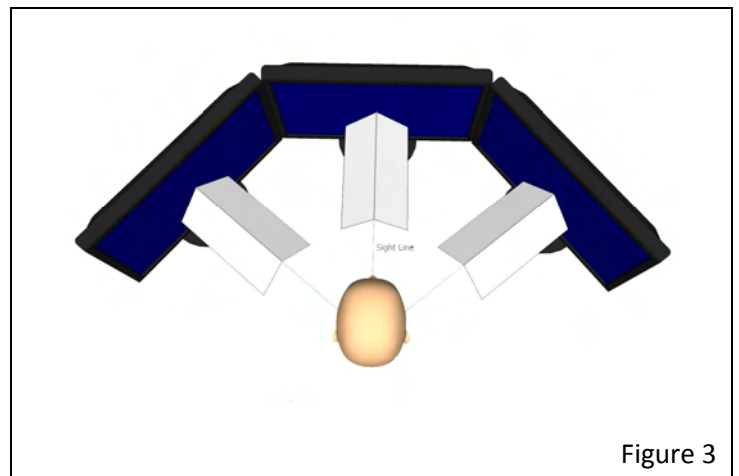


Figure 3

Hopefully this guide helps you to adjust your simulator to the ideal driving position. If the proper driving position is not obtainable with your current simulator chassis then, at least, you should be able to get close by making some compromises. If you are shopping around for a new simulator chassis, then hopefully this guide will help you find the right one. Please take a look at the simulator options from Ricmotech which have been designed with these principles in mind. If you have any questions, please send an email to mail@ricmotech.com.

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