

ANALYSIS OF GROUND REACTION FORCE DURING FASTBALL AND CHANGE-UP SOFTBALL PITCHES

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KEY WORDS: kinetics, push-off, landing.

INTRODUCTION: The lower extremity provides stability and balance when we exercise. The roles what lower extremity plays should be clarified during pitching. Therefore, the purpose of this study was to observe the differences of ground reaction force for fastball and change-up windmill softball pitching.

METHODS: Ten collegiate female windmill pitchers (age: 19.5 ± 2.0 years, height: 167.5 ± 4.8 cm, and weight: 64.3 ± 8.6 kg) participated in the study. Force platforms (9281, Kistler) sampling at 1000 Hz were used to collect the push-off and landing forces in the laboratory. Three pressure sensors placed on throwing finger, tiptoe, and heel of each subject were used to define the pitching cycle. The force data were normalized with subject's body weight. Time was normalized with pitch duration. Paired t-test was used to assess the differences of peak force and $p < .05$ was considered as significance.

RESULTS & DISCUSSION: The ground reaction forces of push-off and landing during fast ball and change-up pitching were similar (Figure 1 and Figure 2), and no differences of peak force were found in all directions ($p > .05$). Peak forces of push-off and landing in vertical direction resulted from this study were similar to baseball pitching in the literatures.

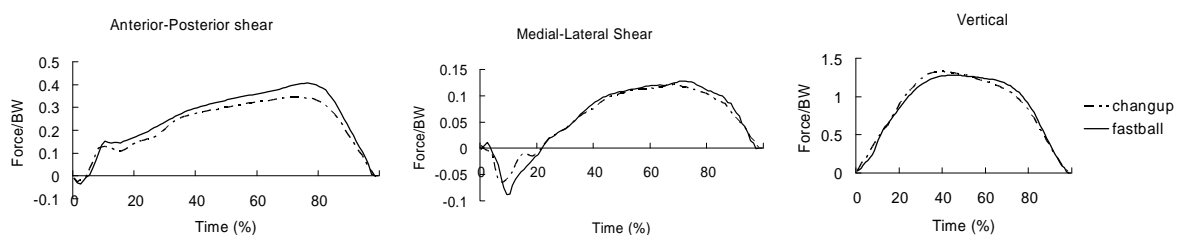


Figure 1. Push-off force based on the mean values of the ten subjects. Force data are normalized with body weight.

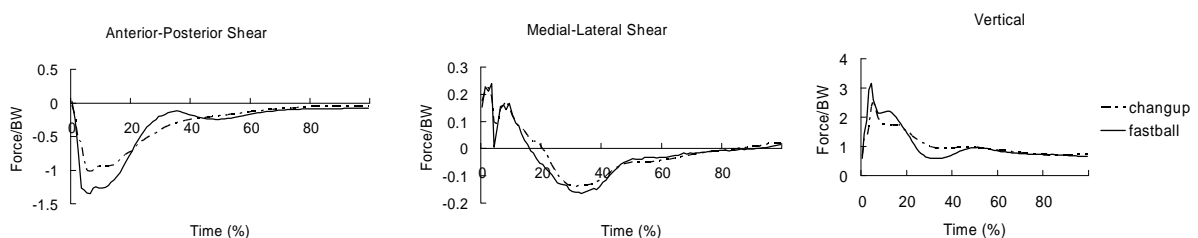


Figure 2. Landing force based on the mean values of the ten subjects. Force data are normalized with body weight.

CONCLUSION: The similar ground reaction forces in vertical, anterior-posterior, and medial-lateral directions were found during fast ball and change-up pitching, which suggests that the lower extremity provides the supports for stability and balance in pitching.

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