

COMPARISON OF TORSO TWIST BETWEEN SLAP HIT AND ORDINARY HIT IN SOFTBALL BATTING

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Softball batters take advantage of slap hit, by positioning the batters much closer to the first base. The purpose of this study was to compare the difference of torso twist between a slap hit and an ordinary hit in softball batting. Ten female college softball batters performed slap hits and ordinary hits. Reflective markers were placed on specific landmarks for each subject and VICON motion analysis system was used to record the hits. Slap hits showed less backward rotation during the torso wind-up phase while ordinary hit showed more forward rotation during the torso follow-through phase. No difference on trunk rotation was found at impact. The findings of this study suggested that the restricted backward torso twist during the wind-up phase and the limited forward torso twist during the follow-through phase should be taken into consideration in slap hits.

KEY WORDS: shoulder girdle, thorax, pelvis.

INTRODUCTION: Various motor skills are associated with softball, such as pitching, batting and fielding. Excellent batting ability is one of the most important factors to win the competition. A variety of batting techniques have been adopted in the course of a typical game in order to step to first base as quickly as possible. In addition to the ordinary hit, a slap hit is a unique technique frequently used in softball batting. A slap hit is used only for the left-handed batters who can get a running start before hitting the ball by using the left-side running slap. The batter is already several steps closer to the first base. The torso is the kinetic linkage between the upper and lower limbs, and its sequential motion in batting has been considered to transfer power and generate synergy between the lower and upper limbs (Morishita, 2010). However, very little research has been conducted to study the twisting motion of the torso in various softball batting techniques. Therefore, the purpose of this study was to compare the difference of the torso twist between the slap and ordinary hits.

METHODS: Ten female left-handed college softball batters participated in this study (age: 19.8 ± 1.0 years; height: 160.7 ± 3.2 cm; weight: 58.5 ± 3.4 kg; hitting experience: 7.3 ± 1.9 years). A VICON 612 motion analysis system (Oxford Metrics Limited.) with six digital cameras (250 Hz) was used to analyze the motion of the players. Surface reflective markers were placed on selective anatomical landmarks for each participant, including the acromion process, the spinal process of the 8th thoracic spine and the anterior superior iliac spines. Each participant performed three trials of each hitting technique from a batting tee. Softball batting consist of a wind-up, swing and follow-through phases (Fig 1). For the kinematic analysis, the swing motion in softball batting was divided into several events, including start of take back, right toe off, right toe on, swing start, impact and swing end (Tago, 2010). Slap hits had two additional instants during the wind-up phase, left toe off and left toe on, to prepare the players with anticipatory running start. The torso twist was defined as the angle between the direction of trunk segment in the frontal plane and the direction of the base toward the pitcher (Morishita, 2010). In this study, positive angle denoted a rotation to right (forward twist) and negative angle denoted a rotation to left (backward twist), while zero degree meant the torso was parallel to the direction of the base toward the pitcher. Paired-t test was used to compare the difference between ordinary hits and slap hits (SPSS, V13.0). The testing variables were the torso twist angles at each specific batting instant in shoulder girdle, thorax and pelvis.

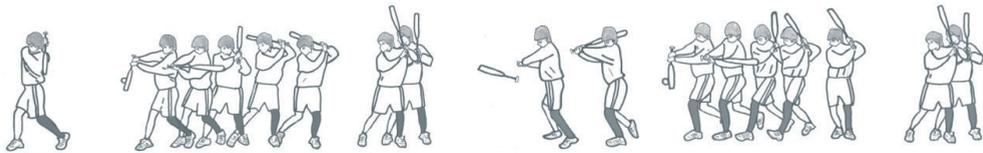


Figure 1: Ordinary hit (left) and slap hit (right).

RESULTS: The torso twist angles in ordinary and slap hits are shown in Fig 2. Significant differences in torso twist (from shoulder girdle to pelvis) were found at the instants of the start of take back, right toe off, right toe on, swing start and swing end ($p < 0.05$). Slap hits showed less torso backward rotation than the ordinary hit during the wind-up phase. However, there was no significant difference at impact in all torso segments.

DISCUSSION: For upper torso (shoulder girdle), from take back to swing start, the slap hit showed less backward rotation than the ordinary hit, indicating that the slap hit step forward with left leg during the wind-up phase would substantially influence or limit the torso twist backward. At the end of swing, more upper torso twist was present in the ordinary hit (more rotation to right). It would perhaps be the outcome of higher swing velocity.

The middle and lower torso (the thorax and pelvis), showed very similar twisting patterns. However, when examining the difference between the ordinary hit and the slap hit in the wind-up phase, the tendency of getting greater difference was observed between the upper torso and lower torso as well as from the early wind-up to late wind-up phases. At swing start, the lower torso in the slap hit already rotated toward the direction of pitcher (26° of forward rotation) while in the ordinary hit, the torso maintained a backward position (22° of backward rotation) to prepare the further quick forward rotation of trunk during the swing phase.

The restricted backward torso twist in the wind-up phase and the incomplete forward torso twist in the follow-through phase, especially in the upper torso, may be the cause of the limited bat swing acceleration in the slap hit. This possible disadvantage should be taken into consideration in softball batting when the batters using the slap hit, making the batter much closer to the first base.

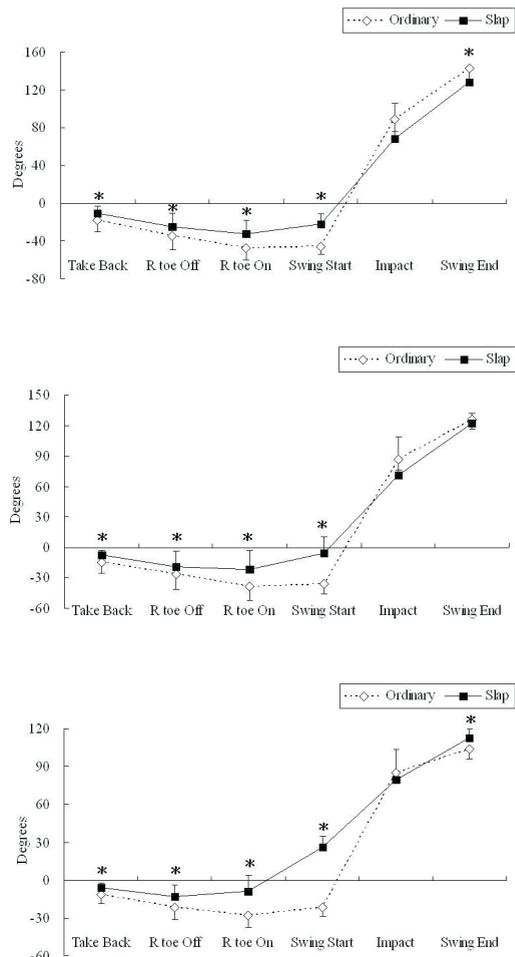


Figure 2: Torso twist angles in shoulder girdle (upper), thorax (middle), and pelvis (lower). * denoted statistical significance (paired-t test, $p < 0.05$).

No significant differences at impact were found in any torso segments. It was clear that the torso position at bat-ball contact was not affected by various hitting techniques used prior to impact.

CONCLUSION: This study investigated the torso twist in the slap hit and ordinary hit. Slap hits showed less backward rotation of the torso during wind-up phase while ordinary hits showed more forward rotation of the torso during follow-through phase. There was no difference between slap and ordinary hits at impact. The findings of this study suggested that torso rotational position at bat-ball contact was not affected by various hitting technique. The restricted torso backward twist in wind-up phase and limited torso forward twist in follow-through phase should be taken into consideration during the slap hit.

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