The Effects of Core Strengthening Training on Baseball Throwing

The purpose of this study was to investigate the effects of core strengthening training on baseball throwing. A total of 14 subjects were recruited from among middle school baseball players. The main outcome measures were as follows: speed guns were used to measure the velocity of baseballs thrown; scored targets were used to measure throwing accuracy; and 50m measuring tapes were used to measure throwing distances. It was found that core strengthening training improved the velocity of baseballs thrown and throwing accuracy and distance. Thus, core strengthening training is effective for improving the throwing ability of baseball players.

Key words: Core Strength, Throwing, Velocity, Accuracy, Distance

INTRODUCTION

Baseball is one of the most popular modern sports. It includes all sport motions that can be performed by humans, such as running, throwing, hitting, jumping, and catching. Among the many motions used in baseball games, throwing is the most frequently used, to the extent that it accounts for approximately 70% of the motions performed when games are played(1).

Throwing motions involve moving objects spatially using body segments, in particular, hand and arm segments, which can be classified into overarm throws, sidearm throws, and underarm throws and divided into throwing objects quickly, accurately, and far away(2,3). Many factors are involved in the improvement of throwing ability in baseball, such as the coordination of body segments during the process of throwing(4,5), the levels of contribution of body segments to ball speed(6,7), pitching motions for maximum ball speed(4)(8,9), and upper limb muscle strength (7)(10–12).

Previous studies regarding throwing have mainly involved kinematic and kinetic analyses of the upper limbs, consisting of the shoulders, the upper arms, the forearms, and the hands, as well as analyses of damage to the upper limbs(13–16). There have also been reports that suggested combining mental practice with physical practice to improve accuracy(17,18). In addition, Lee reported that using steps was more effective for distance throws, and throwing while stationary was more effective for accuracy(19).

To make a mechanical identification of motions in order to increase speed and present optimum models, recent studies have analyzed the movements of not only upper limb segments, but also the trunk and lower limbs. In a previous study, it was advised that training to increase power in the femoral muscle was effective for increasing the speed of baseball players’ pitches(20). In addition, Cho et al, reported that increasing the flexibility and strength of the femoral muscles of the lower limbs and trunk muscles could help increase ball speed(14), and So reported that core stabilization...
exercise programs improved ball speed(21). In a study by, Oh the author indicated data that would enable the use of variables for Tee—Ball throwing motions for ball throwing motion guidance and performance ability improvement using 3D image analysis equipment and ground reaction force equipment(22). In another study, Jin conducted kinematic and kinetic analyses of male and female middle school students’ ball throwing motions and reported the results(23).

As mentioned above, most previous studies regarding the improvement of throwing ability have concentrated on the upper and lower limbs, while studies on trunk function and improving throwing ability have been insufficient. In a previous study, Cho reported that although strong shoulders were regarded as an important requirement for good pitchers, during pitching training, pelvic and truncal motions should be considered as important variables for increasing ball speed(14). In addition, Cho et al. reported that lumbar spinal flexor muscle strength and power and extensor muscle strength are important for speed improvement(9). In particular, Hodges and Richardson proved that trunk muscle activities occur before limb activities, regardless of the direction of the limb movements(24). The trunk is the center and largest part of the body, and trunk muscle activities maintain balance and independent postures against gravity and prepare for limb movements.

Recently, training to strengthen the core, which is the center of the functional kinetic chain, has been emerging as a major matter of concern, not only for rehabilitation from musculoskeletal diseases, but also for improving exercise performance. The core refers to the lumbo-pelvic-hip complex, which is where the center of gravity of the body is located and all movements begin (25,26). Core strengthening training is essentially explained as controlling the muscles that are required to maintain functional stability around the lumbar vertebrae. If limb muscles are strong and the core is weak, the forces necessary to produce efficient movements cannot be generated sufficiently. A weak core is a basic problem that causes damage due to inefficient movements.

Previously, Aaron and Dominguez stated that core—strengthening training would improve dynamic posture control, ensure balance of the muscles around the lumbo-pelvic–hip complex and joint kinematics, and improve neuromuscular efficiency of the entire kinetic chain(27,28). In addition, previous researchers advised that core—strengthening training would provide a stable base of lower limb movements and would be effective in preventing lower limb damage(29–31).

As described above, despite its great effects, studies regarding the effects of core strengthening training on improving exercise performance ability are insufficient, and in particular, the effects of core strengthening training on improving throwing ability have not been verified. Therefore, the purpose of the present study was to verify the effects of core strengthening training on improving the throwing ability of middle school baseball players.

**METHODS**

**Study subjects and period**

The present study was conducted with 14 current baseball team members of M Middle School, located in Changwon—si, Gyeongnam, with no damage to the body or pain. Core—strengthening training was implemented for one hour per day, three days per week, for a total of six weeks, from October 17 to December 17, 2015.

**Experimental tools and measuring method**

1) Speed measurement

Each subject was instructed to throw a baseball three times, at maximum speed, to a Stalker Radar Speed Gun PRO(USA) located at a distance of 27.431m(distance between two bases) to measure pitch speed; the average value of the three pitches was calculated.

2) Accuracy measurement

To measure accuracy, each subject was instructed to throw a baseball, ten times, at a target 1.2m in diameter installed 30cm off the ground in a mesh net, located at a distance of 27.431m. The balls that hit the target were scored and the average value of the scores was used.

3) Distance measurement

KMC—1600/100m Phantom fiber tape measures were used to measure throw distances. Each subject threw a baseball three times as far as possible while in a standing position. The throw distances were measured and the average value of the three measurements was used.