PID Controller Reflection

I have two PID controllers, one for steering (pid_str) and the other is for throttle (pid_thr). the final hyperparameters (P, I, D coefficients) are chosen through manual tuning. My initial parameters for pid_str is 0.1, 0.001, 2.8 respectively and those for pid_thris 0.45, 0.000, 0.5 respectively.

In order to tune parameters, I calculated and recorded the average error for both controllers. The steering controllers with initial parameters returned an average error of 2.69802 and that of The throttle controllers is 0.0623749 before the autonomous vehicle leaves the drivable portion of the track surface.

I then tried to change only one of the parameters with others being the same. And the following table shows the change of errors after each of the parameters has changed.

parameters	Average error of steering	Average error for throttle
pid_str.Init(0.1, 0.001, 2.8); pid_thr.Init(0.45, 0.000, 0.5);	2.69802	0.0623749
pid_str.Init(0.1, 0.001, 2.8); pid_thr.Init(0.3, 0.0, 0.5);	25.0991	0.807649
pid_str.Init(0.1, 0.001, 2.8); pid_thr.Init(0.45, 0.0, 0.05);	8.36628	0.27165
pid_str.Init(0.1, 0.0001, 2.8); pid_thr.Init(0.45, 0.000, 0.5);	0.708315	0.0216228

It turned out the last set of parameters are good enough since the car successfully drove a lap around the track.