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How Club Head Mass Affects Driver Swing Performance: Is Lighter Better?

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Purpose: To examine how driver club head mass affects impact conditions and ball flight.

Methods: 24 male, right handed golfers (age 18-23, handicap range 0-10) were recruited for this study. Golfers were asked to swing 4 drivers a total of 15 times each. Driver heads were obtained from the manufacturer and were identical except for the mass. An epoxy resin was added to each club head prior to final assembly so that the total head masses were 200, 215, 230, and 240 grams (Clubs 1, 2, 3, and 4, respectively). A single shaft was used for all swings. The order for each club head was randomized by subject, and the golfers were blinded to the differences in club head mass. A TrackMan IIIe was used to record club delivery and ball flight metrics. Powder spray was applied to the club face to mark and record impact location. Club metrics and ball metrics, as well as overall shot performance ("Drive Score") were evaluated for each club.

Results: The group mean ± standard deviation for key metrics can be found in Table 1. Club Speed decreased significantly as club head mass increased. Ball Speed was greatest for Club 1 and slowest for Club 4, though not significantly different for Clubs 2 and 3. Carry and Total Distance were significantly lower for club 4, but not significantly different for clubs 1, 2, and 3. Lateral Carry and Lateral Total Distance were significantly reduced in Clubs 2 and 3, which was accompanied by a decrease in Face to Path Orientation from Club 1 to Club 3. Drive Score tended to improve as the lateral dispersion decreased but, because of the large variability in Drive Score, this trend did not achieve statistical significance. Table 2 shows that individual best performances varied widely by club.

	Club 1	Club 2	Club 3	Club 4
Club Speed (mph)	104.1 ± 5.5	102.3 ± 6.0	101.2 ± 5.7	100.0 ± 5.6
Ball Speed (mph)	152.7 ± 9.8	151.5 ± 11.1	151.7 ± 9.0	150.0 ± 5.6
Carry Dist. (y)	249.1 ± 25.7	247.7 ± 24.8	247.5 ± 23.7	243.7 ± 27.6
Lateral Carry (y)	20.0 ± 7.0	18.7 ± 6.9	18.0 ± 6.3	17.9 ± 5.6
Face to Path (deg)	3.54 ± 2.58	3.31 ± 2.74	3.06 ± 2.26	3.25 ± 2.17
Drive Score	31 ± 17	33± 20	35 ± 19	33 ± 18

Table 1. Group Mean ± Standard Deviation for select club and ball flight metrics.

	Club 1	Club 2	Club 3	Club 4
Carry Dist.	8	8	7	1
Lateral Carry	5	4	6	9
Drive Score	3	6	9	6

Table 2. Number of subjects (out of 24) who performed best in that category for each club.

Discussion: As expected, club speed tended to decrease as the mass of the club head increased. While there was a tendency toward a decrease in Carry Distance, Lateral Carry significantly improved as club head mass increased, and Drive Score actually tended to improve, though not significantly. A secondary analysis was performed to determine the best performing club for each subject. As shown in table 2, an almost equal number of subjects had the greatest carry using Clubs 1, 2, and 3. The greatest number of subjects showed the lowest (best) Lateral Carry with the heaviest club head (Club 4). Club 1 showed the highest mean Club and Ball Speeds, yet the fewest number of subjects had their best Drive Score with that club, indicating that the decrease in Lateral Carry associated with the high mass clubs was more important for overall performance than the slightly higher Club and Ball Speeds seen with the lowest mass club heads.

Practical Application/ Clinical Relevance: The results of this study suggest that club head mass should be included as a component of club fitting. Specifically, higher mass club heads (up to 230 grams) tend to result in lower lateral carry despite a slight decrease in club head speed, and this may result in better on-course performance. Also, it became evident that different subjects performed best with different mass clubs. Therefore, emphasis during club fitting should be placed on the shot performance of the individual, rather than club speed and/or carry distance.