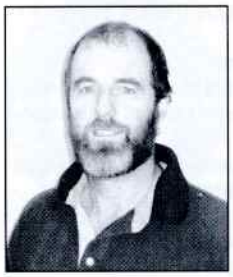
by John Byl, Ph.D.

Starting rotation?



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A volleyball team using a 5-1 typically positions its setter in the No. 1 (or service) spot on the first rotation. But is that always the best place to start a team's setter? A similar question could be asked of a team using a 6-2 or any other offense. Is the starting position selected the best one?

Obviously, it would be helpful for a coach to be able to calculate if this were the case. Now it is possible. This computation can be accomplished by measuring the relative strengths and weaknesses of the six rotations. Knowing this data quickly can also help a coach make necessary adjustments between games. In addition, knowing this data following a match can help one strengthen weaker rotations during subsequent practices.

Applying Calculations to Rotations

Table 1 provides a set of scores taken from one game; in the starting rotation for the Red Team, the setter, No. 3, begins in the No. 1 spot (service position). When he/she is in that spot, his/her team scores no points the first time and one point the second time; the Blue Team gets two points twice and one point once. In this rotation, the average point loss/gain is -1.2; as a result, the Red Team is getting behind. When the same calculations are applied to all the rotations, the averages work out as shown in Table 2. At a quick glance, one would guess that starting the team with No. 3 in the No. 1 spot might not be the best plan.

Calculating Victory

Assuming these patterns of scoring were to continue, it is possible to calculate which starting rotation would provide the earliest victory for the Red Team. The results are indicated in Table 3. The earliest victory would be achieved with player Nos. 4, 5 and 7 beginning in the service position--not player No. 3, the setter. The Reds would not want to start with player Nos. 10 or 9 beginning in the service position, because in those placements it would take the most number of rotations to get to 15 -- and it would take the fewest number of rotations for the visiting team to get to 15 -- a net difference of only three rotations compared to 5-6 in the other rotations. These numbers indicate that having player Nos. 4, 5 or 7 begin in the No. 1 spot would be most advantageous to the Red Team. If the Reds decided not to make any adjustments to serve rotation, the least they could do would be to make some adjustments to their serve receive attack when either player No. 3 or 10 is in position No. 1 to prevent the Blue Team from scoring seven points (half the visitor's points) in those two rotations.

The Use of Computers

These calculations are often

Table 1: Scores of One Game

Red Team							Blue Team					
I	II	III	IV	V	VI		I	II	III	IV	V	VI
3	4	5	10	9	7		6	14	2	11	12	9
					2							
:	:	:	:	:	3:2		:	:	:	:	:	:
:	:	:	:	:	12:8		:	:	:	:	:	:
X	1	3	3	3	6		2	2	2	2	2	2
6	6	7	7	7	7		4	4	4	4	6	7
8	8	12	14	14	15		8	8	8	10	12	

Table 2: Average Points Gained and Lost Per Serving Position

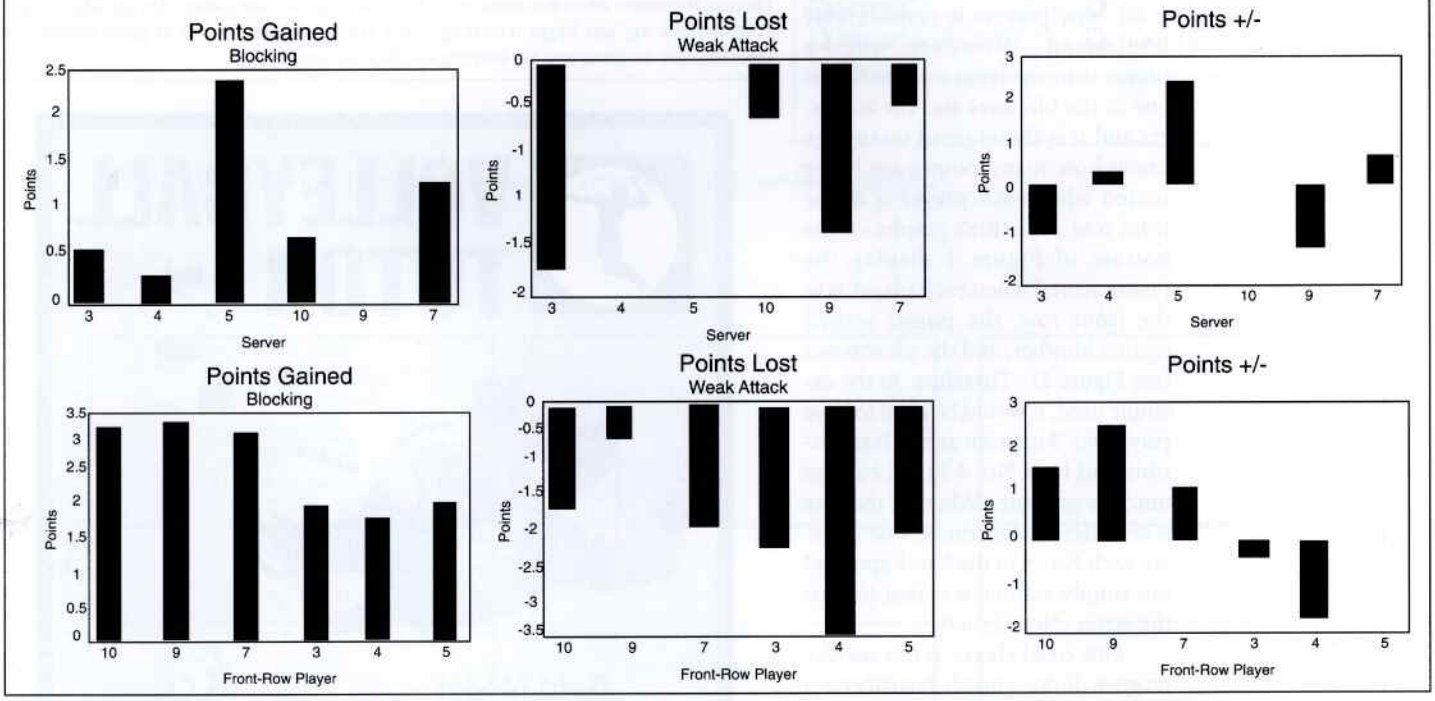
3	4	5	10	9	7
-1.2	0.3	2.3	0.0	-1.3	0.8

Table 3: Rotations to Victory

	3	4	5	10	9	7
Red	18	17	17	18	18	17
Visitor	23	23	22	21	21	23
Difference	5	6	5	3	3	6

Figure 1

Pts Won		3	4	5	10	9	7
	0	1	2		2	3	1
	1	1	1	1			1
	2			1	1		
	3						1
	4			1			
	5						
	6+						
Rotations	18	17	17	18	18	17	
		5	6	5	3	3	6
Pts Lost		1	2	3	4	5	6
	0		3	3	2	1	1
	1	1					1
	2	2				1	
	3						
	4						
	5						
	6+						
Rotations	23	23	22	21	21	23	



made somewhat intuitively by coaches who then realign their starting rotations accordingly. Computers make these calculations more quickly and are not distracted by the emotions and tensions of a game. Using a spreadsheet program, the coach can input the scores during the game following each service rotation. The results can be graphed and tabulated automatically, using a split window and can be printed with the output demonstrated in Figure 1.

The tables on the left side of Figure 1 provide a point frequency distribution for the home team (top) and visiting team (below) for each rotation. When Red's player No. 3 is in the No. 1 spot, the Reds get zero points and one point; they also lose one point once and two points twice.

This information should also help pinpoint very troublesome rotations, during which the other team may score multiple points several times. In the example given, the Reds could not get an immediate side-out in three attempts when No. 9 is serving; there must be some sort of problem with the attack. At the bottom of each table is a row of numbers indicating length of match for each team; the row of numbers below the home team rotations indicate the difference between the two teams--if one is winning, the best rotations are those in which the number is high (6 in this example–begin with No. 4 or 7 serving); if either one is losing, the

best rotations are those in which the number is low.

The graphs display the average results for each rotation. The "Points Gained" graph shows that the third rotation seems to be the strongest, the fifth rotation the weakest--since one is most likely to score off a blocked serve, this is indicated with the subtitle "Blocking." The "Points Lost" graph shows that most points are lost on the first and fifth rotations -- since one is most likely to lose points by an ineffective first attack, this is indicated with the subtitle "Weak Attack." The data for these two graphs is combined in the "Points +/-." This final graph is the most informative, with the other five graphs providing further detail, and indicates that (in the example used), the Reds are strongest when player 5 or 7 is in the No. 1 spot.

Conclusion

Volleyball is a team sport, and if a team cannot pass or dig well, the possibility of a strong attack by front- row players is considerably minimized. However, when a player is in the front row, he/she is one of the blockers and the attackers and it is therefore of interest to know how many points are being scored when each player is in the front row. The three graphs on the bottom of Figure 1 display the points scored when each player is in the front row; the points scored against him/her; and the plus/minus (see Figure 2). Therefore, in the example used, it would be ideal to have player No. 9 up front as much as possible and have No. 4 in the back as much as possible. When all the data is considered, it might be wise to begin with No. 4 in the No. 1 spot and not simply assume it is best to start the setter (No. 3) there.

One could choose not to use this program during a match, but rather as a follow-up. A coach could place the team on the court at a subsequent practice, identifying strong and weak rotations and looking for explanations and solutions to problems identified by running the computer program in order to strengthen the team for the next contest.

(Note: A person could make up a spreadsheet program as indicated. If you would like a free copy of the one used here as an example, it can be sent as an attachment [Quattro Pro or Excel--please indicate preference] if you email byl@redeemer.on.ca. Otherwise send $5.00 and a disk will be sent to you: John Byl, 777 Garner Road, Ancaster, Ontario L9K 1J4.)

Figure 2

Instructions to use PlusMinus

1. Make a copy of this program so that you have a safe copy of the original.
2. Open up the program using Quattro Pro (Pmq) or Excel (Pmx).
3. In the top left-hand corner (cell a1), place the score you are going to use (15, 25).
4. You may have to adjust your display size (%) to view all six graphs as you enter the scores.
5. On the cells b1 to g1, place the number of the players or their initials (if two players are sharing a position you might want to put them both down, ie., Chris and Jesse become CJ on the top row) in order of first serve.
6. On the "Home" (cell a2), place your team's name; on the "Away" (cell a3), place the visiting team's name, unless you prefer to leave it as "Away."
7. Run the macro to place the players, names and team names on the appropriate spots.
8. In Quattro Pro, click on Tools, Macro, Play, and then type BB1 {enter}.
9. In Excel, click on Tools, Macro, Macro1, Run.
10. "Save As" this file. (You can score all games on this file or you may want to do separate ones for each game and copy the data from each game onto a master to compile the overall match results).

How to record the scores?

Serve and win	1	3	15
	2	4	
Serve and lose	1	3	
	2	15	
Receive and win		2	15
	1	3	
Receive and lose		2	
	1	15	

Record the scores when the rotation has been switched in later games. Do not adjust your original line-up; just begin recording where the appropriate server or serve receiver is located (this assumes you are keeping roughly the same order).