Union College Mechanical Engineering

The Kinesiology of the Baseball Swing

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Introduction[1,2]

My research involves looking into the fluidity which is involved in generating an efficient, effective, and powerful baseball swing. There are so many moving parts involved the swing, and they all must come together at just the right times in order to create this fluidity. As anyone will tell you who knows a decent amount about baseball, the most significant part of the swing involves the turning of the hips. It is the lower half of the body which supplies the power, which then transfers to the trunk, and then to the upper extremities. Although it would be incorrect to say that the hips are the only important part of the swing, since every moving segment of the body in the swing is inherently significant, the hips initiate the power in the swing. Though this project is more of a general investigation about learning how to make measurements, we believe we will be able to represent the movements of the body during the swing numerically.

Methods and Materials

In order to get a more full understanding of the movement of the body during the baseball swing, it was necessary to acquire data through not only film, but through the implementation of two 2-axis force plates so that the forces of the feet on the ground during the swing could also be tracked. We designed a platform specifically for the purpose of housing the force plates. For the filming of the swing, a Casio Exilim High-Speed Camera was used recording at a rate of 120 frames per second. One camera was used looking down on the batter from directly above using Union College's Cherrypicker. From this above view, a planar view of the swing was captured and the angular velocities of the shoulders, hands, and bat were acquired.

Figure 1: Photo of Cherrypicker and experimental set-up

Results

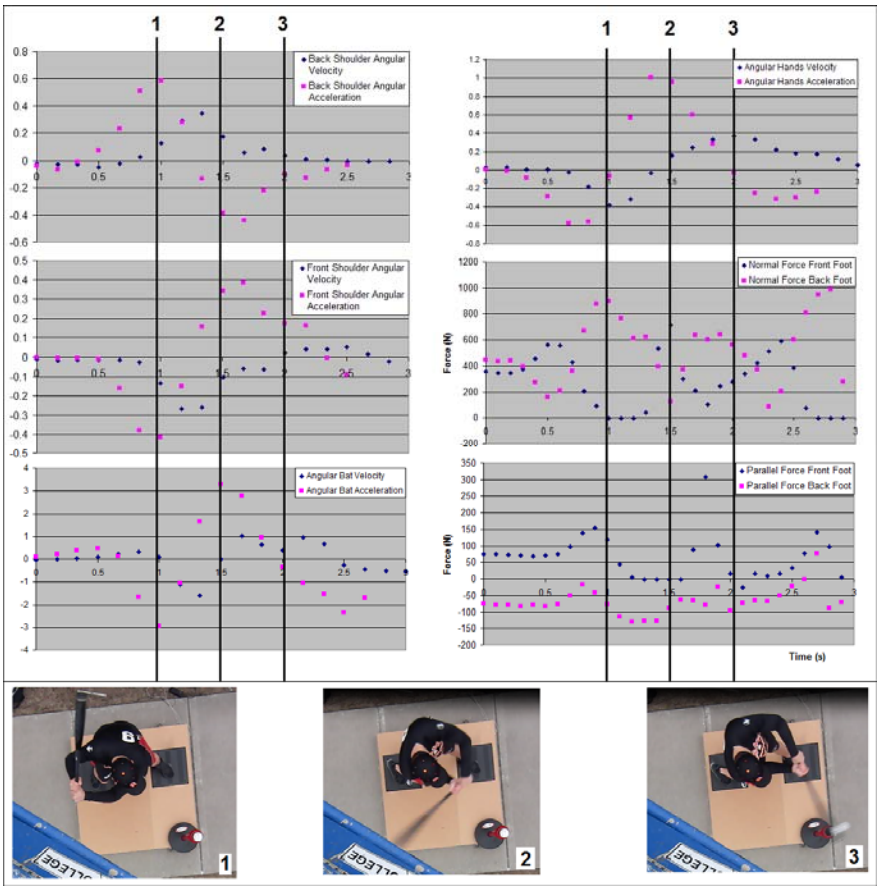

Figure 2: Above are the various plots of angular velocities and accelerations of the hands, bat, and front and back shoulders, along with the parallel and normal forces exerted by the feet on the force plates. The lines running through the graphs correspond to instances in time during the swing, as shown by pictures which match to the numbers above the lines.

Conclusions

Ultimately, although we were unable to factor the hips into the final experiment due to difficulties which would be involved in quantifying three dimensions, we successfully broke down and analyzed quite a large part of the baseball swing. Though we were unable to test a large number of subjects due to time constraints, the data acquired was consistent, and as the plots in Figure 2 show above, the swing was able to be explained quantitatively.

Future Work

A comparison of data acquired from baseball players of different levels — from professional ballplayers, to high schoolers, to even tee-ballers — would certainly provide an interesting and very telling analysis of what constitutes a good swing. A more extensive analysis as such could be used to potentially improve baseball players swings at all skill levels.

References

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