6.2.3. Multiple Comparisons: A Follow Up to Two-Factor ANOVA

Pairwise Comparisons for Interactions (Club*Ball):

Diagram for Driver

A	D	B	C
228.425	229.750	233.725	243.100

We can be 95% confident that, when using the Driver, the mean distance for Ball C is different than for Ball A and D. No other differences are significant.

Diagram for Five Iron

D	C	A	B
160.500	167.200	171.300	182.675

We can be 95% confident that, when using the Five Iron, the mean distance for Ball B is different than for Ball C and D. No other differences are significant.

6.4 Extra Sum-of-Squares F-test for Testing Interaction by Comparing Additive and Non-additive Models

(b) Now suppose the Interaction is ignored, use the additive model to determine whether either club type or ball brand have an effect on mean distance. Perform the test at the 5% significance level

H_0: Neither factor has an effect on mean distance.
H_a: At least one factor has an effect on mean distance.

$$F = \frac{(32086.778+801.348)/(2-1+4-1)}{1584.816/27} = 140.076$$

$df = (4, 27)$
$P < 0.001$, there is extremely strong evidence against H_0.
$P < \alpha(0.05)$, therefore reject H_0.

At the 5% significance level, the data provide sufficient evidence to conclude that either club type or ball brand, or both have an effect on mean distance.

6.5. Comparing Extra Sum-of-Squares F-test in Single-Factor ANOVA and Two-Factor ANOVA

Extra Sum-of-Squares F-test in Single-Factor ANOVA (Nested Design)

If there is no difference in mean SBP between males and females in the exercise group, the $\mu_{EF} = \mu_{EM}$
If there is no difference in mean SBP between males and females in the movie group, the $\mu_{MF} = \mu_{MM}$

$H_0 : \mu_{EF} = \mu_{EM}$ and $\mu_{MF} = \mu_{MM}$ (reduced model: Two-mean model - Table 3)
$H_a : \mu_{EF}, \mu_{EM}, \mu_{MF}, \mu_{MM}$ (full model: Four-mean model - Table 2)

$df_E(full) = n - k = 36 - 4 = 32$
$df_E(reduced) = n - k = 36 - 2 = 34$

$F = \frac{[SS_E(reduced) - SS_E(full)]\ /\ [df_E(reduced) - df_E(full)]}{SS_E(full)\ /\ df_E(full)} = \frac{(1519.389 - 1209.333)/(34-32)}{1209.333/32} = 4.102$

$df = (2, 32) \approx (2, 30)$
$0.025 < P < 0.05$, strong evidence against H_0
$P < \alpha(0.05)$, therefore reject H_0.

At the 5% significance level, the data provide sufficient evidence to conclude that there is a difference in mean SBP between females and males, after accounting for activity group.