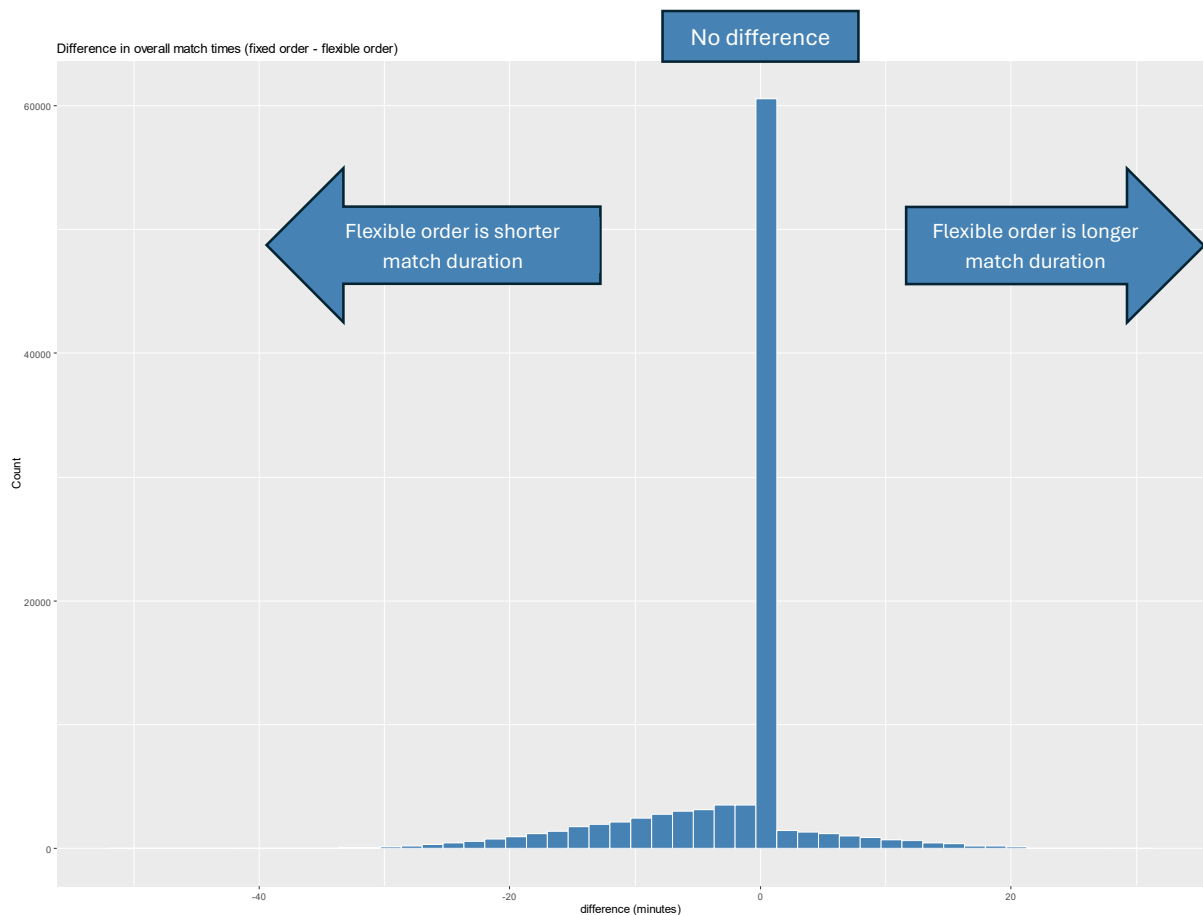


Analysis of match duration dependency on playing order (Men's 6 and Mixed 6)

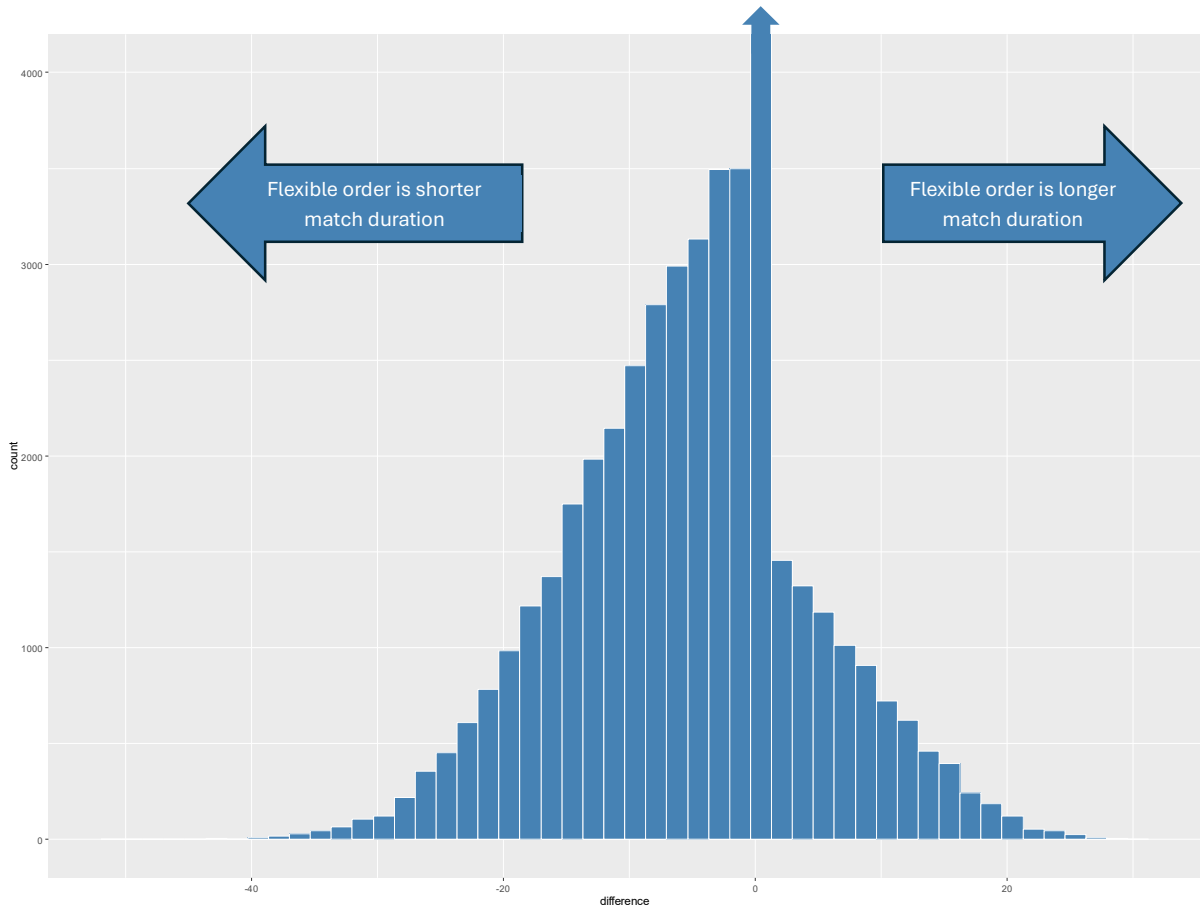
The Southwest Herts badminton league score sheet for men's 6 matches suggests a playing order for each rubber. The question is whether it is better to stick to that order even if a court is free and another pair is available to play ('strict order'), or whether it is better to start a new rubber as soon as any pair is free ('flexible order'). To answer this question 100,000 matches were simulated assuming that only two courts are available for play and each rubber in those matches lasted a random length of time.

For the majority of matches (58% of the time) it makes no difference. Of the other 42%, the majority of matches would be shorter if a flexible order is adopted (32% are shorter, and 10% are longer).

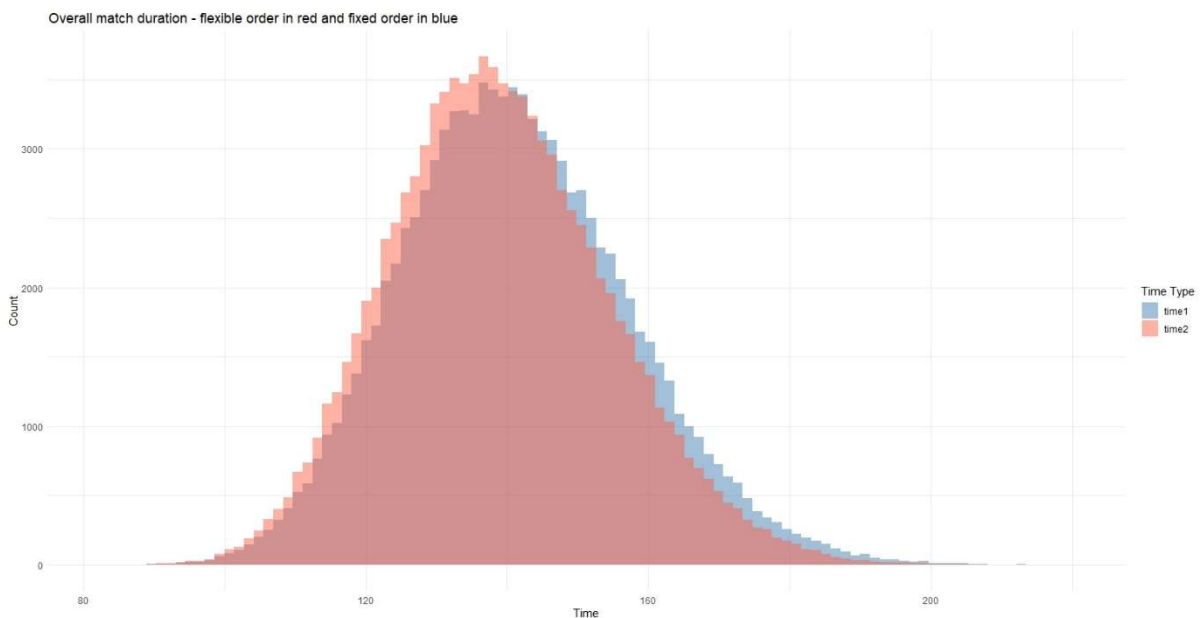
The difference in overall match lengths was compared when (1) playing pairs in strict order or (2) in a flexible order. Graphically the results were:



Zooming in on the bottom of this chart we can see that when it makes a difference, then playing a flexible order would save around 9 minutes overall.



For context the overall match duration of all 100,000 simulated matches showed the following distribution:



The average match duration was 2 hours 19 minutes where a flexible order was used and 2 hours 21 minutes where a fixed order was used.

Details of the methodology

Order of play

The Men's 6 scoresheet suggests the following order of play:

Order	Home	Away
1	Pair 1	Pair 1
2	Pair 2	Pair 2
3	Pair 3	Pair 3
4	Pair 2	Pair 1
5	Pair 3	Pair 2
6	Pair 1	Pair 3
7	Pair 3	Pair 1
8	Pair 1	Pair 2
9	Pair 2	Pair 3

PLAYING ORDER		
1	8	6
4	2	9
7	5	3

Program

An algorithm was constructed (in R) to simulate 100,000 matches. For each match, random times for each rubber were generated and then used to simulate pairs playing their rubbers for those times. As each pair comes off court the algorithm would test to see if the next pair were available to start playing. For each set of rubber times, the next pair was: either selected based on the strict order above (and if both pairs required were not available then the court remained empty until the other game finished); or if any available pairs who had not played their rubber were available then they would go on court.

The code for the algorithm is available here:

[Mens 6 playing order simulation with histogram of differences.txt](#)

<https://1drv.ms/t/c/b2c9590716d4f627/IQDCYIArVOtFRrz7czZGck98AXJcSwfbuq3bceW6lZsRWfU?e=luxW1k>

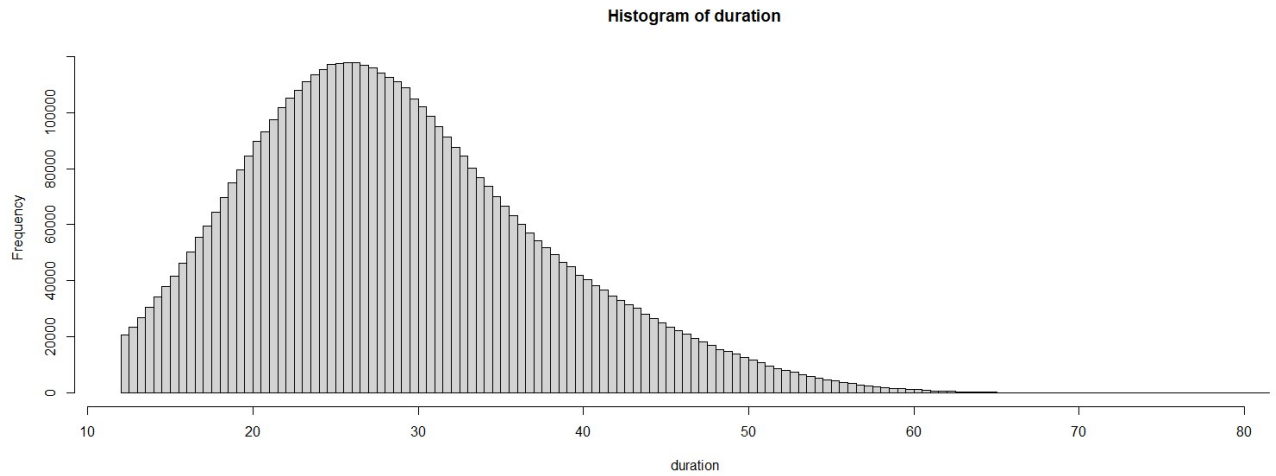
The annex shows an example of the playing times and sequence of play on both bases.

Probability distribution for the duration of each rubber

The probability distribution for the random times for each rubber was generated assuming:

- the first two games have an average duration of 25 minutes (+/- 7 minutes) and follows a normal distribution but with a minimum playing time of 12 minutes
- one quarter of rubbers go to three games
- where a third game is played, then it has an average duration of 13 minutes (+/- 5 minutes) and follows a normal distribution but with a minimum playing time of 5 minutes

On this basis the average rubber duration was 29 minutes (+/- 9 minutes) and the distribution is slightly tail-heavy.



Annex – example of playing order

Playing in strict order

	cum.time	A1	A2	A3	B1	B2	B3	Playing1	Playing2	Time1	Time2
1	0.00000	rest	rest	rest	rest	rest	rest	0	0	0.0000000	0.0000000
2	0.00000	play	rest	rest	play	rest	rest	1	0	37.8943207	0.0000000
3	0.00000	play	play	rest	play	play	rest	1	2	37.8943207	16.613097
4	16.61310	play	rest	rest	play	rest	rest	1	0	21.2812236	0.0000000
5	16.61310	play	rest	play	play	rest	play	1	3	21.2812236	20.782005
6	37.39510	play	rest	rest	play	rest	rest	1	0	0.4992182	0.0000000
7	37.89432	rest	rest	rest	rest	rest	rest	0	0	0.0000000	0.0000000
8	37.89432	rest	play	rest	play	rest	rest	4	0	20.5856743	0.0000000
9	37.89432	rest	play	play	play	play	rest	4	5	20.5856743	28.610750
10	58.47999	rest	rest	play	rest	play	rest	0	5	0.0000000	8.025076
11	58.47999	play	rest	play	rest	play	play	6	5	41.7314666	8.025076
12	66.50507	play	rest	rest	rest	rest	play	6	0	33.7063905	0.0000000
13	66.50507	play	rest	play	play	rest	play	6	7	33.7063905	20.242706
14	86.74778	play	rest	rest	rest	rest	play	6	0	13.4636845	0.0000000
15	100.21146	rest	rest	rest	rest	rest	rest	0	0	0.0000000	0.0000000
16	100.21146	play	rest	rest	rest	play	rest	8	0	22.3653737	0.0000000
17	100.21146	play	play	rest	rest	play	play	8	9	22.3653737	25.066351
18	122.57684	rest	play	rest	rest	rest	play	0	9	0.0000000	2.700977
19	125.27781	rest	rest	rest	rest	rest	rest	0	0	0.0000000	0.0000000

Random time for rubber 1

Random time for rubber 2

Rubber 4 has to wait for 5 minutes before being able to start

Playing in a flexible order

	cum.time	A1	A2	A3	B1	B2	B3	Playing1	Playing2	Time1	Time2
1	0.00000	rest	rest	rest	rest	rest	rest	0	0	0.0000000	0.0000000
2	0.00000	play	rest	rest	play	rest	rest	1	0	37.8943207	0.0000000
3	0.00000	play	play	rest	play	play	rest	1	2	37.8943207	16.613097
4	16.61310	play	rest	rest	play	rest	rest	1	0	21.2812236	0.0000000
5	16.61310	play	rest	play	play	rest	play	1	3	21.2812236	20.782005
6	37.39510	play	rest	rest	play	rest	rest	1	0	0.4992182	0.0000000
7	37.39510	play	rest	play	play	play	rest	1	5	0.4992182	28.610750
8	37.89432	rest	rest	play	rest	play	rest	0	5	0.0000000	28.111532
9	37.89432	rest	play	play	play	play	rest	4	5	20.5856743	28.111532
10	58.47999	rest	rest	play	rest	play	rest	0	5	0.0000000	7.525858
11	58.47999	play	rest	play	rest	play	play	6	5	41.7314666	7.525858
12	66.00585	play	rest	rest	rest	rest	play	6	0	34.2056087	0.0000000
13	66.00585	play	rest	play	play	rest	play	6	7	34.2056087	20.242706
14	86.24856	play	rest	rest	rest	rest	play	6	0	13.9629027	0.0000000
15	100.21146	rest	rest	rest	rest	rest	rest	0	0	0.0000000	0.0000000
16	100.21146	play	rest	rest	rest	play	rest	8	0	22.3653737	0.0000000
17	100.21146	play	play	rest	rest	play	play	8	9	22.3653737	25.066351
18	122.57684	rest	play	rest	rest	rest	play	0	9	0.0000000	2.700977
19	125.27781	rest	rest	rest	rest	rest	rest	0	0	0.0000000	0.0000000

Rubber 5 can start before rubber 4

Rubber 4 gets played later in the sequence