P02-9 ID242

SWING MECHANICS OF COLLEGIATE BASEBALL PLAYERS IN DIFFERENT BATTING HEIGHT

Tang-Yun Lo[1], Pi-Tsumg Wang[2], Jia-Hao Chang[1]

[1]Department of Physical Education, National Taiwan Normal University, and [2]Department of Aquatic Sport and Recreation, Taipei College of Maritime Technology, Taipei, Taiwan

The purpose of this study was to understand the batting stability of baseball player in different divisions during three batting height. Eight division I and eight division II baseball players served as the subjects in this study. The 3D motion analysis system was used to collect the kinematics data. The swing plane was calculated and the error between the trajectory and the plane was considered as outcomes. Two-way mixed design ANOVA (α = .05) was used for statistics. D_{bh} were smaller in low (79.79±54.05) than that in high (160.80±98.35, *p*= .001) and middle (150.58±67.07, *p*= .000) batting conditions. $D_{sholder}$ in low (4.72±3.01) was smaller than middle (16.04±7.21, *p*= .006) and high (16.04±7.21, *p*= .000) conditions, and $D_{sholder}$ in middle was smaller than high (*p*= .001) condition. From the point of view of deviation of bat head and shoulder, the swing performents were more stable in low condition than other conditions.

KEY WORDS: kinematics, hitting, stable

INTRODUCTION: Many researches investigated the difference of body motion in varying hitting conditions (Welch, Banks, Cook, & Draovitch, 1995; Tago, Ae, Fujii, Koike, Takahashi, & Kawamura, 2006) and focused on joint angle and angular velocity. But few researches investigated the changes of trajectory which is more directly affect batting. Therefore, this research aim to realize the differences in batting stability between two division levels of baseball players in three hitting height conditions (high, middle, low) during batting.

METHODS: Eight division I (23.00±2.05yr, 174.05±6.23 cm, 72.72± 8.54 kg) and eight division II collegiate baseball players (22.70±2.05yr, 175.44±6.29 cm, 68.57±6.30 kg) participated in this study. Markers were placed on participants in accordance with the plug-in gait marker set, and markers also placed on adjustable height batting tee, bat head and bat tail (Figure 1A). Every player was asked to bat 3 times successfully and the trail which has the fast velocity of bat head while ball-bat contact was chosen during each height task. A 3D motion analysis system (Vicon MX13+ Oxford Metrics Ltd., Oxford, England, 250Hz) was used to collect kinematic data and Kwon3D XP (Visol, Kyonggi-do, Korea) was used to calculate the kinematic parameters. The swing phase was defined from the angle theta which was equal to zero($\theta = 0$) to ball-bat contact. The angle theta was the angle between the vector of left shoulder to the right shoulder and the X axis of global coordinate system in XY plane (Figure 1B). During swing phase, we used segment trajectory to calculate the plane which has the minimum sum of deviation and calculated the sum of deviation each chosen trail. Deviations were standardized by the time period during swing phase and tested by two-way mixed design ANOVA (α = .05). If there is no interaction between divisions and hitting conditions, the main effect will be tested.

RESULTS: There were no interaction between divisions and hitting conditions (Fig. 2). The deviation which was calculated by bat-head trajectory (D_{bh}) were smaller in low (79.79±54.05 cm/s) hitting condition than in high (160.80±98.35 cm/s, *p*= .001) and middle (150.58±67.07 cm/s, *p*= .000). The deviation of shoulder trajectory ($D_{sholder}$) in low (4.72±3.01 cm/s) condition was smaller than middle (16.04±7.21 cm/s, *p*= .006) and high (16.04±7.21 cm/s, *p*= .000), and $D_{sholder}$ in middle condition was smaller than high (*p*= .001). There were no differences between division I and division II in both D_{bh} and $D_{sholder}$.

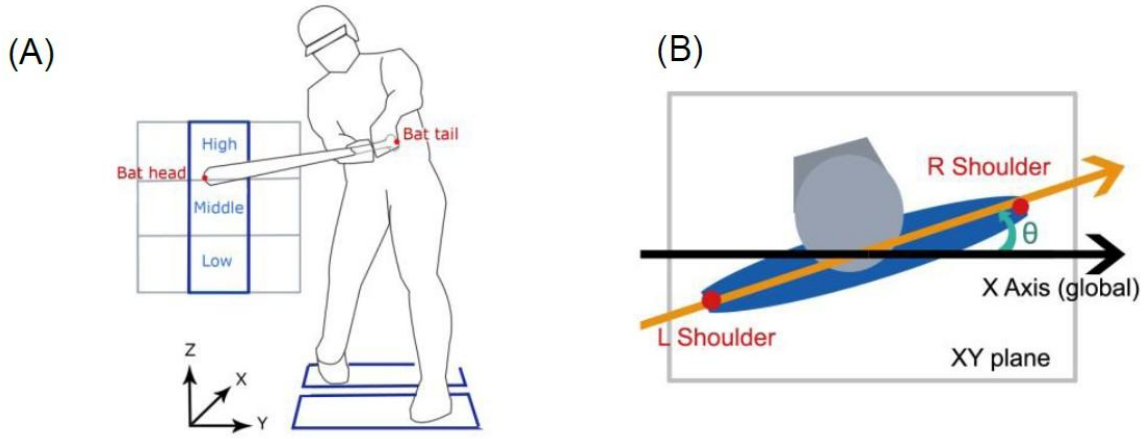

Figure 1: (A) Batting in difference conditions and (B) the angle theta.

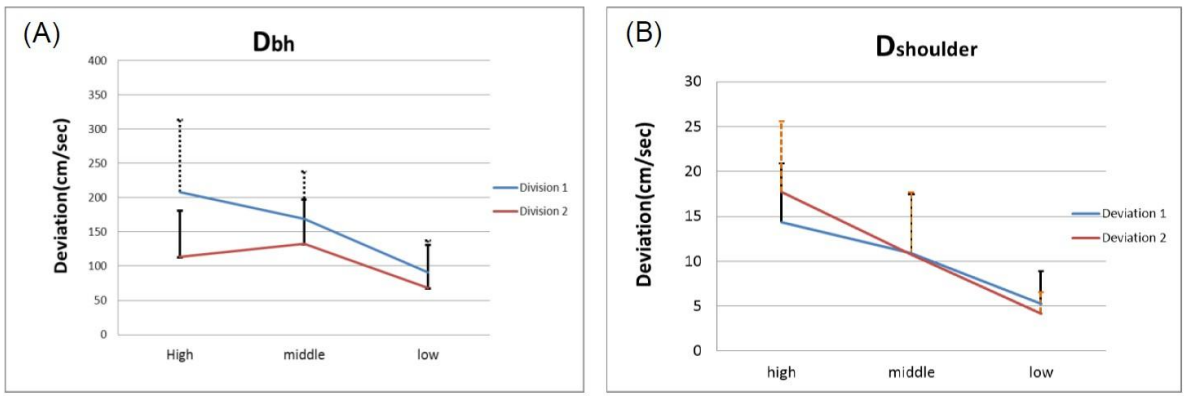

Figure 2: The deviation of (A) bat head and (B) shoulder of difference divisions in difference hitting conditions.

CONCLUSION: Both D_{bh} and $D_{sholder}$ were smaller in low than in other hitting conditions. It means that the rotation trajectory approched to one plane and the swing performents were more stable in low conditions. Because these experiments were tested in indoor labratory, the criterion we evaluating the hitting was bat-head velocity. However the velocity of bat head was not the only factor affect hitting quality. For this reason, it does't mean that players will play batter in low hitting conditions even the deviations were smaller. The relation between deviation of trajectory and hitting quality have to be further proven.

REFERENCES:

Tago, T., Ae, M., Fujii, N., Koike, S., Takahashi, K., & Kawamura, T. (2006). Effects of height of hitting point on joint angular kinematics in baseball batting. *Japanese Journal of Biomechanics*, *10(1)*, 2-13.

Welch, C. M., Banks, S. A., Cook, F. F., & Draovitch, P. (1995). Hitting a baseball: a biomechanical description. *Journal of Orthopaedic & Sports Physical Therapy, 22(5)*, 193-201