Swimming Starts
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Abstract
In competitive swimming, relay starts are known to be faster than starts from a standstill but exactly how much faster and why are unknown. Measurements were made using iPhone video recordings and Logger Pro software for analysis. The average reaction time for a relay start is \(0.26 \pm 0.03\) seconds and \(0.71 \pm 0.03\) seconds for a flat start. With 95% confidence, the average relay start reaction time is 0.39 seconds shorter than the flat start time. The maximum speeds reached during relay and flat starts are statistically indistinguishable.

Results
- **Experimental Design**
  - Average reaction times
    - Relay Start: \(0.26 \pm 0.03\) seconds
    - Flat Start: \(0.71 \pm 0.03\) seconds
  - Average relay start reaction time is \(0.39\) seconds shorter than flat start reaction time, with 95% confidence
  - Maximum speed reached during relay and flat starts are statistically indistinguishable (over all swimmers)
  - Difference in times for relay splits and individual races is likely due to the advantage of anticipating the start, not the extra steps or arm swings allowed (over all swimmers)
  - There are trends unique to each swimmer which can be used to improve technique
  - MIT relay start reaction times are as fast as elite Division 1’s

![Graphs and charts illustrating reaction times and maximum speeds during relay and flat starts.]