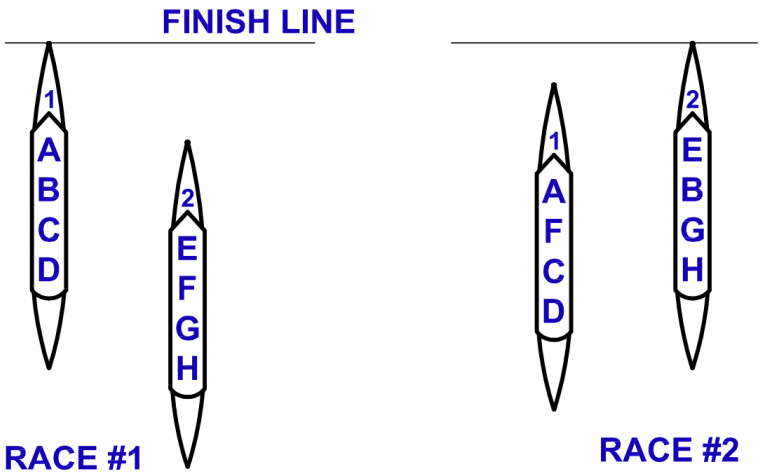
4.5 SEAT RACING *by: Mike Purcer*

Seat racing is a term used to describe the evaluation of athletes by racing them in inter-squad crews. This process involves comparing athletes by switching crews and measuring differences in their finish times. The variations in finish times reflect an athlete's ability to move the boat, as better athletes will contribute to faster times. Seat racing assumes that all athletes perform consistently throughout all races and that those with superior boat-moving abilities will make their crews faster. It is a widely accepted method for evaluating athletes' racing skills.

A simple example of seat racing is shown in Figure 4.5a, Seat Racing. In Race #1, Boat 1 finishes ahead of Boat 2 by 2.28 seconds, and this difference is recorded. After Race #1, athletes B and F swap boats. In the second race, the boats cover the same distance in their original lanes. In that race, Boat 2 finishes ahead of Boat 1 by 1.15 seconds.

Figure 4.5a *Seat Racing*



The results of the two races allow a comparison of athletes B and F. The first race established the initial comparison for the crews, with boat 1 2.28 seconds faster than boat 2. After the first race, athletes B and F switched seats, and boat 2 was 1.15 seconds faster. Across the two races, the difference between the two boats shows that boat 2 was 3.43 seconds faster when athlete B joined the crew, as the only difference was the two athletes, B and F, swapping crews. The seat race result indicates that athlete B is 3.43 seconds faster than athlete F. In seat racing, when switching athletes, it is assumed that all other variables, including steering and the performance of other athletes in the boats, have remained consistent between the two races.

There are numerous methods for switching athletes within boats to compare results. A more comprehensive form of seat racing involves multiple athletes changing crews over several races. The matrix of changes must ensure that athletes race with and against the other athletes they are being compared to an equal number of times. This method again provides objective, quantifiable total time values that measure the athletes' ability to move their boats.

4.5.1 Seat Race Matrix

A seat racing matrix is a complex method for switching multiple athletes between crews across a set number of races. The switches must ensure that the athletes being compared race with and against each other an equal number of times. In sweep rowing, port and starboard athletes may not race against each other the same number of times and are not typically compared. Athletes should rotate between boats to minimize inconsistencies that may affect their times. Athletes receive finish times for every race, and the sum of their finish times allows

comparison with other athletes. The matrix system also allows different athlete combinations to be evaluated by comparing the finish times of the crews in all races, provided the conditions remain consistent.

4.5.2 Equipment Setup

The equipment used for seat racing must be consistent, with identical boats and oars. The boats should be rigged and checked before seat racing begins. Oars should be set to standard length and inboard. However, some consideration can be given to athletes with unique stroke lengths. Athletes with noticeably longer or shorter stroke lengths can use a clip-on load adjustment mechanism (CLAM) or use an oar with inboard/outboard settings throughout the race. This allows athletes to match outboard stroke lengths with others in the crew and optimize performance.

If seat racing is in coxed boats, the coxswains must weigh the same to ensure the shells are as similar as possible, and lighter coxswains can carry weights as needed. Rigging and rowing the shells during workouts before seat racing will provide an opportunity to ensure the boats are in good racing condition.

4.5.3 Racing Format

By distance, seat racing can be conducted like regular racing, with crews side by side or in a head race format. The races should take place on the course in the same lanes and must cover the same distance. While the race distance can vary, it typically ranges from 1000m to 1500m. The race distance is determined by the number of races scheduled per day, so athlete fitness should not affect the results. An athlete who experiences greater fatigue in the last few seat races may negatively affect the crew's finish time. Other athletes racing with the fatigued

individual will be adversely affected and may record unreliable times, reducing the accuracy of the comparison. Seat racing by distance provides a time comparison of the athlete's ability to move the boat.

By time: Another method of seat racing is timed pieces. For example, the two crews row beside each other. The crews build to race rate, and the timer starts the watch when the bows are even. After a set time interval, such as four minutes, the timer determines which crew is ahead and by how much. One crew may be ahead by a deck, a deck and a seat, half a length, half a boat open or the best distance estimate. The crews stop, and two athletes switch boats. The boats begin again and row beside each other for a second piece. As in the first piece, the crews build to race rate and, when even, race for the same amount of time as the first piece. At the end of the timed piece, the distance by which one boat is ahead is estimated and recorded. The difference in distance between the first and second pieces reflects the boat-moving ability of the two athletes who switched crews. It is important not to disclose which athletes are switching crews, and athletes must believe there is another scheduled race to keep them motivated, thinking they might be switched next and their performance tested.

4.5.4 Race Setup

Before seat racing, if a matrix is used, designate athletes with numbers, letters, or both (for sweep rowing) and record their names on the race sheet. Allowing athletes to select their own numbers or letters will show that the boat changes to match athletes are not predetermined, demonstrate that the coach is not biased, and show that the matrix is fair.

Seat racing with controlled stroke rates can limit athlete fatigue when many races are scheduled. However,

open stroke rates are more common. Coaches have also allowed athletes to choose the seating arrangement within an assigned crew. Typically, seat races start with running starts, and crews row through the start line at race rate and speed.

Before the first race, the warm-up must be thorough and include rowing at race pace. The following is an example outline of the seat race format:

1) The coaches/timers assigned to the start and finish will start their watches together before racing begins.
2) The seat racing distance is commonly 1500m, 1250m, or 1000m, depending on conditions and available time.
3) Crews can row through the start line together at race speed within assigned lanes and receive individual start times if the boats are not evenly matched. Alternatively, the boats can race in a time-trial format, one after another, 30 to 45 seconds apart, in the same lane.
4) Coxswains must provide only the stroke rate and not count or motivate the crew.
5) Any unusual situations during the race must be recorded on the race sheets; athletes should speak with their coaches after each race to discuss any concerns.
6) Crews should dock near the finish line to facilitate crew changes. This allows the new crew a chance to row together before the next race.

The coach must ensure fairness in all races. Coaches must verify that all boatings are correct before launching for the next race.

4.5.5 Athlete Preparation

Athlete preparation is critical to achieving ideal performance, and athletes should receive support in preparing for seat racing. Athletes must bring water and snacks if the race is expected to continue for extended periods. Seat racing can be highly stressful for athletes who feel their future in the crew depends on their performance.

Athletes should be informed days in advance of the scheduled seat races, including the format and the number of races. Before the seat races, coaches should hold a pre-brief with the group to explain the setup and address any questions. At the end of the day's racing, a debrief with the athletes allows for feedback. The debrief is not suitable for discussing future plans if the next steps depend on the results. Results should not be shared until verified, and coaches may need to hold individual meetings.

4.5.6 Race Record Sheets

Coaches should use predesigned Race Record Sheets to record race-related times and notes. Times transcribed from the watch to the sheet must be legible and verified. Typically, the lead timer records the time on the sheet, and the backup timer checks the transcribed numbers against the backup watch.

The race record sheets must indicate shell names, the athlete's seat in the boat, start and finish times, overall times, and any events that may have affected race times should be noted. The weather and water conditions should be recorded for all races.

The legibility of the race records is critical, and the sheets must be kept for future reference and in case of appeals. A photo of the sheets can serve as a backup of the document. Also, smartphone video of the watch as

times are recalled can serve as a permanent record of the start and finish times.

4.5.7 Analysis

Seat racing is typically measured by time, and athletes with faster (lower) times have demonstrated better boat-moving ability. The difference in time between two or more athletes is the measurable indicator of racing ability. A slight variance in the total measured time of less than 0.3% may be considered negligible and might not be conclusive when distinguishing between two athletes. A minimum difference of 0.5% is suggested, while a full 1% would be regarded as conclusive. Following a complete matrix, the sum of the times from all races provides a comparison of the athletes' abilities.

A spreadsheet that allows input of start and finish times for each crew and race will reduce the risk of calculation errors. The spreadsheet calculates the time for each race and should also calculate the total overall time for each athlete. The athletes' overall times provide the basis for comparison, and lower times reflect a faster boat-moving ability, as more highly skilled athletes will contribute to faster boats and lower overall finish times.

A seat racing matrix provides a number of crew combinations. Reviewing the finish time for each crew may show the fastest athlete combination, provided the conditions remain the same for all races. The fastest time across all races may be misleading, as the seat racing may have taken over a few hours, and the conditions may have changed. Additionally, fatigue from race to race may have affected results. Seat racing in a matrix may provide the following results:

a) Athletes with the lowest overall time for all races combined.
b) The fastest time for the crew related to all races.

c) The largest time difference between the two crews.

Seat racing data can support more detailed analysis using athlete times, crew combinations, and assigned boats. Dividing each athlete's overall time by the number of races yields their individual average time. Combining the average times of the individuals in the crew yields a theoretical projected finish time for that combination of athletes. Comparing two crews' projected finish times with their actual race times indicates the consistency of the athletes' performances.

Consistency in performance is essential for valid seat racing. The coach must examine significant discrepancies between finish and projected times to monitor consistency. The coach should review the race sheet for any changes in conditions or other factors that may have affected the race. Additionally, the coach should analyze the times to ensure that the race did not affect athlete rankings. The spreadsheet should include a comparison of projected and actual race times. Section 4.5.10 of the Seat Racing Spreadsheet discusses many of the calculations used to analyze seat racing performances.

The similarity of the shells used in seat racing often raises concerns, and the data related to projected times and actual times can be used for review. Shell times that are consistently faster or slower than projected times should be analysed to determine if one shell has an advantage over the other. For this reason, it is important that the athletes race in all boats the same number of times.

4.5.8 Athlete Debrief

Selection is a highly stressful time for athletes who are very concerned about seat racing results. Coaches who de-select athletes based on seat racing results may wish to meet with the athlete individually before the team

debrief. Results can be shared with individuals by removing names and identifying the individual's time and ranking. Review Section 4.4 Selection for related information.

4.5.9.1 Traditional Seat Racing

A traditional seat racing example was shared at the beginning of this section. It involved racing two crews together and switching two athletes between boats before the next race. The athletes who are switched are judged based on their finish time compared with the previous race. Following each race, two athletes will switch crews to continue the comparisons.

It is important that athletes not know who will be switched or whether there will be further racing, to keep them motivated to perform at their maximum. Seat racing using this method can be done with any boat class (eights, fours, doubles).

4.5.9.2 Fours Matrix

The Fours Matrix rotates eight athletes through the two shells over six races, as shown in Figure 4.5.9.2a. Through this rotation, starboard and port side athletes race with each other an equal number of times. Every athlete races twice with athletes rowing on the same side of the boat and three times with athletes on the opposite side of the boat. Figure 4.5.9.2a details the matrix rotation of athletes through the seat races.

The Seat Race Matrix in Figure 4.5.9.2a designates each athlete with a letter or number. Reading the table down from bow to stroke shows athletes A, B, C and D on the port side in a standard rigged boat. Reading the table down from stroke to bow designates A, B, C and D as starboard-side athletes. Some coaches allow athletes to decide the crew's seating arrangement, while others assign seats.

Figure 4.5.9.2a *Fours Matrix*

Race 1	
Boat 1	Boat 2
2	3
B	C
1	4
A	D

Race 2	
Boat 1	Boat 2
4	3
D	C
2	1
B	A

Race 3	
Boat 1	Boat 2
2	1
B	A
3	4
C	D

Race 4	
Boat 1	Boat 2
1	3
C	A
2	4
D	B

Race 5	
Boat 1	Boat 2
4	1
A	D
2	3
C	B

Race 6	
Boat 1	Boat 2
2	4
D	B
3	1
A	C

As shown above, athletes designated with letters row in both boats an equal number of times. Athletes designated with numbers row in one boat four times and in the other boat twice, except for athlete number 2. Athlete 2 will row in the same shell for all six races, while athletes 1, 3, and 4 will row in the other boat for four races and in athlete 2's boat twice. For this reason, it is important to use boats of the same size and rigging. If the boats are not identical, a direct comparison can be made between athletes 1, 3, and 4, while further analysis of the results should be conducted to review athlete number 2. A spreadsheet to calculate results is available on the purcerverance.ca website.

4.5.9.3 Pair Matrix

This Pair Matrix rotates six athletes across three races using three pairs, as shown in Figure 4.5.9.3a. Typically, the athletes steering the shells do not switch boats, as adjusting the footstops may interfere with rudder alignment. Every effort must be made to ensure that the shells are similar in quality, size and rigging.

Figure 4.5.9.3a *Pair Matrix*

Race 1		
BOAT	BOAT	BOAT
1	2	3
A	B	C

Race 2		
BOAT	BOAT	BOAT
3	1	2
A	B	C

Race 3		
BOAT	BOAT	BOAT
2	3	1
A	B	C

In matrix racing, total times allow comparisons between athletes on each side of the boat. Since all pair combinations have the chance to row together, the fastest time across the three races may indicate the best combinations, assuming that the conditions remain consistent.

4.5.9.4 Doubles Matrix

The Doubles Matrix ensures that all athletes compete against one another the same number of times. It is also advisable for athletes to switch boats and seats to reduce any shell advantage. Figure 4.5.9.4a shows four athletes (sculling) rotating through two double shells over three races. The results will include the total time for each athlete and facilitate a comparison with the lowest time, indicating the fastest boat-mover.

Figure 4.5.9.4a *Doubles Matrix (four athletes)*

Race 1	
Boat 1	Boat 2
A	C
B	D

Race 2	
Boat 1	Boat 2
A	B
C	D

Race 3	
Boat 1	Boat 2
D	B
A	C

Figure 4.5.9.4b, Doubles Race Matrix, shows six athletes rotating through three boats over five races. The five races allow all athletes to race together once.

Figure 4.5.9.4b *Doubles Matrix (six athletes)*

Race 1		
BOAT	BOAT	BOAT
A	C	E
B	D	F

Race 2		
BOAT	BOAT	BOAT
B	F	D
C	A	E

Race 3		
BOAT	BOAT	BOAT
C	A	B
E	D	F

Race 4		
BOAT	BOAT	BOAT
E	F	D
A	C	B

Race 5		
BOAT	BOAT	BOAT
F	B	C
D	E	A

The matrix results show the total times for each athlete and can be compared to determine the fastest boat mover. Racing in a matrix format enables further analysis using times from all races. Section 3.5.10, Seat Racing Spreadsheet, provides examples of advanced calculations from spreadsheet analysis.

4.5.10 Seat Race Spreadsheet

Spreadsheets can support complex analyses of matrix seat race data. Figure 4.5.10a presents a pairs matrix for four athletes in two pairs. The top section of the spreadsheet lists athlete names, boat names, date, program, race distance, and GMS speed for the boat class. The spreadsheet must include the start and finish times for each boat in every race. The analysis section provides detailed data for review, enabling coaches to analyze the information effectively.

- Athletes' overall time
- Time difference between the athlete's overall times

- Percentage of athletes' time differences
- Athletes' average GMS percentage
- The fastest crew with the biggest win
- Fastest time from all races

Figure 4.5.10a *Seat Race Spreadsheet*

Seat Racing Pairs

Port	
A (Boat 1)	Peter
B (Boat 2)	Tom

Date:	2024-08-31
Program:	Varsity Men
race distance	1500
Category GMS	6:18.0

Starboard	
1	Tim
2	Scott

Boats	
Boat 1:	Minards
Boat 2:	Stone

	Race 1		Race 2			
	Minards	Stone	Minards	Stone		
NAME	Peter	Tom	Peter	Tom	NAME	
NAME	Tim	Scott	Scott	Tim	NAME	
Start Time	51:56.60	51:05.35	18:52.70	18:07.00	Start Time	A
Finish Time	57:02.35	56:11.85	23:56.37	23:06.91	Finish Time	B
Raw Time	5:05.75	5:06.50	5:03.67	4:59.91	Raw Time	C
Place	1	2	2	1	Place	D
Diff:	0	0.75	3.76	0.00	Diff	E
% GMS	92.72%	92.50%	93.36%	94.53%	% GMS	F
Projected	5:03.77	5:04.14	5:04.90	5:03.02	Projected	G
Crew	+1.98	+2.35	-1.23	-3.11	Crew	H
Compared	-0.38	+0.38	+1.88	-1.88	Compared	I
RANK	*2*	*3*	*4*	*1*	RANK	J
RACE	*-0.75*	*0.75*	*3.76*	*-3.76*	RACE	K
RANK TM	*3*	*4*	*2*	*1*	RANK TM	L
OVERALL	*5.84*	*6.59*	*3.76*	*0.00*	OVERALL	M

RANK	Athlete	TOTAL	DIFF	% Diff.	AVG Time	% GMS
1	Tom	10:06.41	0	0.00%	05:03.20	93.51%
2	Peter	10:09.42	3.01	0.49%	05:04.71	93.04%
1	Tim	10:05.66	0	0.00%	05:02.83	93.63%
2	Scott	10:10.17	4.51	0.74%	05:05.08	92.93%
N	O	P	Q	R	S	T

Figure 4.5.10a Seat Race Spreadsheet shows letters to the right and at the bottom of the spreadsheet. These letters reference the rows or columns and are explained below:

Rows

A – [Start Time] the start time of each boat in the seat race.

B – [Finish Time] the finish time of each boat is the seat race.

C – [Raw Time] is the overall time the boat is in the race between start and finish times.

D – [Place] is the finish place in the race (1st or 2nd).

E – [Diff] is the difference in race times between 1st and 2nd for each race.

F – [% GMS] is the finish time percent of the Gold Medal Standard (GMS).

G – [Projected] is the predicted time for the crew in the race based on the athletes' average times from all races. It is the athletes' average times [S] combined to determine the crew's projected time. Compared to the finish time, the projected time reflects the consistency of athletes' performances and weather conditions.

H – [Crew] is the difference (in seconds) between the race time and the projected time [G]. If the race time is faster than projected, the difference is negative and slower results are positive.

i. Consistency in times from all athletes and conditions in all races would result in zero seconds.

ii. Negative numbers (time faster than projected)
- might reflect better conditions such as tailwind.
- might reflect the ability of the athletes in the boat to row together (good combination).

iii. Positive number (time slower than projected)

- may reflect that conditions have changed with headwind or rough water.
- may reflect fatigue in one or more athletes.
- may reflect the inability of the athletes in the boat to row together (poor combination).

I – [Compared] is the difference between a crew's race time and their projected time minus the other crew's race to projected time difference.

- significant differences, greater than four seconds should be reviewed as they highlight inconsistencies between race and projected times for both crews.
- the difference provides an insightful analysis of the crew's performance compared to that of the other crew in the race.
- the time is not a reflection of conditions as both boats row in the same conditions.

J – [RANK] is the ranking of the most significant margin of winning time compared to the other crew(s) in the race.

- rank may indicate the fastest combination of athletes.

K – [RACE] in seconds is the margin of winning in each race. Negative times are the winning times.

L – [RANK TM] is the overall placing of the crew's race time compared to all other race times.

M – [OVERALL] is the difference between the crew's race time and the fastest time from all races.

- the overall time will be affected by conditions or athlete fatigue.

Columns from bottom of sheet

N – [RANK] is the ranking of the athletes based on their times for all races. Lower times reflect that the athlete has helped their boat go faster in racing.

O – [Athlete] athlete's name.

P – [TOTAL] athlete's total time from all races.

Q – [DIFF] the difference between the athlete's time and the fastest athlete's time on their side of the boat.

R – [% Diff] the percentage difference between the athlete's time and the fastest time.

S – [AVG Time] athlete's average time from the races. This is used to calculate project times for races.

T – [AVG GMS] athlete's average GMS from the races.

Seat racing results are rarely repeatable; a different day can lead to varying scores for the athletes in the group. However, similar to racing, all athletes have an equal opportunity to perform.

Seat racing results vary by boat class, as different classes require different skill levels. Small boats (singles and pairs) require highly skilled athletes, while stronger, less skilled athletes may perform better in larger boats (fours and eights). Athletes are unique, with distinct skill sets and physical capabilities. Coaches should consider seat racing that meets the crew's needs.