

ENGINEERING REPORT

Subject: 3 oz. Static Wt. vs Balance Hole- Bowler #2

Date: 3/6/18

Place: International Training & Research Center

Present: Danny Speranza, Bowler #2

Purpose: Use ball with adjustable weights to study 3 oz. static weight in all directions vs. ball with balance hole.

Summary: This was a test to determine if increasing static weights to 3 oz. in all directions could hook more than a ball with a balance hole located to increase the differential RG and flare which results in increased hook. Using a special adjustable static weight ball with and without a balance hole, different combinations of static weight and balance hole were tested. It was determined that the added static weight did not perform better (hook more or greater entry angle) than a ball within existing static weight with a large weight hole to maximize the differential RG to create more flare. In many cases the balance hole ball out performed the added static weights.

Discussion: This is the same test as CORE18 but with a different 220+ average bowler as the tester. We build two adjustable static weight balls with different weighted slugs using switch grips to allow different static weights in the same ball.

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Different inserts were weighted differently to change the static weight. Only three static weight adjusters were used in the ball to prevent the flaring ball track from rolling over the inserts. The inserts allowed for:

- Add positive side weight
- Add top weight
- Add thumb weight
- Negative side weight- added later

The first three were selected because these had the potential to increase the amount of hook and entry angle. The negative side weight slug was added after other testing was completed so the flaring track would not hit it.

A balance hole was added with an insert to allow the ball to return to the original diff RG (insert weight matched the ball material weight removed).

A research Technician made the weight adjustments during the test without the bowler knowing what he was testing. The testing was conducted on a flat oil pattern. The goal was to hit the same one board area in the heads and arrows for all balls. Only good shots were kept.

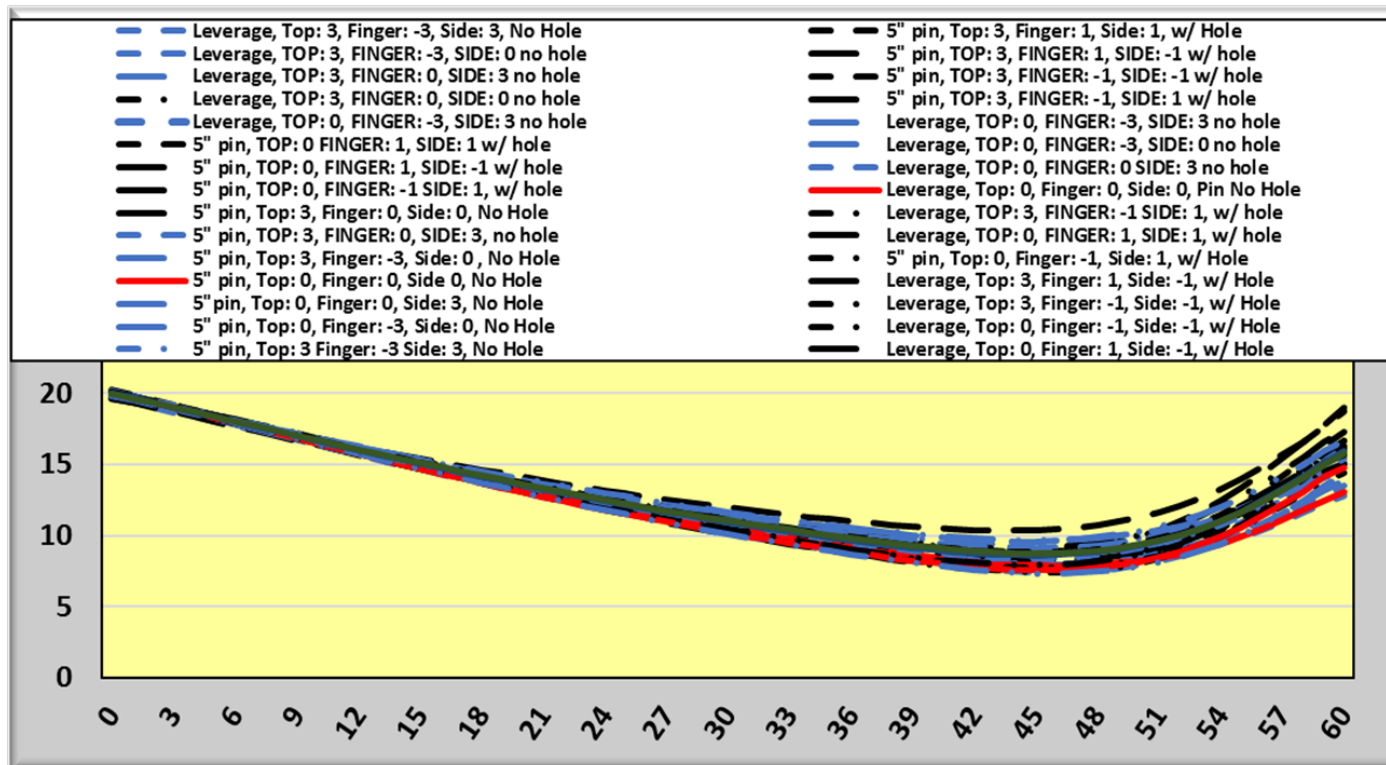
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The goal was also to throw 4 - 5 good shots in less than 15 shots to prevent the lane condition from changing during the test. The balls were initially sanded with 2000-grit Abralon® pads, and then re-sanded every 4th ball test (approximately every 40- 60 shots).

Results combining leverage drilling and 5" pin:

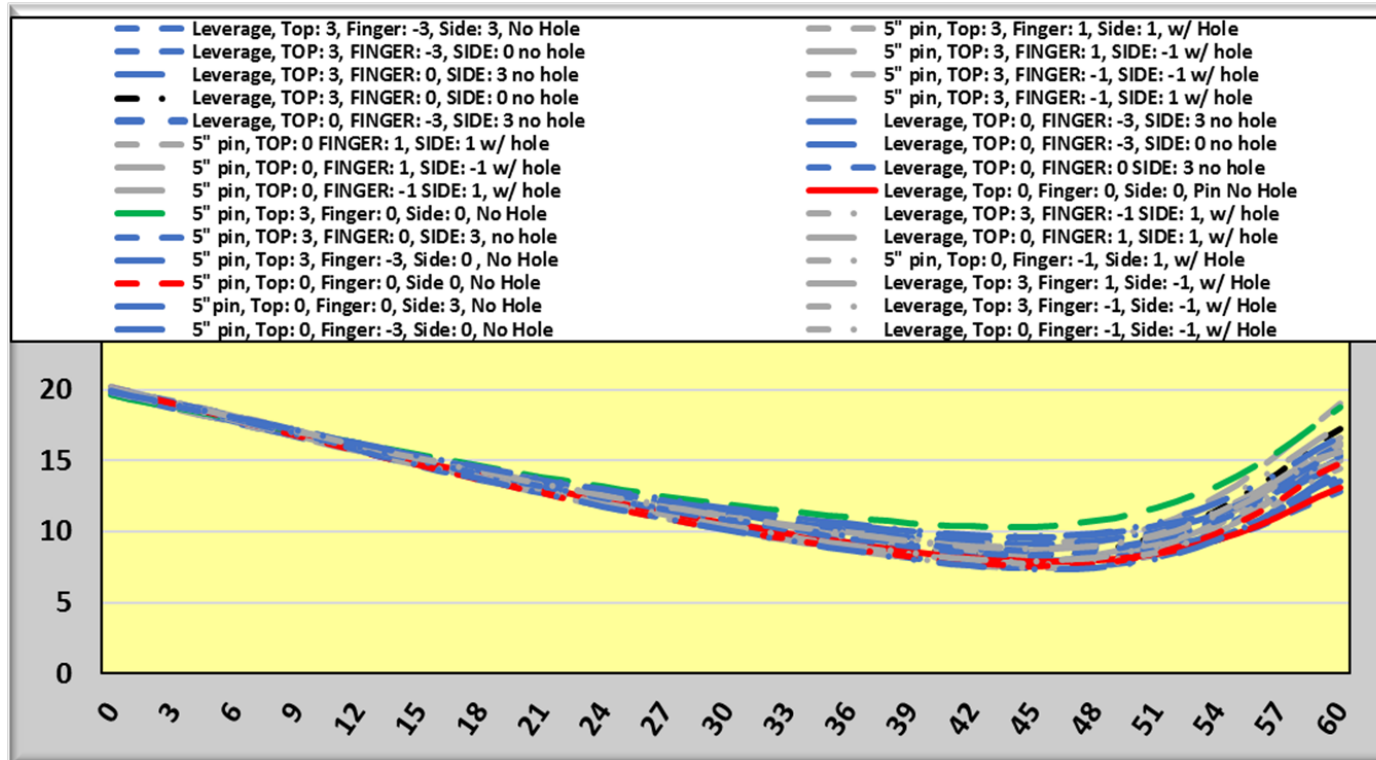
Color code:

- Red= 0 static weight
- Blue= illegal 3 oz. static weight balls
- Black= legal balls today



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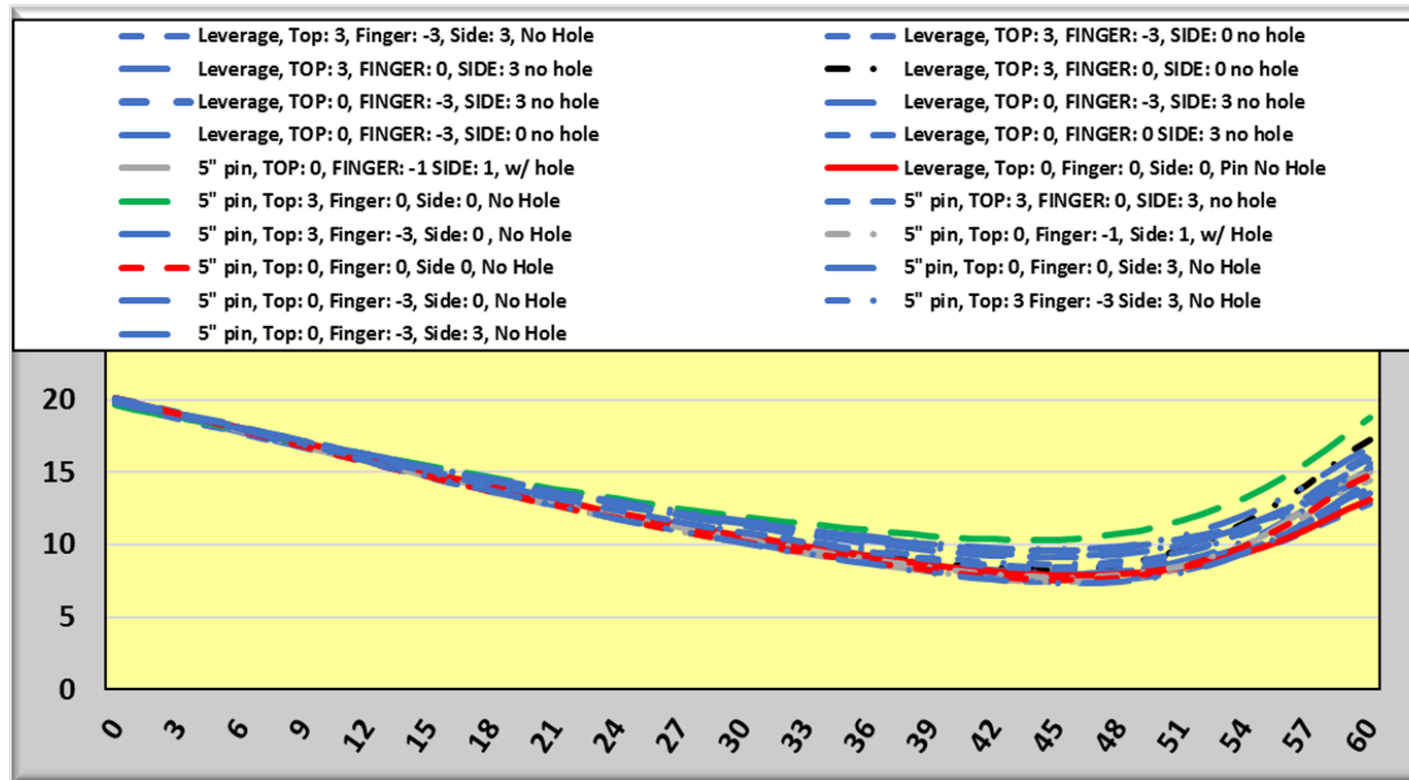
Same graph but grey ball paths would be illegal if balance hole is removed:



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Balance hole balls removed from chart:

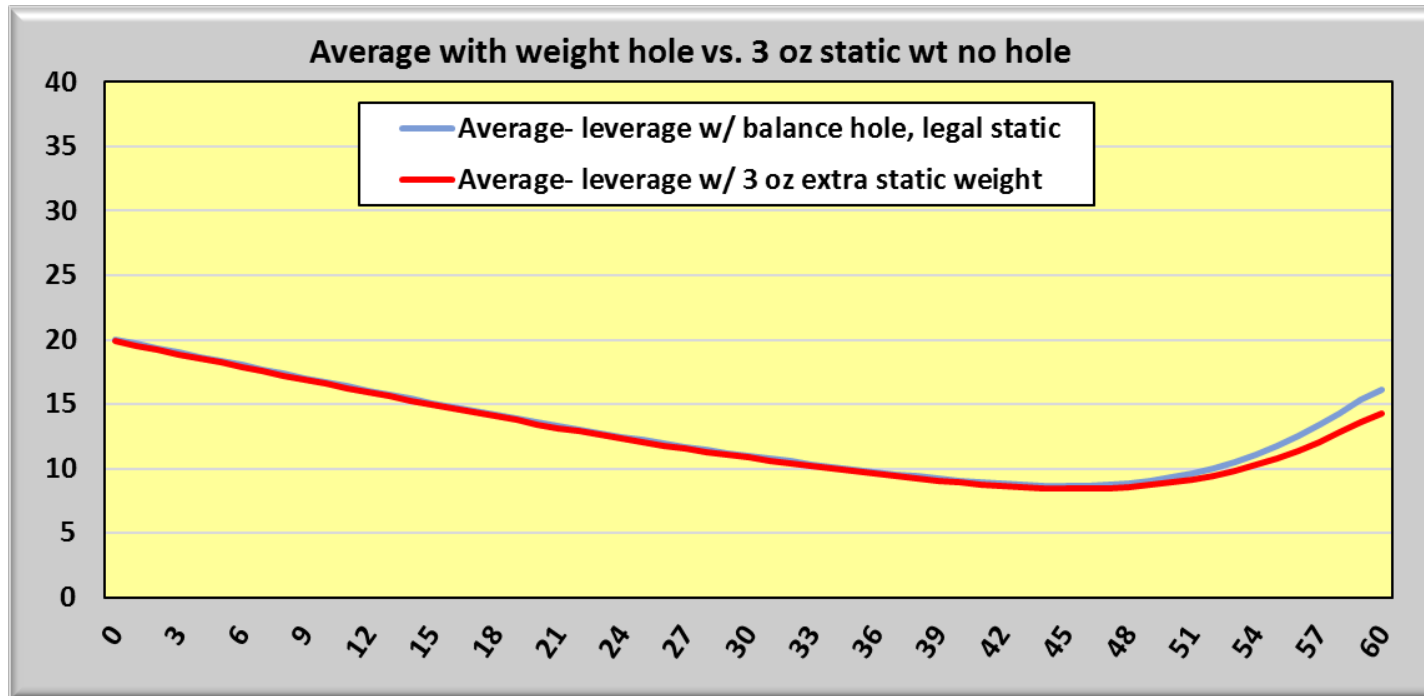
- Most hooking ball path (green) is legal today with 3 top, 0 finger, and 0 side and 5" pin with no weight hole
- 2nd most hooking ball is legal today (black) with 3 top, 0 finger, 0 side leverage drilling with no weight hole



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Average ball path with and without balance hole with leverage drilling below:

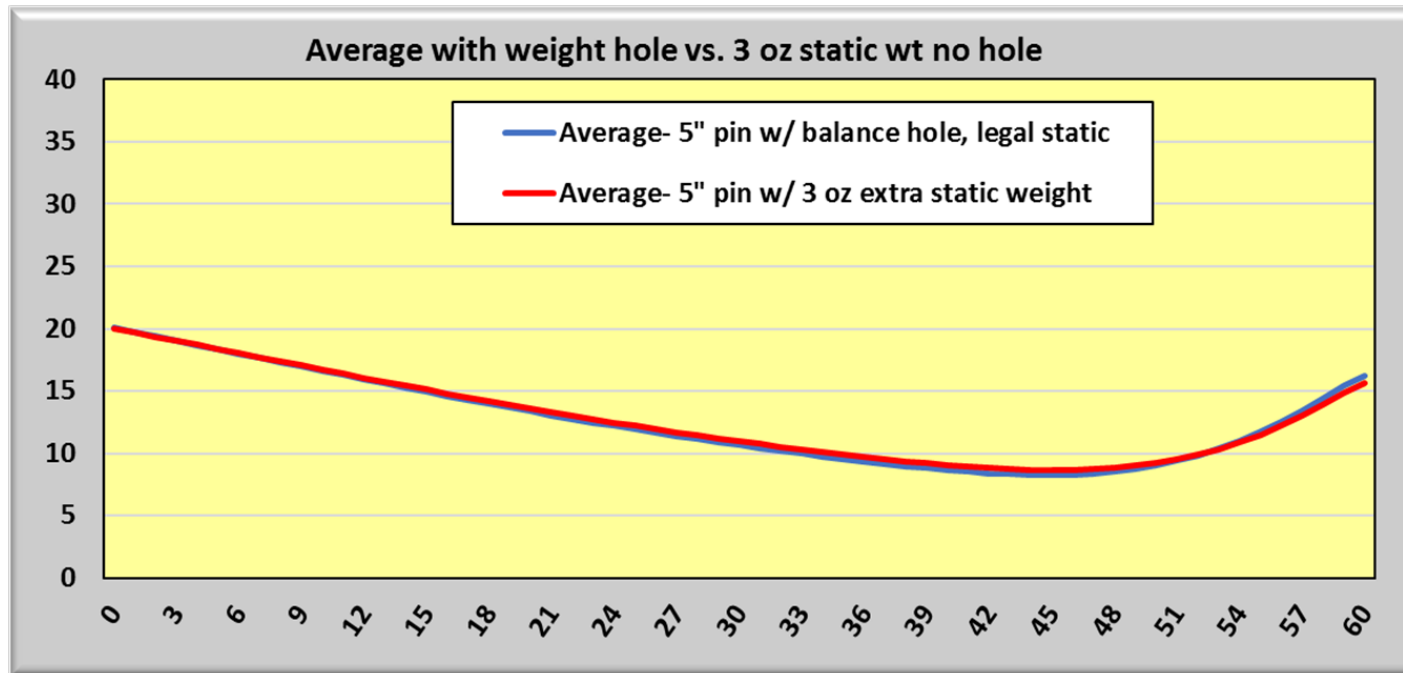
- With balance hole hooks more



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Average ball path with and without balance hole with 5" pin drilling below:

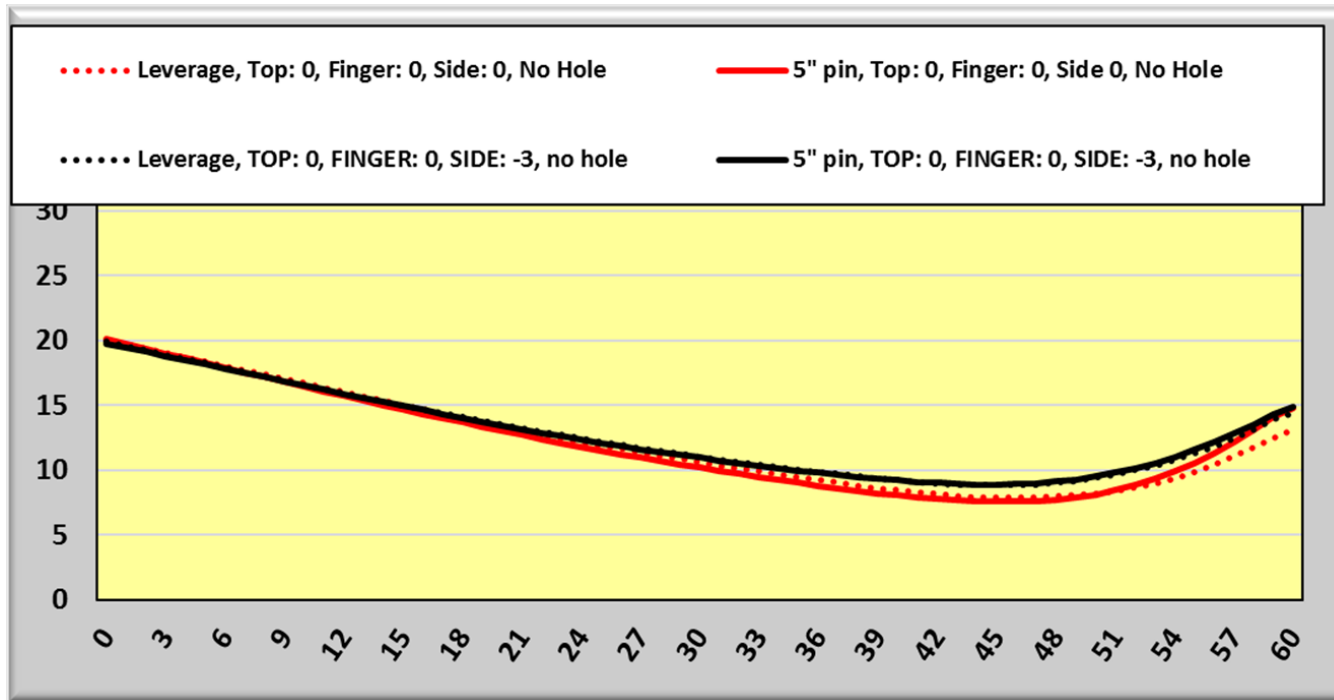
- With balance hole hooks slightly more



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Graphs with negative 3 oz. side weight:

- Red= 0 static weight baseline balls (5" and leverage drillings)
- Black= negative 3 oz. side weight which has small entry angle as expected (5" pin and leverage drillings)
 - Same entry angle as leverage weight with no static imbalance



Comparing 3 oz. negative side weight to least hooking ball paths:

- Added least hooking balls (blue ball paths) for total hook and entry angle during test which are comparable to the negative 3 oz. side with balls (black ball path)

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