

Driver

How does a higher balance point in a golf club produce more distance?

HYPOTHESIS

By raising the balance point of a driver through back weighting, or inserting a weight in the grip end of the club, it becomes easier to swing and can produce at least the same swing speed.

TEST CLUBS

We tested three clubs in this experiment. The Heavy Driver from Bocchieri Golf has a higher overall weight than the other test clubs and is back weighted. The TaylorMade Burner Superfast 2.0 is an ultra lightweight driver. The Nike SQ Dymo represents the conventional or average weighting for drivers on the market today.



Bocchieri Golf
Heavy Driver
BACK WEIGHTED



TaylorMade
Burner Superfast 2.0
NOT BACK WEIGHTED



Nike
SQ Dymo
NOT BACK WEIGHTED

ASSUMPTIONS

1 Golfer's overall body weight = 200 lbs

2 Golfer's distance from their body's core to their center of gravity during a golf swing is 6 inches

MEASUREMENTS

Measurement	Heavy Driver	Burner	SQ Dymo
Total Length	45"	46.50"	45.75"
Balance Point from Grip End	29"	37.25"	34.5"
Total Weight	373 grams	279 grams	312 grams

EQUATIONS

m = mass
 r = radius

Rotational Inertia = $I = mr^2$
Rotational Speed = w
Angular Momentum = $L = Iw$

If angular momentum or the effort applied is a constant (applying the conservation of angular momentum) then if "I" or rotational inertial increases or decreases, then "w" or rotational speed would decrease or increase inversely.



CALCULATIONS



Golfer

Rotational Inertia of the Golfer's body = $I_{\text{body}} = mr^2 = (200) \times (6 \times 6) = 7200.00$



Bocieri Golf – Heavy Driver

Rotational Inertia = $I_{\text{heavy}} = mr^2 = (373 \div 453) \times (29 \times 29) = 692.479$

Total Rotational Inertia required to swing = $7200.00 + 692.479 = 7892.479$



TaylorMade – Burner Superfast 2.0

Rotational Inertia = $I_{\text{tm}} = mr^2 = (279 \div 453) \times (37.25 \times 37.25) = 854.591$

Total Rotational Inertia required to swing = $7200.00 + 854.591 = 8054.591$



Nike – SQ Dymo

Rotational Inertia = $I_{\text{nike}} = mr^2 = (312 \div 453) \times (34.5 \times 34.5) = 819.775$

Total Rotational Inertia required to swing = $7200.00 + 819.775 = 8019.775$



VS



Bocieri Golf Heavy Driver vs. TaylorMade Burner Superfast 2.0

$$I_{\text{heavy}} \times W_{\text{heavy}} = I_{\text{tm}} \times W_{\text{tm}}$$

$$W_{\text{heavy}} \div W_{\text{tm}} = I_{\text{tm}} \div I_{\text{heavy}}$$

$$W_{\text{heavy}} \div W_{\text{tm}} = 8054.591 / 7892.479 = 1.020 \text{ or } 2.0\% \text{ faster speed with the Heavy Driver}$$



VS



Bocieri Golf Heavy Driver vs. Nike SQ Dymo

$$I_{\text{heavy}} \times W_{\text{heavy}} = I_{\text{nike}} \times W_{\text{nike}}$$

$$W_{\text{heavy}} \div W_{\text{nike}} = I_{\text{nike}} \div I_{\text{heavy}}$$

$$W_{\text{heavy}} \div W_{\text{nike}} = 8019.775 \div 7892.479 = 1.016 \text{ or } 1.6\% \text{ faster speed with the Heavy Driver}$$

Momentum at impact

The momentum, P, when the golf club strikes the golf ball during a swing is simply mass \times velocity. The heads of the Heavy Driver are heavier than conventional golf clubs and as shown in the calculations above, are swung faster than conventional golf clubs.

We'll use a Driver swing speed of 100mph for simple math:

$$P_{\text{heavy}} = 208g \times (100\text{mph} \times 1.01) = 21,008$$

$$P_{\text{tm}} = 195g \times 100\text{mph} = 19,500$$

$$P_{\text{nike}} = 202g \times 100\text{mph} = 20,200$$



VS



Bocieri Golf Heavy Driver vs. TaylorMade Burner Superfast 2.0

$$P_{\text{heavy}} \div P_{\text{tm}} = 21,008 \div 19,500 = 1.077 \text{ or } 7.7\% \text{ greater momentum with the Heavy Driver}$$



VS



Bocieri Golf Heavy Irons vs. Nike SQ Dymo

$$P_{\text{heavy}} \div P_{\text{nike}} = 21,008 \div 20,200 = 1.040 \text{ or } 4.0\% \text{ greater momentum with the Heavy Driver}$$

CONCLUSION: With the same effort applied, the golfer is able to swing the back weighted driver (Heavy Driver) faster than conventional and even the lightweight drivers by 1%. This proves that despite raising the overall weight, the higher balance point allows for an easier swing that produces a higher swing speed than a lower balance point in a lighter golf club. The momentum, P, when the golf club strikes the golf ball during a swing is also greater with the back weighted driver (Heavy Driver). This is due to the combination of greater speed and greater overall weight at impact. **The end result to the golfer is increased distance and more control.**

