

An Analysis of Horizontal Forces Between Sports

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ABSTRACT

Different sports have various demands that athletes must meet to perform at the requisite level. For example, hockey athletes produce primarily horizontal forces due to skating. However, in basketball, there are a combination of horizontal forces from running and vertical forces from frequent jumping. Therefore, utilizing forces exclusively in one direction as a metric to compare athletes of different sports could provide a limited analysis. **PURPOSE:** The purpose of this investigation was to compare the relationship between horizontal and vertical forces between athletes who participate in the 4 major sports in the US by using a ratio of horizontal and vertical forces produced, called F_{max} ratios. We hypothesized that athletes who move primary horizontally, like hockey players, would have greater F_{max} ratios than athletes who participate in sports that involve jumping, like basketball. **METHODS:** Kinetic data were collected on 28 male athletes (8 baseball, 8 basketball, 6 hockey, 3 football, 22.4±4.53 yrs., 1.86±0.08m, 86.39±8.64kg) who participate in the 4 major US sports. All athletes had their horizontal forces measured using a DynaSpeed MUSCLELAB system. Athletes ran at various %'s of bodyweight using the DynaSpeed, and regression was used to predict peak horizontal forces. To measure vertical forces, athletes performed a countermovement jump on a force platform. F_{max} ratios were calculated by dividing peak horizontal force by peak vertical force. A one-way ANOVA was used to compare F_{max} ratios between athletes of the 4 major US sports. **RESULTS:** No differences were found in F_{max} ratios between sports (Baseball = 0.22±0.03, Basketball = 0.20±0.02, Hockey = 0.21±0.02, Football = 0.20±0.01, $p=0.34$). **CONCLUSION:** Results contradict our hypothesis as no mean differences were found between any sports. Furthermore, an exploratory analysis found no differences in horizontal forces between groups. This suggests that regardless of predominant direction utilized in sport, athletes of different sports still produce the same magnitude of horizontal forces as well as ratios. Future studies that investigate F_{max} ratios should aim to measure horizontal and vertical forces simultaneously rather than separately to best capture sport specificity.