

Effect of Kinetic mechanisms of lower limbs on torso motion in baseball batting for different ball speeds

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INTRODUCTION: It is known that baseball batters adjust movements of the torso, and lower and upper limbs to hit the ball when ball course and speed vary. However, few studies investigated the effect of kinetic mechanisms of lower limbs on torso motion for different ball speeds. Therefore, the purpose of this study was to investigate effects of kinetic mechanisms of lower limbs on torso motion in baseball batting for different ball speeds.

METHODS: Twenty nine university baseball players hit baseballs thrown by a machine at SLOW (80-85km/h), MEDIUM (100-105km/h), and FAST (125-130km/h) speeds. Three dimensional kinematic data were collected using Vicon 612 system (250Hz), and ground reaction forces were collected with two force platforms (500Hz). Segment torque powers (STP) and joint torque powers (JTP), and joint force powers (JFP) were calculated for the lower body.

RESULTS and DISCUSSION: In our previous study (Takagi et al, 2008), batters reduced the displacement of the center of gravity (CG) towards the machine and rotated the upper torso earlier in FAST than in SLOW. Figure 1 shows hip JFP of the pivot leg in the lower torso averaged for every ball speed conditions. Hip JFP of the pivot leg was slightly less in FAST than in SLOW from CGmin to SR, mainly because of the less velocity of the hip joint. The other hip JFP and STPs of both legs were almost zero. Therefore, it was suggested that less hip JFP of the pivot leg was one of the reason of less displacement of the torso in FAST than in SLOW. Figure 2 shows hip JTPs of the both legs averaged for every ball speed conditions. Batters generated the hip JTPs earlier in FAST than in SLOW just after SR, and these powers were transferred to the upper torso. Therefore, it was concluded that the powers generated earlier in the hip joints helped the batters to rotate the upper torso earlier in FAST.

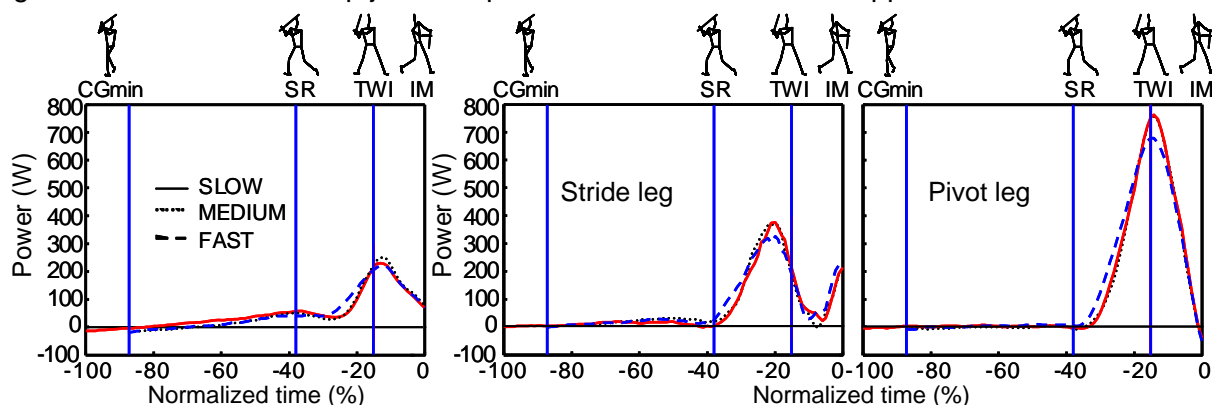


Figure 1 Hip JFP of the pivot leg

Figure 2 Hip JTPs of the both legs

CGmin: Minimum CG displacement against machine, **SR:** Start of rotation of lower torso, **TWI:** Maximum torso twist, **IM:** Impact. The averaged time from CGmin to IMPACT was normalized for every ball speed conditions (-100% : CGmin of SLOW). Vertical lines indicate CGmin of FAST and MEDIUM, SR of every ball speed conditions, TWI of every ball speed conditions in order.

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