

INVESTIGATION OF BASEBALL CATCHERS' KNEE SAVERS BY USING MOVEMENT TIME AND MUSCLE ACTIVITY

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INTRODUCTION: In a baseball game, a catcher has to squat for a quite long time, which easily induce muscle fatigue of lower extremity. Hence, for the sake of protection, the knee savers have been devised in recent years. Though more and more catchers wear such savers in the field, it is no research that can prove the savers wearing enables the catchers to perform better and enables them to lessen the fatigue from the long squat. Therefore, in order to prove the hypothesis that the savers improve the catcher's performance and alleviate muscle fatigue, the purpose of this study was to exam effects of the savers on the movement time of throwing a ball to second base and on muscle activity of lower extremity.

METHOD: Two subjects participated in the study. The subject conducted five times of whole catcher's movements, such as waiting, catching, and throwing, with and without the savers, respectively. Motion Analysis System with 10 cameras at 100 sample/sec and surface EMG were used synchronously to collect the catcher's movement and muscle activity of Quadriceps, Hamstrings, Tibialis Anterior and Lateral Gastrocnemius. The movement time (MT) of throwing is defined as from the moment of catching the ball to releasing the ball.

RESULTS: Based on the data over the MT, the catcher with the knee savers spends less MT during catching to throwing phases than without wearing the savers about 30 ms. The EMG results are shown in Figure. 1. The EMG data reveal that the catcher with the knee savers allows quadriceps to have less motor units charged; that is, Qua are less strained when the catcher squats and wait to catch a pitch. The TA and LG, on the contrary, shown more motor units charged when the catcher wears the knee savers.

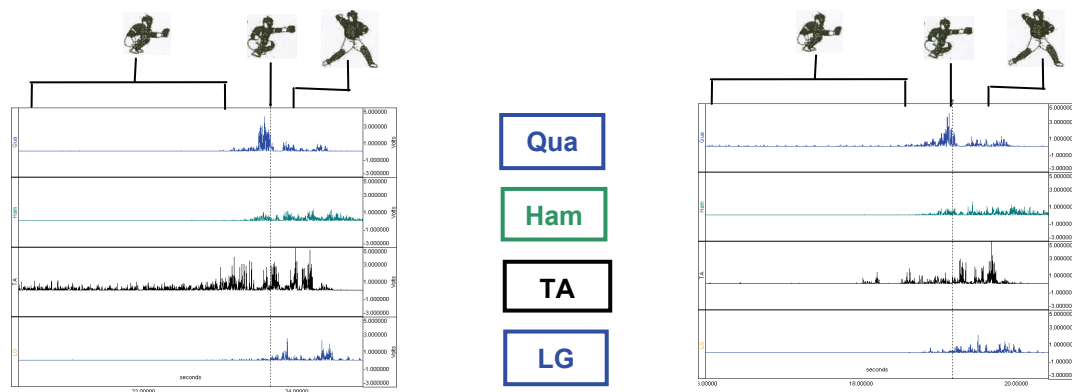


Figure. 1 The raw signals of Qua, Ham, TA and LG. The left is with the savers, and the right is without the savers.

DISCUSSION: The first striking finding of the study is that the catcher with the savers might throw a ball to second base faster and perform better. Moreover, the second finding of the study is that by wearing the knee savers, when squatting to wait a pitch, Tibialis Anterior muscle is a major muscle group to contribute to the catching movement instead of quadriceps muscle. The result reflects that the savers could decrease quadriceps muscle activity and inhibit its fatigue.

CONCLUSION: Through the study, it is revealed that the catcher who wears the knee savers can improve his performance and change innervation pattern of lower extremity muscles.