

## Advantage Golf Croquet - SCF Trial 2021 Evaluation for WCF working group

### INTRODUCTION

Matches played in the Southern Croquet Federation (SCF) Handicap League during 2021 used the Advantage method for all games. Two teams of four players played each opponent once making a total of 16 games per match. There were no handicap restrictions.

A database of 836 games from 58 matches involving 137 players from 16 teams was used in the analysis which follows. 92 games in which both players had the same handicap were excluded from the data as a starting score of 0 : 0 has no relevance to the Advantage game.

A similar database of SCF handicap matches played pre-Covid in 2019 using conventional Extra Strokes rules was created for comparison. This data from 903 games (64 matches) using the same league format as in 2021 likewise excluded 121 games between players of equal handicap.

### ANALYSIS

Data was analysed across the 2021 and 2019 seasons primarily by considering the performance of the stronger player in a number of ways using win percentages to enable a direct comparison to be made. Additional analysis includes the number of hoops actually run in a game and the distribution of match scores. Full figures are given in the tables which follow in this report.

**Table 1 – Percentage wins for stronger player by handicap difference**

Handicap difference	ADVANTAGE 2021		EXTRA STROKES 2019	
	Total number of games	% wins for stronger player	Total number of games	% wins for stronger player
1	198	49 %	216	50 %
2	155	47 %	178	43 %
3	150	46 %	143	47 %
4	106	44 %	131	53 %
5	88	36 %	78	53 %
6	54	44 %	71	59 %
7	40	35 %	32	69 %
8	15	33 %	30	70 %
9	18	56 %	10	60 %
10	8	38 %	7	86 %
11	4	0 %	3	67 %
Range of handicap difference				
1 to 2	353	48 %	394	47 %
3 to 4	256	45 %	274	50 %
5 to 6	142	39 %	149	56 %
7 to 8	55	35 %	62	69 %
9 to 11	30	43 %	20	70 %

A key feature of both the trial results and the 2019 comparison is apparent in a number of the analyses but is shown most clearly above. The table apparently shows that a known inherent flaw in the fairness of Extra Strokes play has been over compensated for in the Advantage trial.

As the two players' handicap difference increases the data show that the desirable 50% win ratio achieved with a handicap difference of 1 becomes increasingly unequal. In Extra Strokes games the stronger player won up to 70% of games where the handicap difference was 9, 10 or 11. In Advantage games the stronger player won only 43% of similar games.

*The trend is clear in both games. Conventional Extra Strokes play is biased in favour of the stronger player whereas the Advantage trial favoured the weaker player.*

**Table 2 – Percentage wins by handicap**

Handicap	ADVANTAGE 2021					EXTRA STROKES 2019				
	As stronger		As weaker		% wins	As stronger		As weaker		% wins
	W	L	W	L		W	L	W	L	
-1	3	1	0	0	75 %	7	5	0	0	58 %
0	2	10	0	0	20 %	26	22	0	0	54 %
1	14	22	0	0	39 %	11	11	2	0	54 %
2	23	35	1	1	41 %	42	27	0	3	58 %
3	55	95	6	7	37 %	48	46	0	4	49 %
4	46	74	8	9	39 %	110	93	19	10	56 %
5	64	77	35	27	49 %	66	63	29	31	50 %
6	74	68	66	48	55 %	69	95	72	62	47 %
7	34	36	76	56	54 %	44	32	67	68	53 %
8	25	24	83	49	60 %	34	33	107	109	50 %
9	20	11	62	45	59 %	4	8	64	68	47 %
10	12	7	53	44	56 %	2	4	40	61	39 %
11	3	1	45	43	52 %	0	1	16	11	57 %
12	0	0	23	43	35 %	0	0	16	24	40 %
14	0	0	3	3	50 %	0	0	8	12	40 %

As might be expected win percentages by handicap also reflect the same biases. Under the Advantage method players of handicap 6 and above generally won more than half of their games whereas under Extra Strokes this applies to handicap 5 and below.

**Table 3 – Advantage 2021 stronger player win percentages by starting score**

Starting score	Total games	Stronger win		Weaker win	Level play points exchanged
		frequency	percentage	frequency	
-1 : 0	264	135	51 %	129	9/11 & 8/12
0 : 1	97	53	55 %	44	7/13
-1 : 1	124	50	40 %	74	6/14
0 : 2	66	29	44 %	37	5/15
-1 : 2	66	31	47 %	35	4/16
0 : 3	98	37	38 %	61	3/17
-1 : 3	64	19	30 %	45	2/18
-2 : 3	14	5	36 %	9	1/19
0 : 4	7	5	71 %	2	(1/19)
-3 : 3	9	2	22 %	7	(1/19)
-1 : 4	1	0	0 %	1	(1/19)
-4 : 3	10	3	30 %	7	(1/19)
-5 : 3	1	1	100 %	0	(1/19)
-2 : 4	5	3	60 %	2	(1/19)
-3 : 4	10	2	20 %	8	(1/19)

Table 3 is ordered by level play points exchanged. Advantage starting scores map directly to the level play Exchange of Index Points table (EIP) used by the Croquet Association and elsewhere for maintaining a handicap system.

If we consider the main body of starting scores (above the line), the stronger player fares less well as scores move away from the leading diagonal of 0 : 0 scores.

For the more extreme starting scores, or outliers (in italics below the line), the win percentages are inconsistent and suggest an inherent difficulty in arranging for players of widely different abilities to play each other on level terms.

**Table 4 – Game analysis by final score**

ADVANTAGE 2021							EXTRA STROKES 2019						
No of games	% of total	Final score					No of games	% of total	Final score				
		Stronger wins			Weaker wins				Stronger wins			Weaker wins	
		Score	Freq	%	Score	Freq			Score	Freq	%	Score	Freq
836	100%	7 - ?	375	<b>44 %</b>	? - 7	461	903	100%	7 - ?	463	<b>51 %</b>	? - 7	440
248	30 %	7 - 6	150	<b>60 %</b>	6 - 7	98	256	28 %	7 - 6	126	<b>49 %</b>	6 - 7	130
187	22 %	7 - 5	90	<b>48 %</b>	5 - 7	97	218	24 %	7 - 5	113	<b>52 %</b>	5 - 7	105
174	21 %	7 - 4	73	<b>42 %</b>	4 - 7	101	186	21 %	7 - 4	87	<b>47 %</b>	4 - 7	99
124	15 %	7 - 3	45	<b>36 %</b>	3 - 7	79	129	14 %	7 - 3	83	<b>64 %</b>	3 - 7	46
62	7 %	7 - 2	15	<b>24 %</b>	2 - 7	47	77	9 %	7 - 2	35	<b>45 %</b>	2 - 7	42
20	2 %	7 - 1	1	<b>5 %</b>	1 - 7	19	31	3 %	7 - 1	15	<b>48 %</b>	1 - 7	16
21	2 %	7 - 0	1	<b>5 %</b>	0 - 7	20	6	1 %	7 - 0	4	<b>67 %</b>	0 - 7	2

Table 4 looks at final scores in a game and shows that the stronger player won 44% of Advantage games compared with 51% of Extra Strokes games. Under Advantage a 7 – 6 win was more frequently achieved by the stronger player (60%) at the expense of less close wins, whereas in Extra Strokes play the wins were generally close to 50% for most final scores.

Final scores in Advantage are naturally affected by non 0 : 0 starting scores but regardless of winner. 30% of Advantage games finished 7-6 (or 6-7) and 22% at 7-5 (or 5-7). In Extra Strokes games the corresponding figures are 28% and 24%.

In both formats therefore, 52% of games ended with the loser ‘scoring’ 5 or 6 hoops.

**Table 5 – Frequency of number of hoops run per game**

Number of hoops run	ADVANTAGE 2021 Frequency	EXTRA STROKES 2019 Frequency
4	2	
5	7	
6	15	
7	26	6
8	59	31
9	123	77
10	141	129
11	135	186
12	159	218
13	82	256
14	87	
<b>Mean hoops/game</b>	<b>10.7</b>	<b>11.4</b>

Apart from the aim to achieve an overall average of 50% wins for both stronger and weaker player Advantage also aims to keep games to a similar length (on average) as Extra Strokes games. Timing data was not collected as part of the trial but it is possible to compare the total number of hoops run per game in both formats.

Under Advantage in Table 5 the mean number of hoops per game was 10.7 compared with 11.4 for Extra Strokes. Very short games (less than 7 hoops) comprised 3% of Advantage games whilst 10% of games finished after 14 hoops.

**Table 6 – Frequency of match scores**

Home score	Away score	<b>ADVANTAGE 2021 Frequency</b>	<b>EXTRA STROKES 2019 Frequency</b>
16	0	0	0
15	1	0	0
14	2	1	1
13	3	3	0
12	4	3	4
11	5	6	8
10	6	8	4
9	7	6	16
<b>Total home wins</b>		<b>27</b>	<b>33</b>
8	8	8	13
<b>Total away wins</b>		<b>23</b>	<b>18</b>
7	9	10	8
6	10	6	5
5	11	4	1
4	12	2	4
3	13	1	0
2	14	0	0
1	15	0	0
0	16	0	0
<b>Mean home score</b>		<b>8.45</b>	<b>8.52</b>
<b>Std. Dev. <math>\sigma</math></b>		<b>2.51</b>	<b>2.12</b>

Frequency of match scores shows 27 Home and 23 Away wins under Advantage compared with 33 Home and 18 Away under Extra Strokes. In both games the mean home score is very similar with the standard deviation showing a slightly wider distribution of scores for Advantage matches.

Any real significance in these figures is probably lost as a result of the aforementioned handicap biases and the fact that many teams varied their handicap strengths from match to match. For example a team using only a pool of 6 players with handicaps in the range 5 to 7 competed against a team with a pool of 10 players and handicaps from 1 to 10.

The mean number of players constituting any one team pool was 8.6 with a minimum of 6 and a maximum of 13 – each match using any 4 players per team.

## FEEDBACK

SCF clubs participating in the trial Advantage league were invited to contribute their thoughts and observations as the season progressed. Following the trial, a circular to all players requested a more structured response either from individuals or as a team. This included some questions which might help with evaluating the success or otherwise of the trial.

*Is a form of Advantage play a useful alternative to handicap play?*

*Would you suggest any modifications to the way Advantage has been played in this trial?*

*Did Advantage play become easier as the season progressed?*

*Was it difficult to keep score? Did you find a satisfactory method?*

*Some players have cited a psychological barrier when playing a weaker opponent at Advantage. Is this your experience? Can you explain it? Can it be overcome with greater familiarity?*

*Do you like or dislike traditional Extra Stroke handicap play? Do you think this represents the majority view at your club?*

*Are there any other significant features of Advantage that you think should be considered?*

It is not possible to summarise feedback quantitatively – some was on an individual basis, other by team – and many critical responses for example were qualified by, or restricted to specific detail rather than an overall dislike of the concept. In general higher handicap players were likely to be in favour of Advantage, the better players being much more critical.

Personal reasons for liking/disliking either of the two games were varied, but generally hinged around whether the additional tactics and skills required by Extra Strokes were regarded as enjoyable or as anathema.

“the tactical challenge of Extra Strokes play has been eliminated”

“it is difficult for people to master different tactics in Extra Strokes games”

“the award of hoops before play begins is wrong in principle”

“the idea of playing level and letting the handicap system adjust the scores seems good in principle”

“novices will never win a game without extra strokes”

“Advantage is straightforward. You can concentrate on the game and not think about bisques”

Similarly, the views expressed on other specific aspects often encompassed the full range from “triumph” to “disaster”, or “yes we need a further trial” to “no never again”.

Criticism that games were both too long *and* too short, depended it would seem upon individual experience. (Table 5 gives a slightly lower mean number of hoops per game for Advantage and the distribution is naturally wider than for Extra Stroke play).

A few respondents offered the thought that not all players were conversant with the game, and confusing feedback from one or two teams does suggest that this may indeed have been the case.

Notwithstanding the above, there are two aspects of the trial which are significant and identified consistently by many players:

### **Advantage favours the weaker player**

Table 1 in particular fully supports this observation when the handicap difference becomes large. Many players suggested a cap on the maximum starting score for the weaker player of 2 or 3.

### **Scoring was difficult**

Negative numbers, a multiplicity of scoring clips, difficulty in reconciling the score with physical position on the court, confusion when players/teams used different scoring methods, were all cited as significant problems.

One or two respondents offered some very detailed analysis and constructive feedback relating to starting scores, keeping score and the negative number problem, but much of this was radical and added extra complications whilst still only being a compromise solution. *The one common conclusion which these players offered is that no handicap system can successfully accommodate extremes of abilities and that it is unrealistic to try and do so.*

## **PROPOSALS**

SCF trial data, feedback evidence and personal communications from outside of the trial all lead me to conclude that Advantage GC has the potential to provide a practical and attractive alternative to Extra Strokes handicap play for many croquet players.

To realise this potential it is clear that some modifications need to be made to the game as used in the trial, in order to respond to the bias towards the weaker player as identified in Table 1 and in much corroborative feedback.

it is worth noting here that little can be done about the bias in Extra Strokes play. We know already that awarding the same number of Extra Strokes to players of different handicaps is intrinsically unfair. For example, in Level play (by referencing the "Points exchanged table") a scratch player is expected to win 85% of games against a handicap 4, whereas a handicap 8 player is only expected to win 70% of games against a handicap 12. Awarding the weaker player 4 Extra Strokes in both of these cases is clearly not a satisfactory solution.

### **Starting scores table**

Anecdotal evidence during the Advantage trial confirms that a bias arises because the improved chance of winning a hoop by playing first to it was not built into the original algorithm. In an Advantage game, as opposed to Extra Strokes play, the weaker player can expect more first-to-hoop situations than the stronger player because the stronger player must win more hoops. The greater the handicap difference the more this will favour the weaker player.

I am in the process of reworking the Advantage starting scores table by running the computer simulations with a modified algorithm which can be expected to remove much of the bias seen in games with large handicap differences.

In the main body of the starting scores table, which applied to the majority of league games, this will mean the weaker player starting on a maximum score of 2. Typically, existing scores of 0:3 and -1:3 for example will become -1:2 and -2:2 respectively. This will have an effect on the length of a game, increasing the number of hoops scored per game above the trial mean of 10.7. By comparison the Extra Strokes mean was 11.4 so we can expect the two games to be very close in this respect.

### **Outliers**

In addition to reworking the main body of the starting scores table I propose to remove all of the outliers (see Table 3) and replace them with one representative starting score. This score will offer a reasonable challenge to both players but cannot offer a 50% win ratio in the more extreme cases. Only some 3% of trial games used the extreme cases and many such were regarded as "unenjoyable", "unfair", or "not normal croquet". I firmly believe along with several of my correspondents that handicap play with such extremes of ability is neither desirable nor feasible.

### **Keeping score**

The problems arising with keeping score in an Advantage game are more difficult to tackle but I am aware that some players (teams) were not well enough prepared in advance to cope with a more complex scoring method than they were used to, and that more help needs to be available.

I propose that GC Rule 7.4 must be adhered to *both* by the use of clips and by announcing the score after each hoop.

The suggested clip method has been rightly criticised for the “Christmas tree effect” on hoop 1 (hoop 8) and consequent difficulties in correcting a ‘clipping’ error here as well as the impracticality of removing the clips in order to run the hoop without hindrance. Even more so with double banking.

I have been given details of a number of alternative scoring methods (using clips, beads, score cards etc.) but all fail in some way. Any satisfactory method must enable the game score to be apparent to a spectator/referee/manager, and have the ability to allow backtracking in the event of an error, and be practical to operate.

I believe the simplest method requires a clear physical indication of both starting scores to be available so that normal ‘clipping’ (one clip for each hoop scored) can be used and the game score will then be calculable. Any practical suggestions are very welcome!

Short of any alternative method I propose to include a scoring advice sheet which was used by one or two teams in the trial. This sheet also answers the often quoted erroneous criticism that there is no connection between the current game score and the last hoop run as in conventional play:

total of current scores = last hoop run.

In Advantage this becomes:

total of current scores = last hoop run + *total of starting scores*.

### **Presentation**

In reworking the starting scores I propose to make a logical presentational change to the table. The starting scores (stronger : weaker) will be shown with the stronger handicap scale horizontally increasing numerically from left to right and the weaker handicap scale increasing vertically from bottom to top. This accords with conventional mathematical representation of x-y co-ordinates.

Finally, the SCF took on the trial of this project on behalf of the WCF to greatly progress the development of a fairer and more enjoyable version of Handicap GC for the Croquet World to enjoy. I truly believe that the modifications that I have outlined, will deliver such a game and the benefits to players around the world will be enjoyed for years to come.

If the WCF approves the proposals in this report I will update the documentation accordingly and request that an Advantage Phase 2 Trial should take place in 2022.

Roy Tillcock  
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