Irons

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

HYPOTHESIS

By raising the balance point of a 6 iron 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 Irons from Boccieri Golf have a higher overall weight than the other test clubs and are back weighted. The Taylormade R7 and Mizuno MP 67 irons represent the conventional or average weighting for irons on the market today.

Boccieri Golf
Heavy Irons - 6 Iron
BACK WEIGHTED

TaylorMade
R7 - 6 Iron
NOT BACK WEIGHTED

Mizuno
MP 67 - 6 Iron
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 Irons	R7	MP 67
Total Length	37.25"	37.75"	37.25"
Balance Point from Grip End	25.5"	29"	29"
Total Weight	460 grams	398 grams	414 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 = $I_{body} = mr^2 = (200) \times (6 \times 6) = 7200.00$

Boccieri Golf – Heavy Irons – 6 Iron

Rotational Inertia = $I_{heavy} = mr^2 = (460 \div 453) \times (25.5 \times 25.5) = 660.298$

Total Rotational Inertia required to swing = 7200.00 + 660.298 = 7860.298

TaylorMade – R7 – 6 Iron

Rotational Inertia = $I_{tm} = mr^2 = (398 \div 453) \times (29 \times 29) = 738.892$

Total Rotational Inertia required to swing = 7200.00 + 738.892 = 7938.892

Mizuno – MP 67 – 6 Iron

Rotational Inertia = $I_{mizuno} = mr^2 = (414 \div 453) \times (29 \times 29) = 768.596$

Total Rotational Inertia required to swing = 7200.00 + 768.596 = 7968.596

VS

Boccieri Golf Heavy Irons vs. TaylorMade R7

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

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

$W_{heavy} \div W_{tm}$ = 7938.892/7860.298 = 1.010 or 1.0% faster speed with the Heavy Irons

VS

Boccieri Golf Heavy Irons vs. Mizuno MP 67

$I_{heavy} \times W_{heavy} = I_{mizuno} \times W_{mizuno}$

$W_{heavy} \div W_{mizuno} = I_{mizuno} \div I_{heavy}$

$W_{heavy} \div W_{mizuno} = 7968.596 \div 7860.298 = 1.014$ or 1.4% faster speed with the Heavy Irons

Momentum at impact

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

We'll use a 6 iron swing speed of 100mph for simple math:

$P_{heavy} = 266g \times (100mph \times 1.01) = 26,866$

$P_{tm} = 258g \times 100mph = 25,800$

$P_{mizuno} = 258g \times 100mph = 25,800$

VS

Boccieri Golf Heavy Irons vs. TaylorMade R7

$P_{heavy} \div P_{tm} = 26,866 \div 25,800 = 1.041$ or 4.1% greater momentum with the Heavy Irons

VS

Boccieri Golf Heavy Irons vs. Mizuno MP 67

$P_{heavy} \div P_{mizuno} = 26,866 \div 25,800 = 1.041$ or 4.1% greater momentum with the Heavy Irons

CONCLUSION: With the same effort applied, the golfer is able to swing the back weighted irons (Heavy Irons) faster than conventional irons 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 irons (Heavy Irons). 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.**