**Ski to Sea: Which sport leg is most important?**

The Ski to Sea race is a multi-sport relay race held annually in Whatcom County, Washington. The race consists of seven legs: cross-country skiing, downhill skiing or snowboarding, running, road biking, canoeing, mountain biking, and kayaking, with each leg representing a different outdoor sport. A team will consist of one person for each leg of the race, except for the canoe leg which has two paddlers per canoe. Racers are allowed to compete in multiple legs of the race. A team must have a minimum of three racers and a maximum of eight, with a maximum of three legs per individual. The canoe leg must have two participants regardless of the number or racers per team. The Ski to Sea Race does not allow individuals to complete all legs of the race.

The following matrix reports the correlation between the completion time in minutes for each leg of the race and the overall competition time in minutes:

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | overall\_minutes | canoe\_minutes | xcski\_minutes | downhill\_minutes | kayak\_minutes | roadbike\_minutes | run\_minutes | xcbike\_minutes |
| overall\_minutes | 1 | 0.237 | 0.21 | 0.439 | 0.464 | 0.189 | 0.015 | 0.378 |
| canoe\_minutes | 0.237 | 1 | 0.361 | -0.186 | 0.428 | -0.126 | -0.587 | -0.055 |
| xcski\_minutes | 0.21 | 0.361 | 1 | 0.184 | 0.357 | 0.226 | 0.034 | 0.193 |
| downhill\_minutes | 0.439 | -0.186 | 0.184 | 1 | 0.273 | 0.459 | 0.505 | 0.432 |
| kayak\_minutes | 0.464 | 0.428 | 0.357 | 0.273 | 1 | 0.12 | -0.079 | 0.504 |
| roadbike\_minutes | 0.189 | -0.126 | 0.226 | 0.459 | 0.12 | 1 | 0.563 | 0.294 |
| run\_minutes | 0.015 | -0.587 | 0.034 | 0.505 | -0.079 | 0.563 | 1 | 0.345 |
| xcbike\_minutes | 0.378 | -0.055 | 0.193 | 0.432 | 0.504 | 0.294 | 0.345 | 1 |

1. Which leg of the Ski to Sea race shows the strongest correlation with the overall competition time? Which one shows the weakest correlation? What do these correlations mean?

The kayak leg shows the strongest correlation with the overall competition time, with a correlation coefficient of 0.464. If a team wants to focus on improving their overall time, they should prioritize the kayak leg of the race. The running leg shows the weakest correlation with overall competition time at 0.015. This may indicate that it is easy for teams to succeed in the running leg and harder to find talent for the other legs.

1. Identify and interpret the correlation between the time taken for the downhill skiing leg and the canoeing leg?

There is a weak negative correlation between the time taken for the downhill skiing leg and the canoeing leg, with a correlation coefficient of -0.186.

1. How does the correlation between the running leg and the overall competition time compare to the correlation between the road biking leg and the overall time?

The correlation between the running leg and the overall competition time (r = 0.015) is weaker than the correlation between the road biking leg and the overall time (r = 0.189).

1. Which two legs of the race have the weakest correlation with each other?

The correlation between the cross country skiing and running is the weakest, with a correlation coefficient of 0.034.

1. How does the correlation between the cross country skiing leg and the overall time compare to the correlation between the cross country biking leg and the overall time?

The correlation between the cross-country skiing leg and the overall time (0.21) is weaker than the correlation between the mountain biking leg and the overall time (0.378).

1. If a team wants to improve their performance in the running leg, which other leg should they focus on based on the correlation data?

If a team wants to improve their performance in the running leg, they should focus on improving their performance in the road biking leg. The road biking leg shows the strongest positive correlation with the running leg, with a correlation coefficient of 0.563.

1. Which leg of the race shows the strongest positive correlation with the kayaking leg?

The cross country biking leg shows the strongest positive correlation with the kayaking leg, with a correlation coefficient of 0.504.

1. Report the correlation between the running and canoeing leg and interpret why you think there might be a negative correlation between these two?

The correlation between the running and canoeing leg is -0.587. I beliebe there is such a strong, negative correlation here because it may be easy to find good runners and hard to find a pair of people that can canoe quickly together. Additionally, canoeing may require more core/upper body strength and technique than running.