

## Shaft testing

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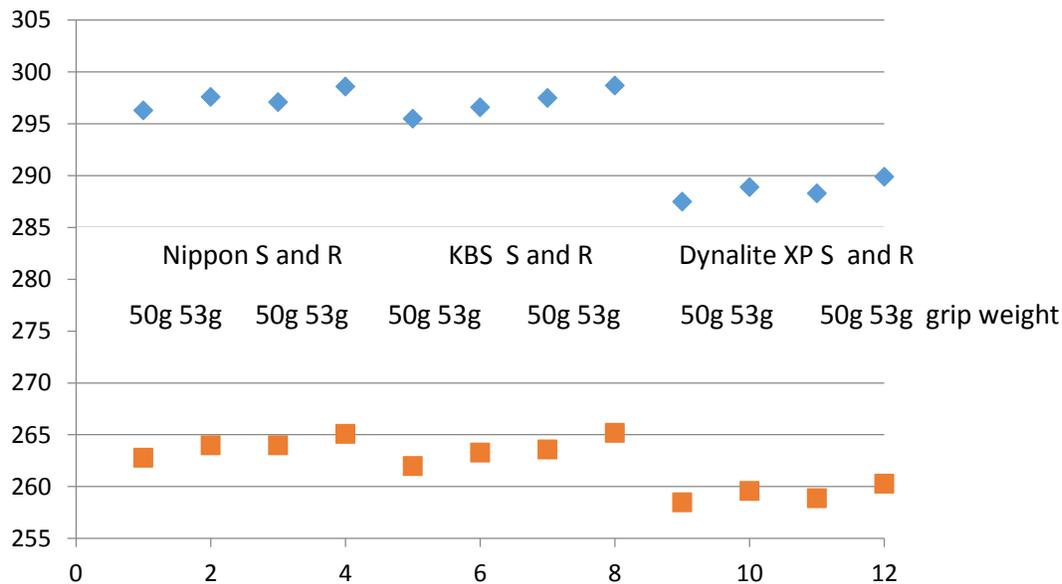
A large number of shafts are available on the market, and they all claim to have the best performance. The shaft is often blamed or praised to the skies for the poor or good performance of the golf club. How then can we find out which shaft is best? When shafts are tested in hitting machines, there are often only minimal differences between the various shafts. The machine's arm can be directed so it always strikes the ball correctly and this arm has almost unlimited power. We humans adapt our swing when we encounter a change in physical stress, because the body always strives to maintain its equilibrium. So in order for humans to be able to test the properties of various shafts these shafts need to have the same weight and balance point. Only then can we experience what the relevant characteristics of the shafts different dynamic properties have for effect on the ball flight.

Shafts seldom have the same weight and balance, so what happens with the stress from club to body when we replace the shaft. To help visualize this, we make some clubs with similar shafts.

We start with two iron heads, a 9-iron and a 5 iron, and construct a few different configurations with the shafts that the manufacturer normally has available as well as two standard grips. We weight the club to swing weight D 2 in each case. The shafts we test are taken straight from the warehouse shelf: Nippon NS1150 R and S, Dynalite XP S300 and R300, KBS Tour S and R. Both the weight and balance point varies from shaft to shaft so to compensate this different weights are placed in the head. At Smart Balance Golf we measure four different torsional moments with which the club affects the body when the club is swung. When we switch between these shafts, we find that different stresses are placed on the body with every configuration. The performance and feel will therefore be different for the player.

We can simplify the discussion by focusing only on what happens to the weight in the club's head. The head is the heaviest part of a golf club and has the largest acceleration and speed. It is also furthest away from the player.

The table below shows the weights of the heads vary despite the all configurations having swing weight D2



The 9 iron has varies in weight by at most 11.2 g, and the 5 iron by 6.7 g. This may not sound like much, but at 80 mph it gives a difference in the power of the hands of about 15Nm (ie 1.5 Kg or 3lb)

All manufacturers of golf clubs obviously know this; it is a result of using swing weight as a method of matching clubs. Head weight and the shaft's balance point are two important ingredients that should be checked in order to ergonomically match golf clubs and this is completely missing in clubs matched by swing weight.

The extra stress means that you alter your swing and thus you can't determine what was causing change in ball trajectory or spin, most likely it's a mixture of everything. Moreover, the clubs match changes.

So what is that you are really testing when you change between shafts ?