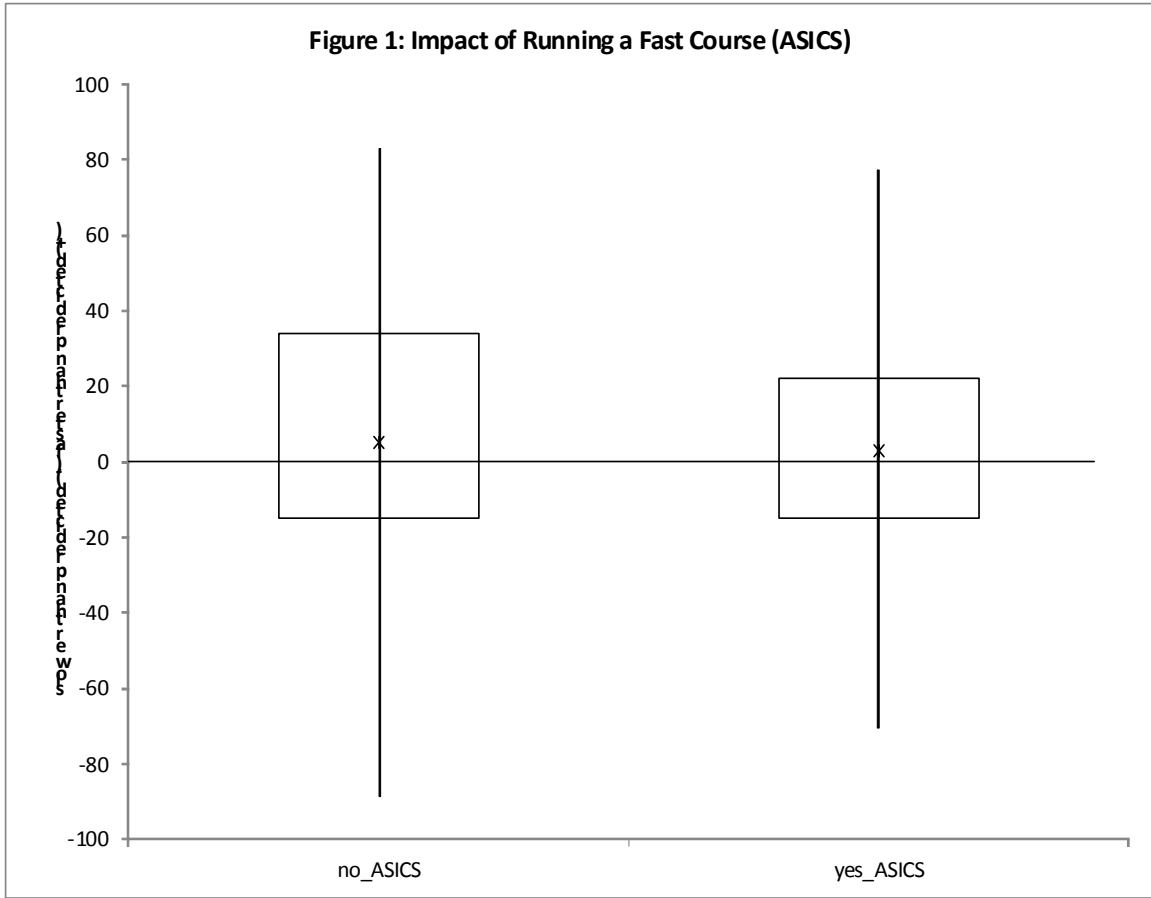


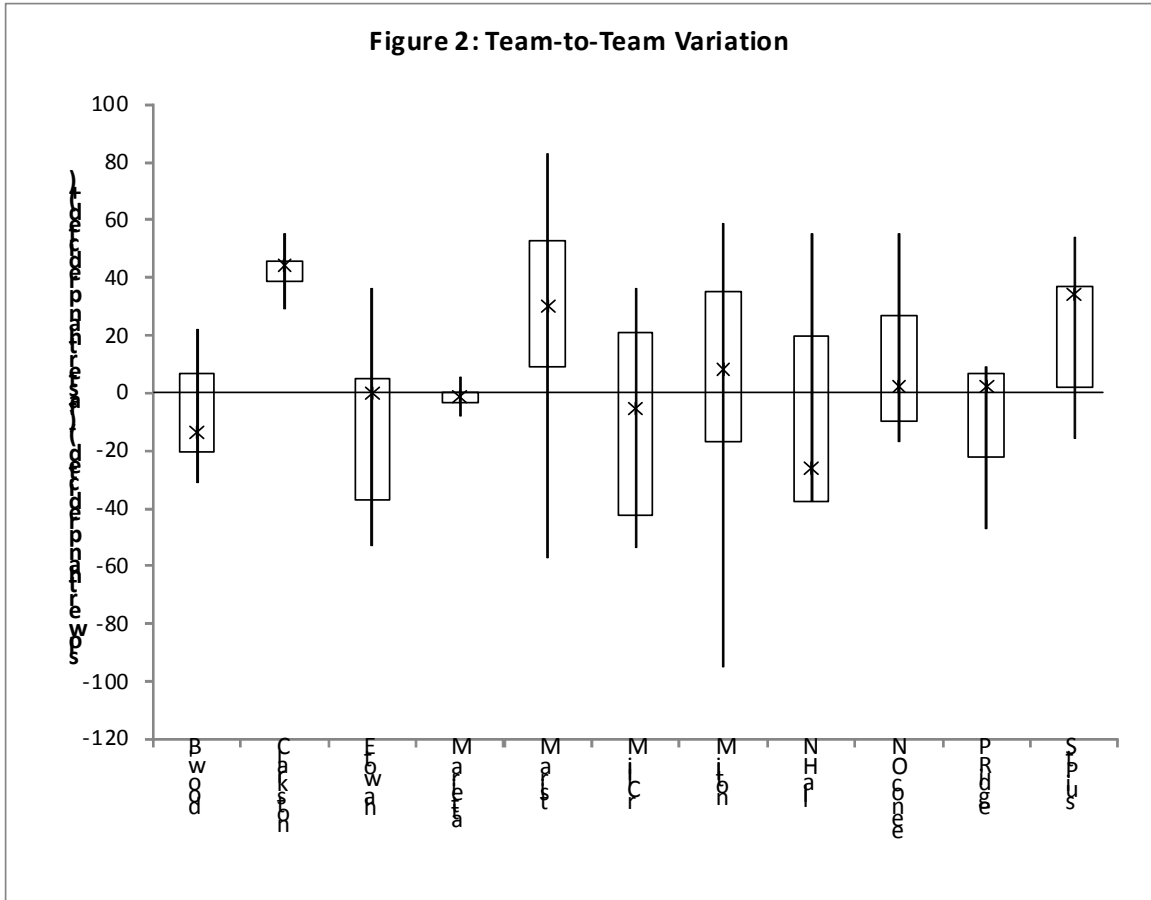
Most coaches would like their team to peak for the state meet. Gaining a precious few seconds per runner could be the difference in winning a championship and becoming an also-ran. Debates as how to prepare runners to peak at the right time have been both numerous and, at times, heated. Whereas I don't pretend to have anything approaching all of the answers, I did find a way to explain about 20% of the variation in performance at the state meet. The other 80% of the variation shall remain proprietary information for some of the best coaches.

I track about 160 athletes (all boys) during a cross country season. After a few weeks, I can compute a time adjustment for each event that normalizes the data. Once I have that normalization factor, I can predict a time for each boy on a given course if they run a course that is in the database. Carrollton is in the database after the Carrollton Orthopedic Invitational (COI). Knowing the adjustment factor for that event allows me to predict times at state for each boy regardless of whether that boy actually ran the COI. Actual times at state will be faster than predicted for some boys and slower than predicted for others.

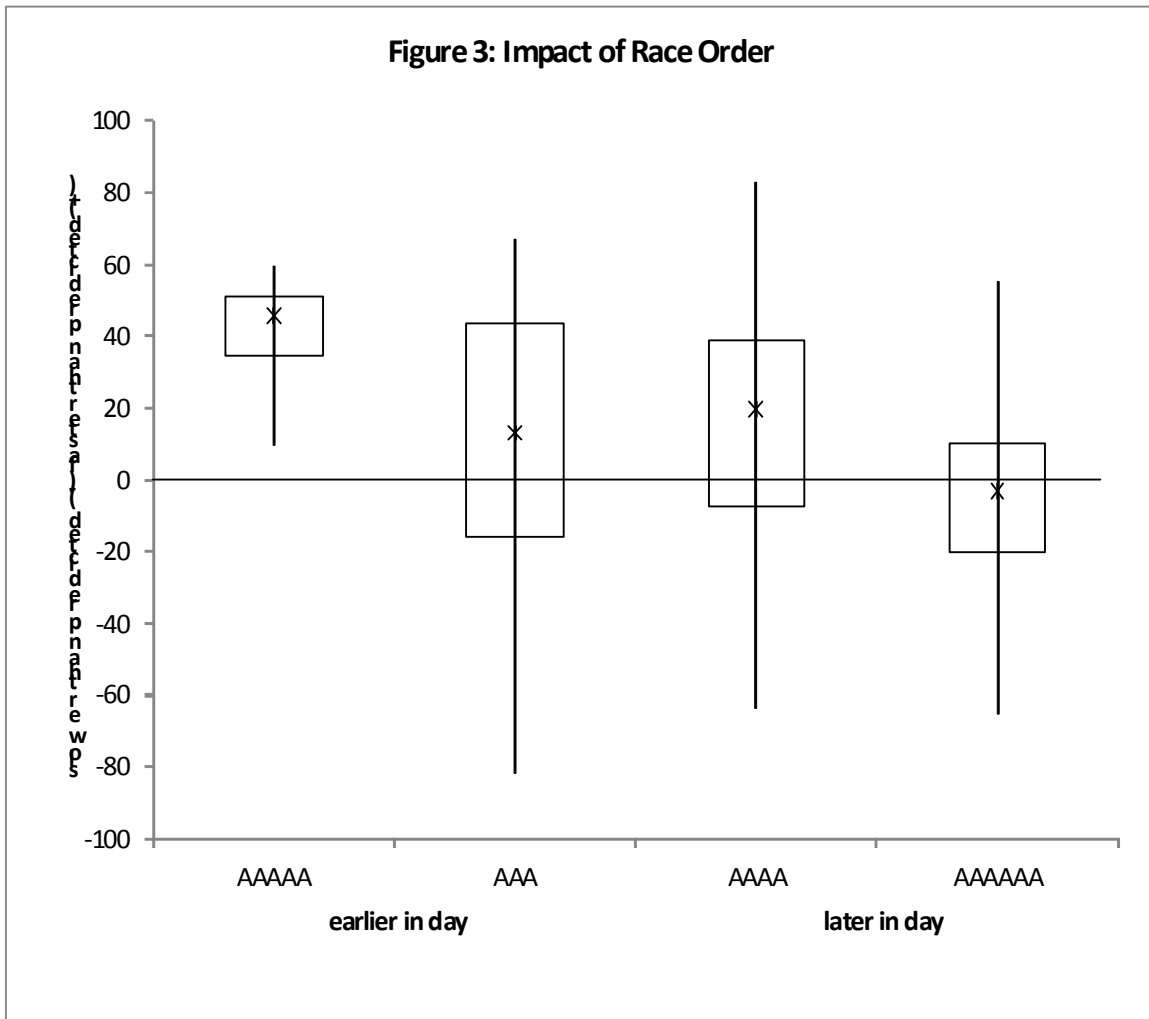
This study began as an attempt to determine if running a fast course, such as ASICS, helped or hindered performances at the state meet. I could not see where it had any impact on performances at state as the deviation from predicted was not statistically significant between the group that ran ASICS and the group that did not. I did see noticeable team-to-team variations in performance vs. predicted.



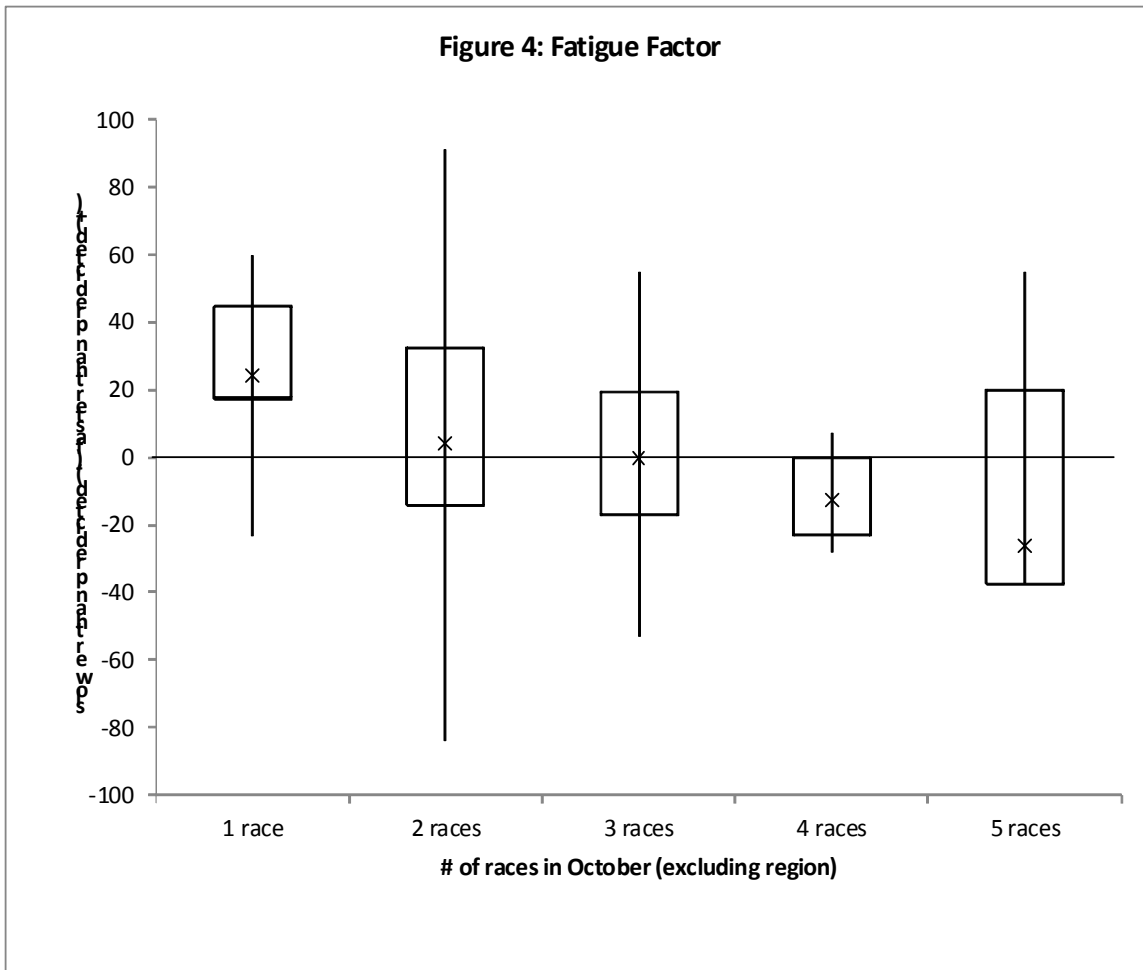
The lack of impact of ASICS is depicted in Figure 1. Some of you may not be familiar with boxplots. A boxplot is a method to depict a distribution showing the median (the asterisk), the 5<sup>th</sup> percentile (bottom of whisker), 25<sup>th</sup> percentile (bottom of box), 75<sup>th</sup> percentile (top of box), and 95<sup>th</sup> percentile (top of whisker). Note that in Figure 1, the “no\_ASICS” box is almost identical to the “yes\_ASICS” box, indicating that whether or not a team that ran that particular meet was not a good predictor of performance at state.



Teams like Clarkston, Marist and St. Pius ran much faster (~40 seconds/man) than predicted. Most teams ran about the same as predicted. There were a few teams that ran much slower (~30 seconds per man) than predicted. Note in Figure 2 that some teams' boxes are much higher than others, indicating that those teams ran better (relative to predicted) than those teams whose boxes are lower on the graph. This simply tells us which teams ran better or worse than predicted that day, but it does not tell us why those teams ran better or worse.



As I attempted to explain the team-to-team variation, I did find two factors that were statistically significant and did collectively explain about 20% of the variation in performance vs. predicted. The first factor is the order of races. I had been tracking runners in races 1(AAAAA), 3(AAAA), 5(AAA), and 9 (AAAAAA) on the day. Each successive race was about five seconds slower (vs. predicted) than was the previous race. I am guessing that this is largely an effect of rising temperatures, but other factors could also be playing a role. Note in Figure 3 that the AAAAA (1<sup>st</sup> race) box is considerably higher than the AAAAAA (9<sup>th</sup> race) box, with the AAAA (3<sup>rd</sup> race) and AAA (5<sup>th</sup> race) boxes in between.



The other factor is the number of races each team ran in October (excluding region meets if it was held before 11/1/14). Those that only had one meet in October were ten seconds faster relative to predicted than were those running two October meets. That ten second per meet trend continued for those teams that had run 3, 4 or even 5 October meets (again excluding region). Note that in Figure 4, the asterisks (medians) gradually drift down as the number of October races increases. I can't say with any certainty that fatigue is causing this relationship, but it sounds like a reasonable theory.

Putting it all together, we would expect a team running in race #1 that had only had one October meet to run 80 seconds faster at state than would another team with equivalent ability that was running in race #9 and had run five meets in October. Of course a coach does not choose the order of races at state, but he can choose the number of races to run in October. I can't say for sure that running one October race is preferable to two, but I would not advise running more than two October races if winning state is a team goal.

