Sudden Death and Longer Playoffs in Disc Golf

By Steve West Disc Golf, LLC

June 16, 2016

The question came up as to whether the current method of settling ties is the best.

When two players are tied for first place, the PDGA Competition Manual prescribes:

> 1.9 Tie Breakers
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> Last updated: Wednesday, December 26, 2012 - 14:24
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> B.   Final ties for first place in any division or for the reduction of field size must be broken by sudden death play. Sudden death play shall begin with hole number one unless a different hole or series of holes is designated by the Tournament Director prior to the start of the tournament.

The two things we want an additional round to do are:

- Break the tie.
- Pick the better player.

This paper explores how well additional round(s) of a specified number of holes perform, compared to the special case of a one-hole additional round(s), which is called sudden death.

It finds no compelling reason to extend a playoff to more holes.

The Simulation

I chose a SSA = 57 course and two nearly 1000-rated players.

The performance of a playoff round depends on how closely the two players are matched. So, I looked at a range of differences in skill. I endowed each player with a tournament rating to represent how well they were playing that day.   For example, when looking at a difference in skill of 10 ratings points, I had a 1005 rated player vs. a 995 rated player.

The holes played have average scores ranging from 2.7 up to about 3.63. The average score of each hole was adjusted up or down for each player so that the sum of the average score on all holes matched each player's pre-set expected total score.

Then, based on my formula for the expected distribution of scores on a hole by average score (See Measuring Brutality in Disc Golf Course Design at SteveWestDiscGolf.com) I randomly chose a score for each hole for both players.

For each difference in ratings and number of holes, I ran more than 10,000 simulated playoff rounds.

Efficacy at Breaking the Tie

Probability of Breaking a Tie After 1 Playoff Round
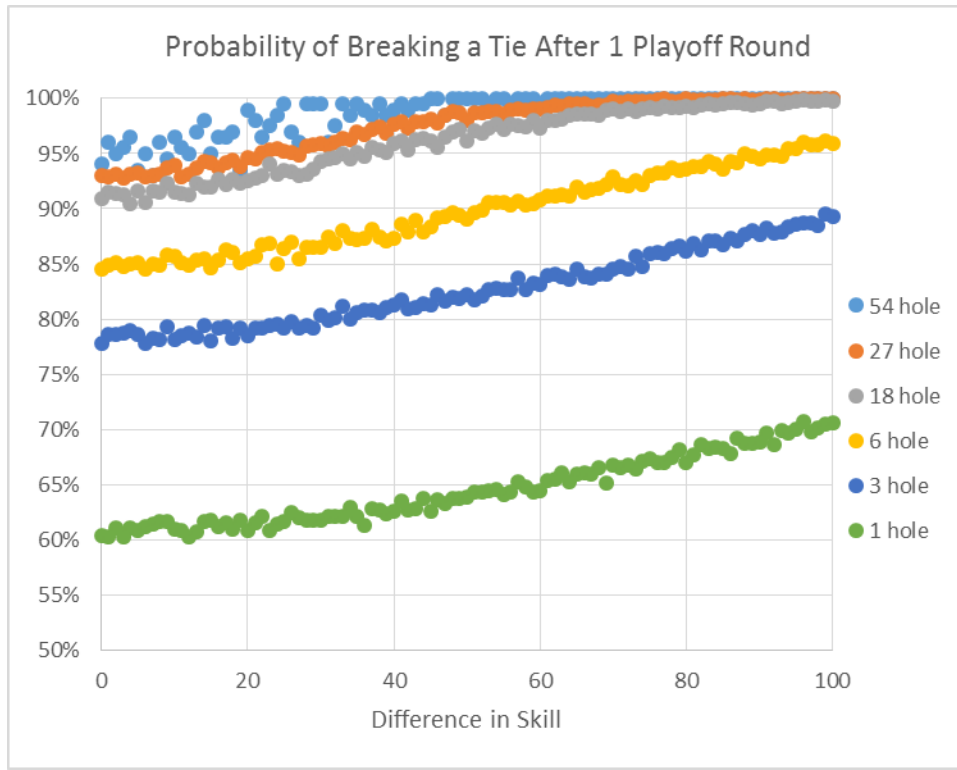
When players are evenly matched, a 54 hole playoff round (or a 54 hole tournament) has about a 95% chance of ending with a clear winner. When the difference in skill is large, there is almost 100% chance of crowning a winner.

When players are evenly matched, a 1 hole playoff round (or the first hole in sudden death) has about a 60% chance of ending with a clear winner. When the difference in skill is large, there is about a 70% chance of ending with a clear winner.

After the first playoff round of *n* holes, there may still be a tie to be broken. This tie could be broken by having another playoff round of n holes, or by sudden death (1 hole rounds until there is no tie). We can use the above probabilities to compute the expected total number of holes played it will take to break the tie.

Expected Number of Holes to Break a Tie, *n* hole playoffs.

Type of Playoff	Skill Difference	1	3	6	9	18	27	54
n holes, n more…	None	1.66	3.86	7.09	10.21	19.79	29.01	57.43
n holes, sudden death	None	1.66	3.37	6.26	9.20	18.15	27.11	54.10
n holes, n more…	Wide	1.41	3.35	6.25	9.17	18.03	27.01	54.00
n holes, sudden death	Wide	1.41	3.15	6.06	9.03	18.00	27.00	54.00

<u>Efficacy at Picking the Better Player</u>

Because the tournament ratings are an input, we know who "should" win each trial. Therefore, we can measure how well each playoff format can pick the correct player to win.
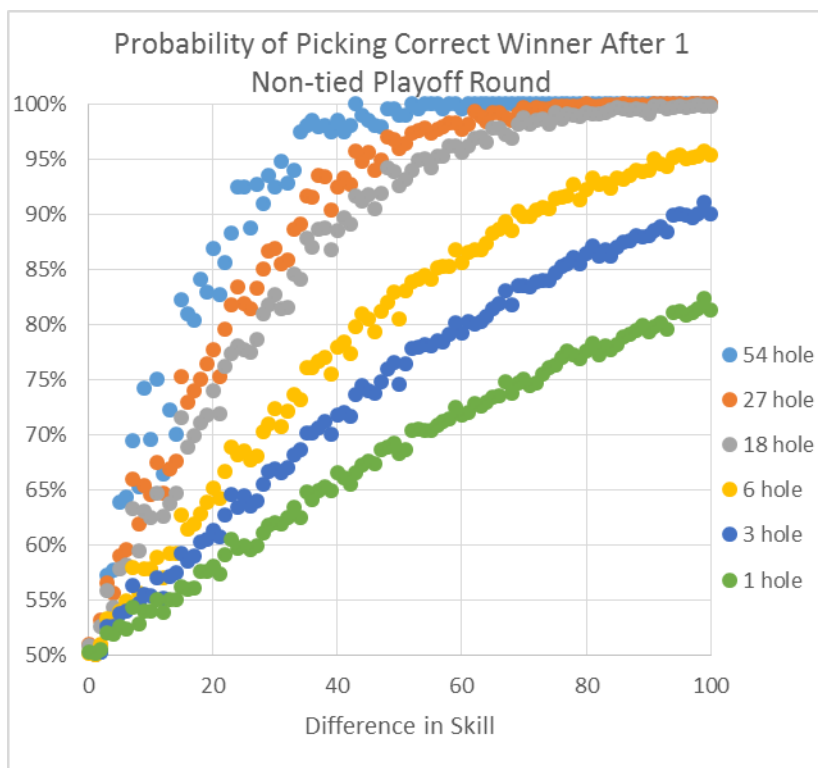
The above chart shows how accurately the different lengths of playoffs picked the winner, when a winner was actually picked.

As expected, when the players are evenly matched, all methods are no better than a coin flip. Also, when there is a difference in skill, the more holes in the playoff, the better the chance that the crowned winner was actually the better player.

However, there is not always a winner after the first playoff round. That is also a bad result. So, the real efficacy is how accurately each method chooses the correct winner, times the probability that they actually make a choice.

Efficacy of Picking the Correct Winner after a Single *n* hole Playoff

Skill Difference	1	3	6	9	18	27	54
None	30%	39%	42%	45%	46%	47%	44%
Wide	58%	81%	92%	96%	100%	100%	100%

Of course, we don't leave things tied after a single playoff round. If another n holes are played (repeat as needed) the chance that a winner is picked goes up to 100%, while the probability of picking the correct player stays the same.

If the playoff is followed by sudden death, the chance of picking a winner also goes up to 100%, but the probability of picking a winner is affected by the probability that sudden death picks the correct winner.

<u>Efficiency</u>

A playoff method that picks the correct winner more often than 50%, and does so with fewer holes played, is more efficient.

We can make up an index of percent of winners picked correctly (above 50%) per playoff hole played.

Since all methods are zero percent efficient when the players are evenly matched, we only need to look at cases where there is a difference in player skill.

Winners Correctly Picked per Playoff Hole Played, for *n* hole Playoffs

Type of Playoff	Skill Difference	1	3	6	9	18	27	54
n holes, n more…	Wide	0.45	0.24	0.15	0.10	0.06	0.04	0.02
n holes, sudden death	Wide	0.45	0.24	0.14	0.10	0.05	0.04	0.02

Conclusion

It is known that for a 54 hole round, the change in a player's tournament rating from one tournament to the next would be expected to be 50 points or more 50% of the time.

Coincidently, a 54 hole round has no chance of ending in a tie if the two players are playing at skill levels that are more than 50 ratings points apart.

So, if there is a tie after 54 holes, the two players are more closely matched than a single player is from tournament to tournament half the time.

For closely matched players, no length of playoff can both: break the tie and pick the correct winner, a majority of the time.

For wide differences in skill, a series of 1 hole playoffs (sudden death) is by far the most efficient way to select a winner.

So, we have found no compelling reason to use anything other than sudden death to break ties.

However, this simulation does not take into account the possibility that some holes are biased against some players. Whether that is possible - or if possible, unfair - is another topic. It seems that no more than a 3 hole playoff (never reverting to sudden death) would be needed in any case.