Do "Gray Zones" Exist?

Testing the Hypothesis That Certain Ranges of Hole Lengths Result in Low Scoring Variation in Disc Golf

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One commonly accepted tenet in disc golf course design is that certain hole lengths, for certain skill levels, will tend to produce the same scores for most players. Sometime called "dumb" holes, these are generally perceived as lengths to be avoided. These lengths fall into "Gray Zones".

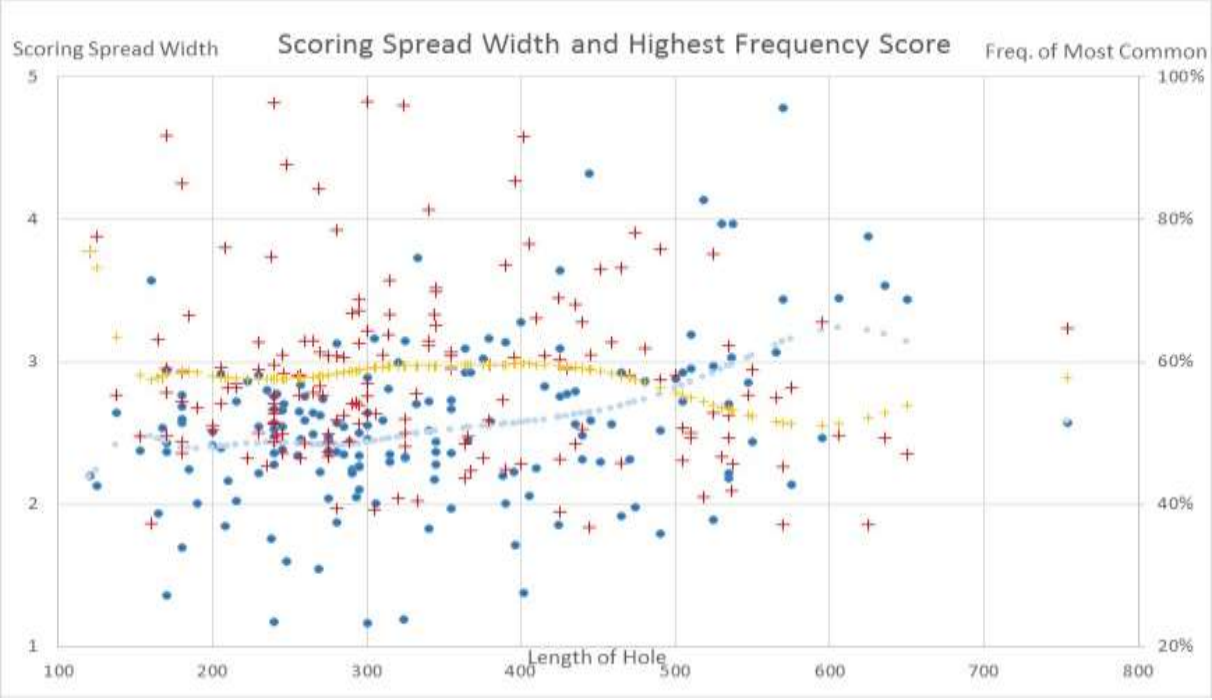
Using data from the Advanced players at the 2104 PDGA Amateur World Championships, I set out to test whether these Gray zones actually exist.

I selected players at the Blue skill level, average rating of 950. Then, I set out to see whether there were any ranges of hole lengths for which the scoring spreads would be narrower.

I plotted two measures of scoring spread. Scoring Spread Width, which is an information-theory based count of the number of different scores. (Higher is better). And the more traditional Frequency of the Most Common Score (lower is better).

There was a lot of variation in scoring spread at all lengths. This alone says that one cannot avoid narrow scoring spread merely by avoiding certain lengths of holes. But, perhaps there are lengths for which there is a tendency for lower scoring spreads.

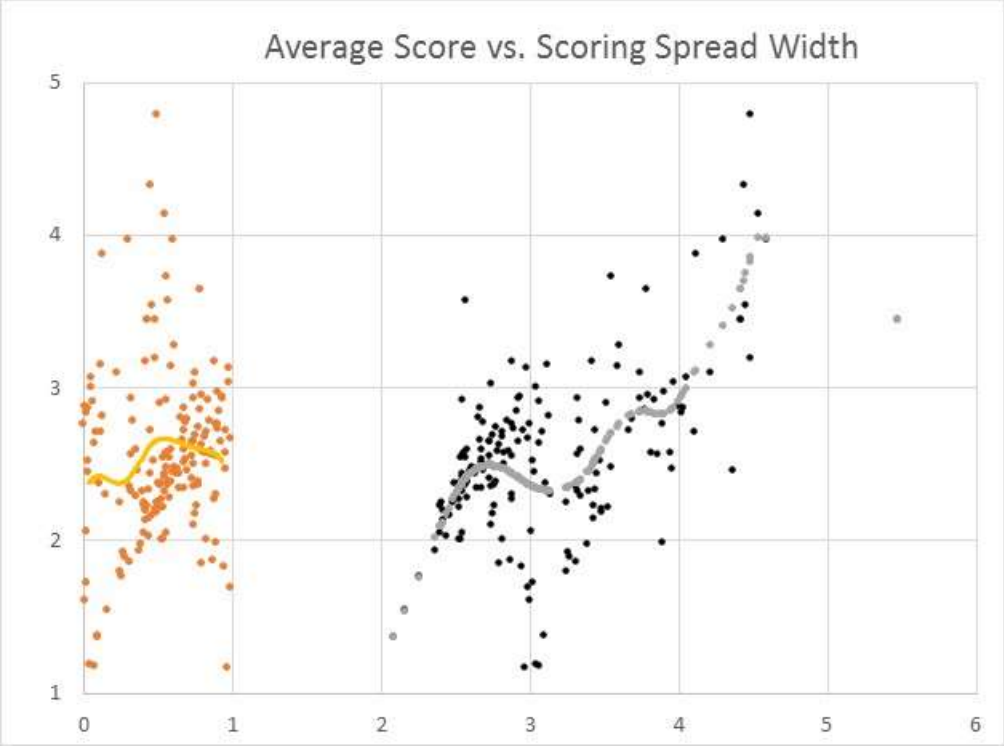
Looking at a moving average (including holes that are + or – roughly 10%), we see no dips in the Scoring Spread Width (until after 600 feet, when data is scarce). We see a slight bump in Freq. of Most Common around 300-400 feet. However, the average Freq. is still below 60% which is considered good.



So, we see no evidence for "Gray Zones" based on hole lengths for this skill level.

Length of hole was always just a proxy for average score. "Dumb" holes – those with low scoring variation may still exist. And, we may tend to find them more often at certain average scores.

So, I plotted Scoring Spread Width against Average Score (see 2 to 6 on the x-axis). Also, against the fractional part of the average score (see 0 to 1 on the x-axis).



Here the results are clearer. The general upward trend for higher scores is more prominent. Also, we see definite dips at certain average scores.

Looking at the plot against the fractional part of the average score, we see that that the very narrowest spreads happen around the integer scores. This is not just a coincidence, but more of a mathematical necessity. The narrowest spread is when everyone gets the same score. So, the narrowest spreads will be around scores of n.0.

We can also see that for scores around n.5 there are no really narrow spreads. Again, this is just mathematics. A score of n.5 can only be a result of splitting the players into (at least) two groups with different scores. Thus, a Scoring Spread Width of less than 2 is impossible for a score of n.5.

Looking at the biggest Scoring Spread Widths we can see that even if the average score is near an integer, it is possible for a hole to have a decent scoring spread. Also, that really wide scoring spreads are easier to achieve for average scores around n.5.

Scoring Spreads are wider for scores in the range n.51 to n.99 than for the range n.01 to n.49. This may merely reflect the tendency for higher scoring holes to have wider scoring spreads.

It is worth noting that the average scoring spread width as a function of the fractional part of the average score only varies from 2.37 to 2.65. Thus, there are no ranges of the fractional part of the average score where a narrow scoring spread is unavoidable, or where a wide scoring spread is guaranteed.

Conclusions:

Average score is a somewhat useful a predictor of scoring spread. Higher average scores will have wider scoring spreads.

The fractional part of the average score is also somewhat useful as a predictor of scoring spread. Holes with average scores near an integer may have vary narrow scoring spreads. Holes with average scores near n.5 cannot have very narrow scoring spreads. However, holes with average scores near an integer can have decent scoring spreads.

Hole length is not a good predictor of the fractional part of the average score, and therefore is useless as a predictor of scoring spread.