

Swimming Starts

Michael Everett

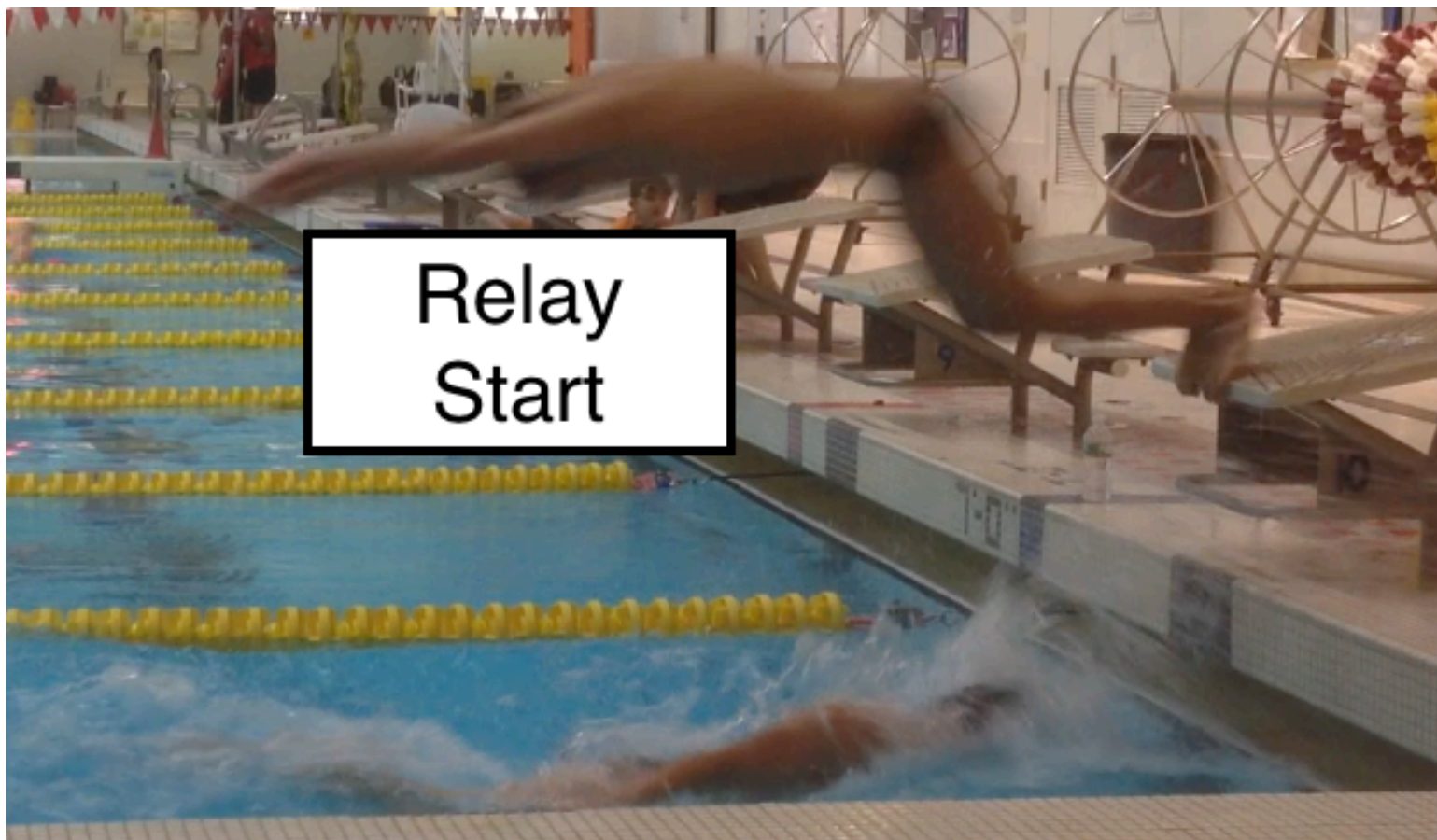
2.671 Instrumentation and Measurement

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 ± 0.03 seconds** and **0.71 ± 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.

Background

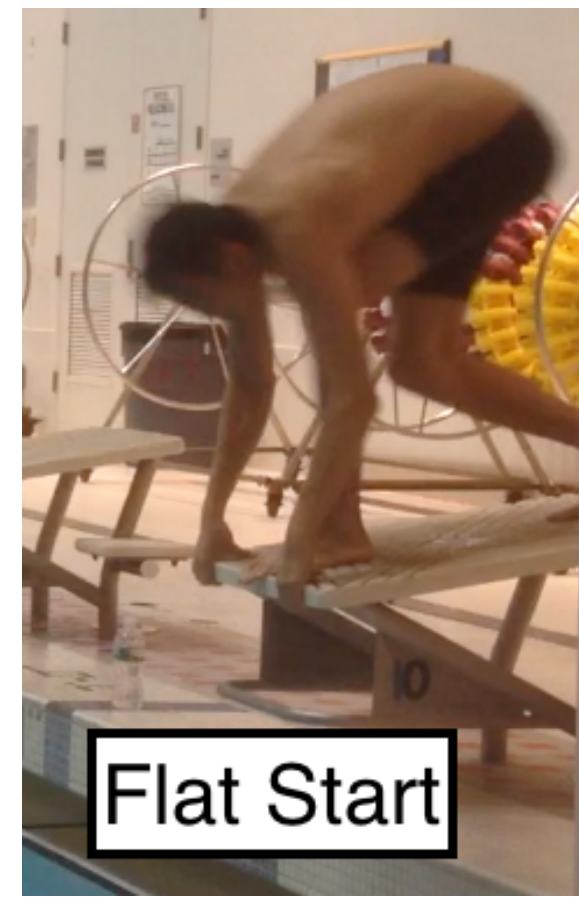
Relay Race



Allowed to Move

Cannot leave block until
teammate touches wall

Individual Race



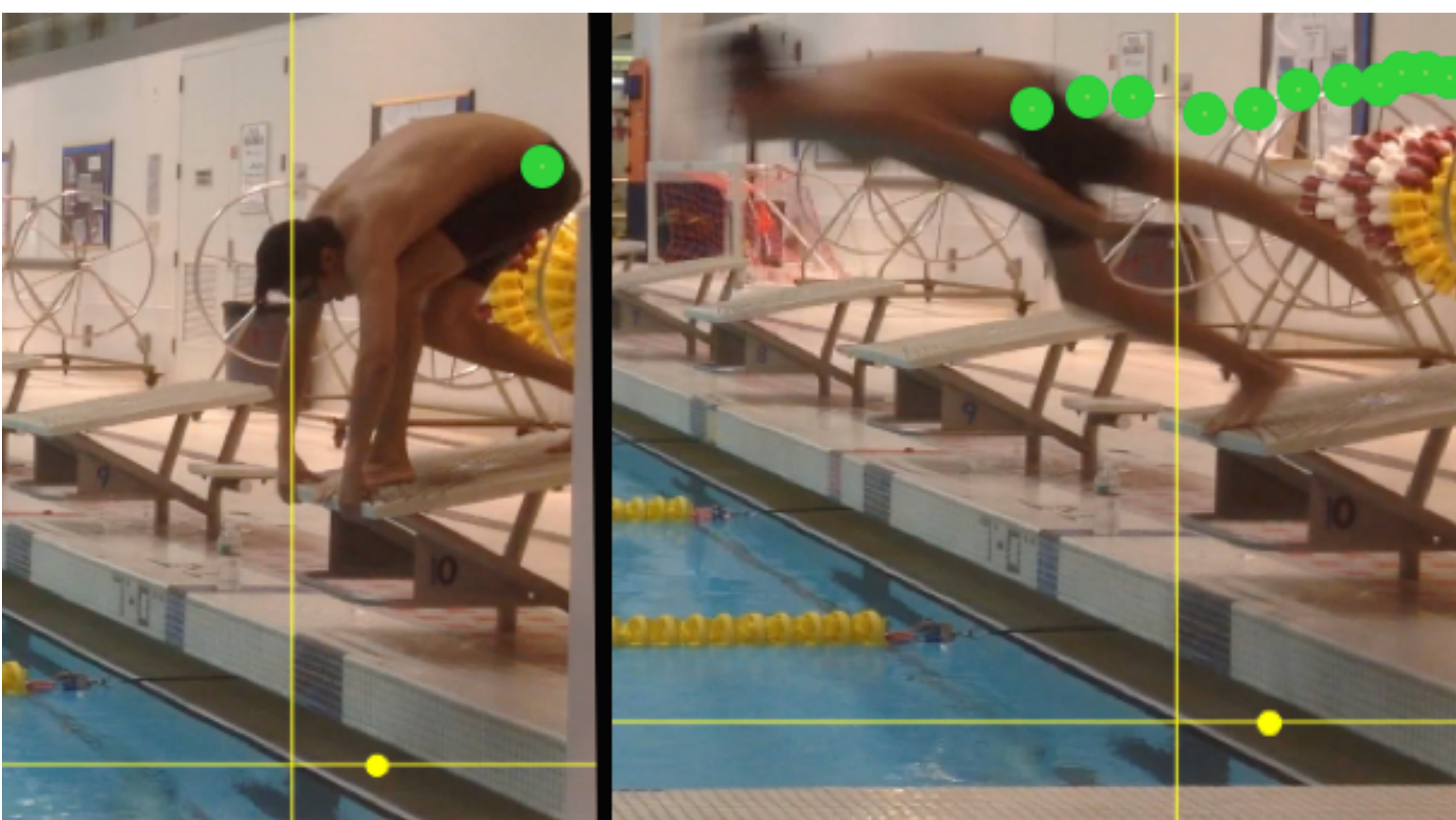
Completely Still

Wait for Sound

Experimental Design

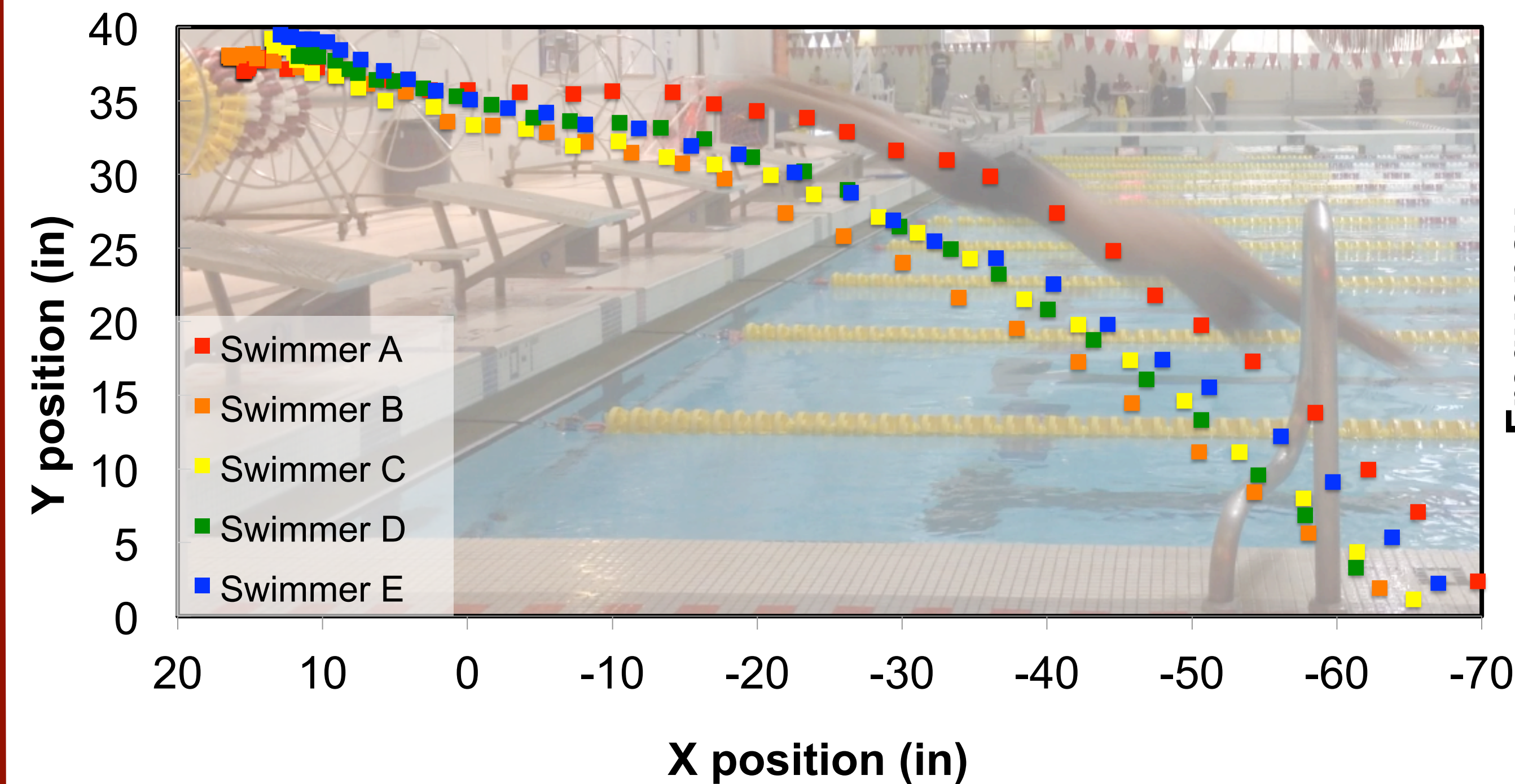
iPhone
Camera

Logger Pro
Software

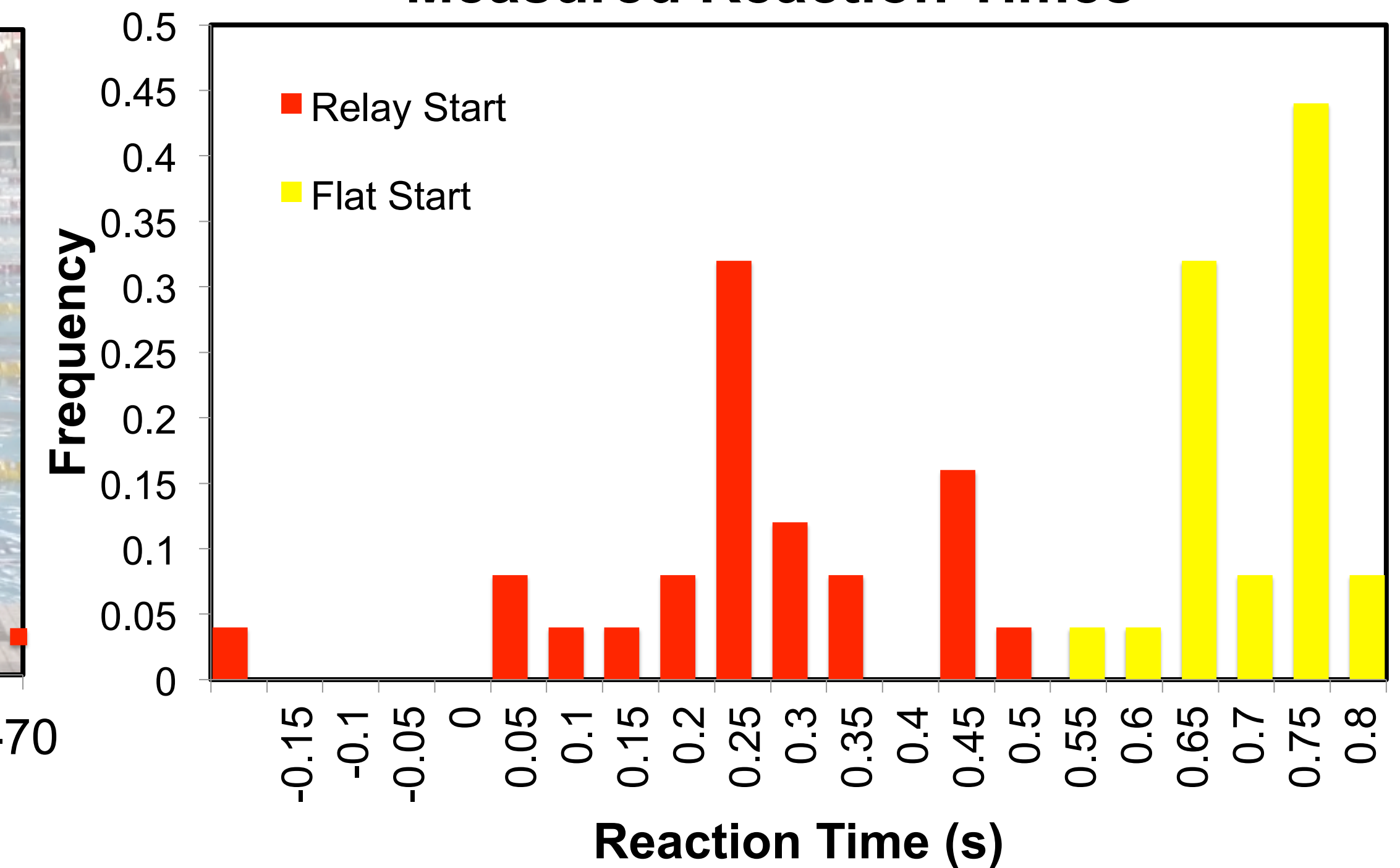


Results

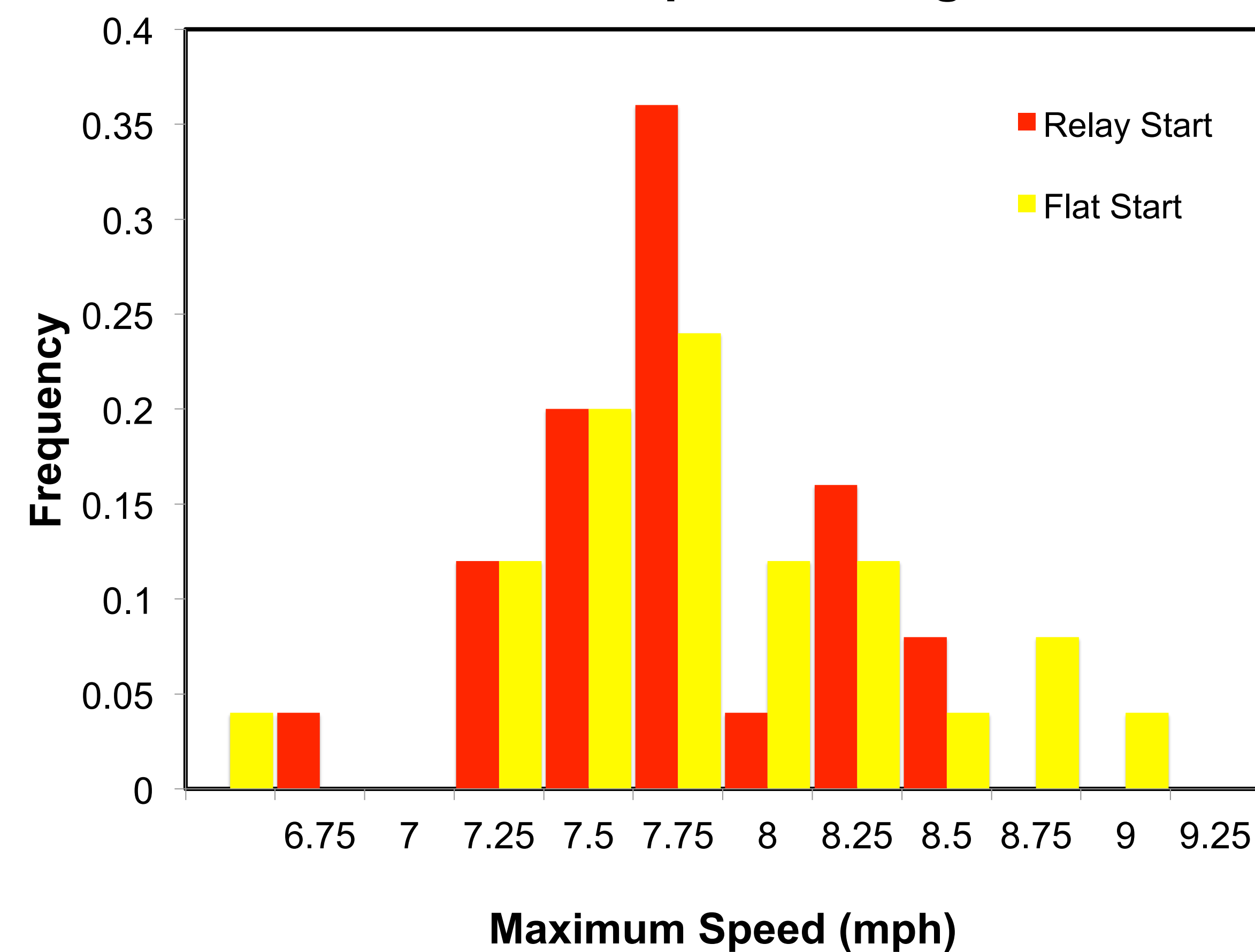
Flat Start Trajectories



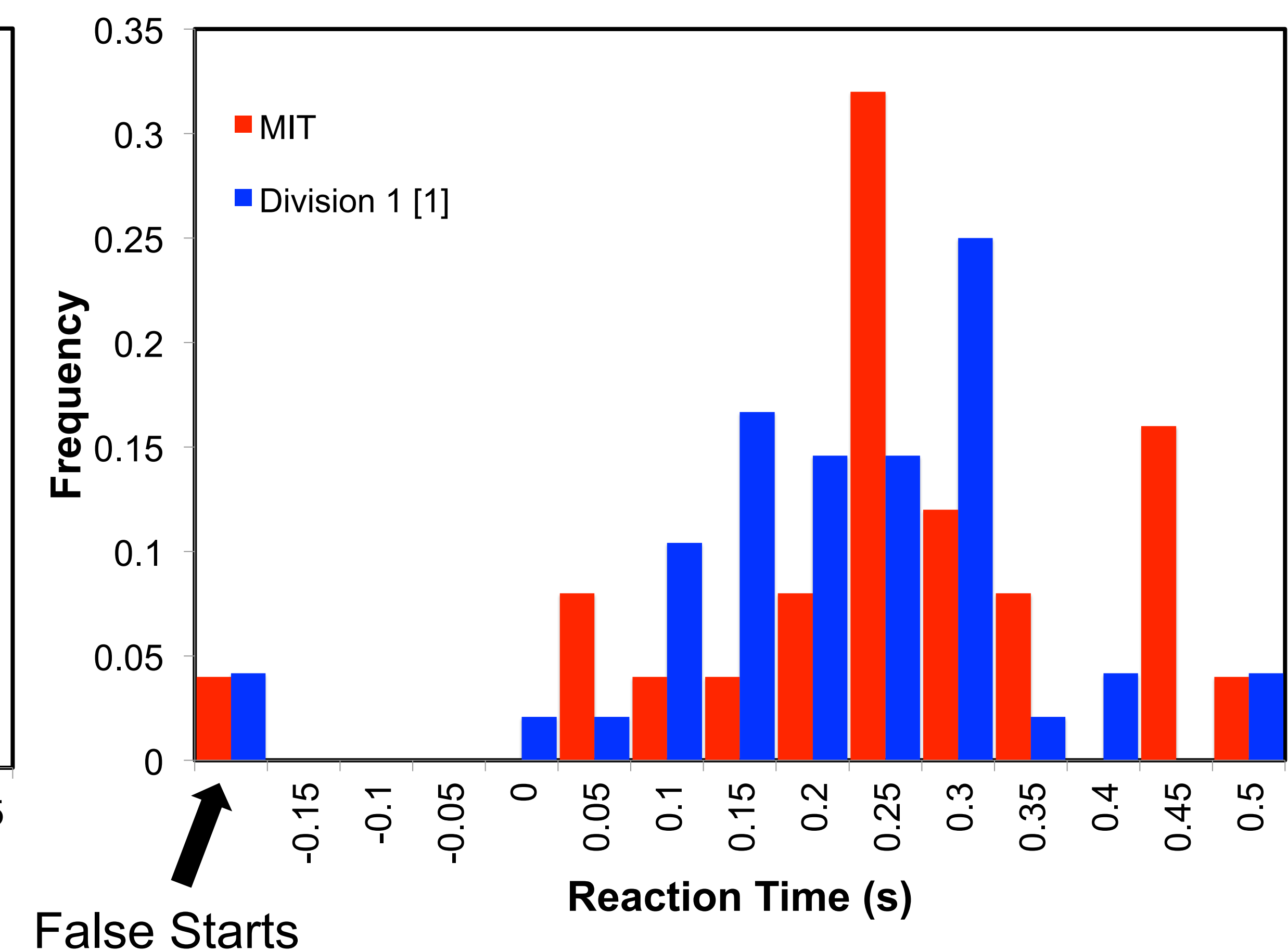
Measured Reaction Times



Maximum Speed During Dive



Relay Reaction Times of MIT vs. Elite



Conclusions

- Average reaction times
 - Relay Start: **0.26 ± 0.03 seconds**
 - Flat Start: **0.71 ± 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

Acknowledgements

Thank you to Dr. Barbara Hughey and the 2.671 course staff as well as Brendon G Chiu, Daryl Neubieser, Justin Chiu, Scott Mayberry, and John "JD" Matthews

References

[1] 2015 NCAA Division 1
Championships Results, 3/26/15,
<http://www.hawkeyesports.com/livestats/c-swim/>