Striking Skills: Developing Power to Turn

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SUMMARY

THE PURPOSE OF THIS ARTICLE WAS TO DISCUSS ROTATIONAL POWER AND ITS IMPLICATIONS FOR STRIKING SKILLS AND IMPROVED SPORT PERFORMANCE. TOPICS TO BE ADDRESSED INCLUDE FUNDAMENTALS OF STRIKING SKILLS, TESTING, AND EVALUATION, AND SUGGESTIONS FOR PROGRAM DESIGN.

INTRODUCTION

The successful performance of many sports skills require powerful, explosive movements, which often occur in the transverse plane (see Figure 1, anatomical plane). Sports such as baseball, boxing, golf, martial arts, softball, and tennis are just a few that use sequential kinetic linking to generate maximal angular velocity in a transverse plane. Such power, sometimes referred to as rotational power, is crucial to the performance of striking skills such as batting, punching, throwing, and serving. Because of the dynamic influence of this performance component, the purpose of this article was to discuss rotational power and its implications for improved sport skill execution. Topics addressed include striking skills, testing, evaluation, and suggestions for program design.

STRIKING SKILLS

Most striking skills require the successful execution of sequential kinetic linking. This important principle requires a coordinated effort of segmental joint rotations, which occur in a specific sequence, with time lapses between the peak rotational velocities of each involved segment. To maximize striking skill performance, kinetic energy must flow sequentially from the core of the body to the appendages, from proximal to distal, massive to least massive, and most fixed to most free (2). Typically, momentum is initiated by the larger slower moving muscles of the trunk and core and then transferred distally to the smaller faster moving appendages of the hands and feet. Similar to a bullwhip, the summation of forces generated by sequential kinetic linking can culminate in very fast body segments, which are necessary for powerful striking skills (2,3).

TESTING

The first step to improving any skill is measuring and evaluating the athlete's existing level of performance. Hence, the saying, "we can't improve what we can't measure." For athletes with the goal of improving sport performance, the first course of action is testing their existing abilities. This begins with the administration of a battery of diagnostic tests to assess their athleticism. One particular test, the transverse power test (see Supplemental Digital Content, http://links.lww.com/SCJ/A86, for a demonstration of the transverse power test), is specifically designed to assess the athlete's ability to produce power in the transverse plane. This test is an excellent practical instrument and has been modified over time in an attempt to improve its efficacy. In particular, instead of attempting to measure the distance the medicine ball is tossed, the use of a radar gun has been added to measure ball velocity. This alteration has made test administration more accurate and efficient because it greatly reduces the learning curve required to achieve optimum angle of release when measuring for distance. Such refinements have made the transverse power test a more effective tool and one that correlates highly with striking skills such as batting (1,6,8,11,12). Administration of the transverse power test includes the following:

1. Equipment–A standard 2 pound (or 1 kilogram) medicine ball and radar gun is used for the test. Although alternate medicine ball weights can be substituted, the normative data presented in this article are specific to a 2 pound medicine ball. Thus, testing with balls of different weights will require the use of normative data that are specific to the weight of the ball. Also, for appropriate statistical discrimination, the radar gun should have the capability of measuring ball velocity in tenths of a mile per hour.
2. Preparatory stance–The test subject should assume an athletic stance with a wide stable base. The feet

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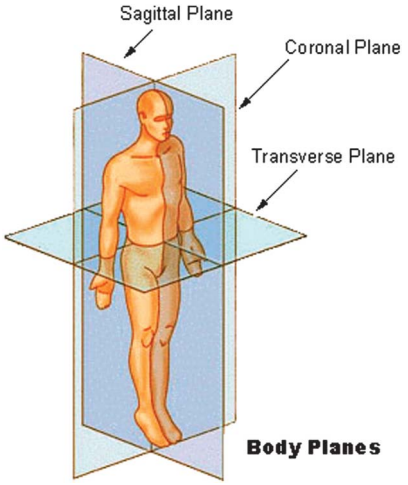

Figure 1. Anatomical planes.

should be wider than shoulder width apart with the torso facing perpendicular to the intended flight path (Figure 2). The athlete holds the medicine ball approximately chest high with the palms positioned at a right angle; the front hand supporting the ball from underneath and the back hand placed at the rear of the ball (Figure 3). The forearms should be extended from the body with the upper arms supported by the torso.

3. Backswing–From the preparatory stance the athlete rotates their torso away from the intended target (approximately 90°), shifting their weight to their rear leg (Figure 4).
4. Force-producing movement–At the completion of the backswing, the athlete uses sequential kinetic linking to explosively rotate toward the target and project the ball on a transverse plane. The motion is very similar to hitting a baseball or softball, where the athlete rotates and hits the ball on a line drive back to the pitcher. Also, to generate maximum angular velocity, the athlete should be encouraged to toss the ball parallel to the ground (not upward) and rotate the hips around a rigid front leg (Figure 5).
5. Scoring–The test administrator should stand to the rear of the athlete, opposite the target and away from the intended flight path. Thus, the target, the athlete, and the test administrator are in a straight line (Figure 6). The best of the 3 trials is recorded in tenths of a mile per hour for the dominant and nondominant throwing sides. However, if test administration time is limited, it is appropriate to test only the athlete's dominant throwing side. Also, it should be noted that if a radar gun is not available, it is possible to measure the distance the ball is thrown as a substitute for ball velocity.

Figure 3. Hand position.

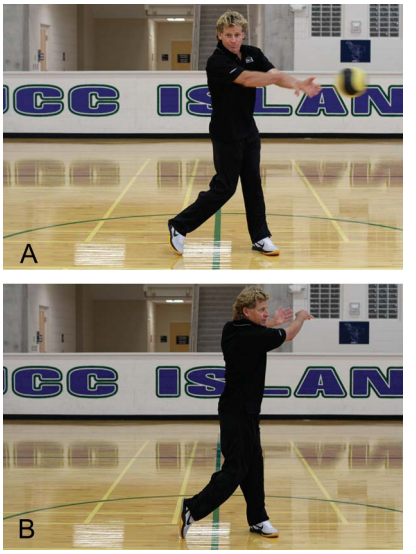

Figure 5. (A) Release; (B) Follow-through.

EVALUATION

If executed properly the transverse power test can provide valuable information for athletes and coaches. In baseball and softball, where throwing and hitting skills use such a plane of motion, this test could indicate an athlete's potential to hit and throw with power (1,7,8,10,12). Scores for the transverse power test will vary depending on the age, gender, maturity, sport, and skill of the athlete. After testing is completed, each athlete is evaluated for transverse power performance based on sport- and position-specific normative data.

PROGRAM DESIGN

Depending on test results, appropriate exercises, designed to improve rotational power, can be prescribed for the athlete's strength and conditioning program. Because sequential kinetic linking plays such a vital role in rotational power, fundamental exercises that enhance trunk and core strength are essential for success. Furthermore, ground reaction forces generated by the large muscles of the lower body provide a base of support

Figure 2. Preparatory stance.

Figure 4. Backswing.

Figure 6. Test administrator position.

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to transfer kinetic energy through the core, resulting in a more powerful kinetic link. Therefore, traditional exercises such as squats, power cleans, and lunges, which are commonplace in most training programs, provide a strong training foundation from which to develop sequential kinetic linking. However, because many of these exercises are performed in the sagittal plane, it is important to consider the addition of transverse plane exercises that may be more specific to the striking skill demands of the athlete's sport and position. Although a variety of exercises can be used, medicine balls have been shown to provide an effective means for developing rotational power (4,9,11). Roozen (5) presents a general medicine ball training program designed to develop rotational power. The program presents 3 basic exercises: seated toss, kneeling toss, and standing rotational toss. Although these exercises may appear rather simplistic, in many cases, as Leonardo Da Vinci stated, "simplicity is the ultimate sophistication." The exercises do not have to be complicated to be effective. However, the explosive nature of each repetition must be emphasized. To improve power, the athlete must train explosively. Rotational training could begin by simply adding one of these exercises to the existing training program. The standing rotational toss would be preferable because it has the greatest potential to develop sequential kinetic linking. The athlete can begin by performing 1–2 sets of 8–12 reps per training session. The weight of the medicine ball should provide adequate resistance while allowing for proper execution of movement. Again, emphasis should be placed on explosive movements while maintaining good technique and sound mechanics.

In contrast to the general medicine ball training program, Szymanski (9) presents an excellent program of sport-specific periodized medicine ball training, which includes exercises such as the twisting wall toss, lateral side hip toss, and hitter's throw (see Table) Although the program is designed for baseball performance, its general nature is transferable to many striking skill athletes. Incorporating such a medicine ball program into an athlete's training program can result in improved sequential kinetic linking and enhanced rotational power, which in turn can produce greater angular velocity and more powerful striking skills (10).

In addition to a training program designed to improve rotational power, coaches and athletes also must recognize the importance of practicing sound sport mechanics. Most striking skills are complex movements that require a great deal of motor skill. Because biomechanical efficiency plays a major role in striking skills, it must be practiced on a regular basis. Although power certainly plays an important role in sport performance, it is no substitute for sound sport mechanics.

In summary, to improve striking skills coaches and athletes should have a basic understanding of sequential kinetic linking, proper testing and evaluation techniques, and exercises that promote rotational power. This knowledge, teamed with a fundamental understanding of proper sport mechanics, can translate into stronger more powerful athletes that achieve greater sport success.

Table
Core training medicine ball exercises

Core Training		
Throwing Standing Medicine Ball Exercises		
Day	**Exercise**	**Sets × Repetitions**
1	Speed Rotation	2 × 8 each side
	Twisting Wall Toss	2 × 8 each side
	Lateral Side Hip Toss	2 × 8 each side
	Hitter's Throw	2 × 8 each side
2	1-Leg Balance Overhead Throw	2 × 10
	Lunge Figure 8 Throw	2 × 8 each side
	Twisting Woodchop Throw	2 × 8 each side
	1-Leg Balance Twisting Overhead Throw	2 × 10
3	Repeat Day 1 If Needed	2 × 12

The main focus is muscular power. Medicine balls are thrown with two hands. Microcycle 10 uses a 4 kg medicine ball, then progresses to 3 kg in microcycle 11, and 2 kg in microcycle 12 for a physically mature high school or college player. Physically immature high school players should be with a 3 kg ball, while middle school players should begin with a 2 kg ball. Decrease the mass of the medicine ball by 1 kg each 2-week microcycle. Rest period is 90 sec between the 1st and 2nd sets. Microcycles 11 and 12 make up the next 4 weeks (2-week microcycles within the 6-week mesocycle). Adapted with permission from Szymanski (9).

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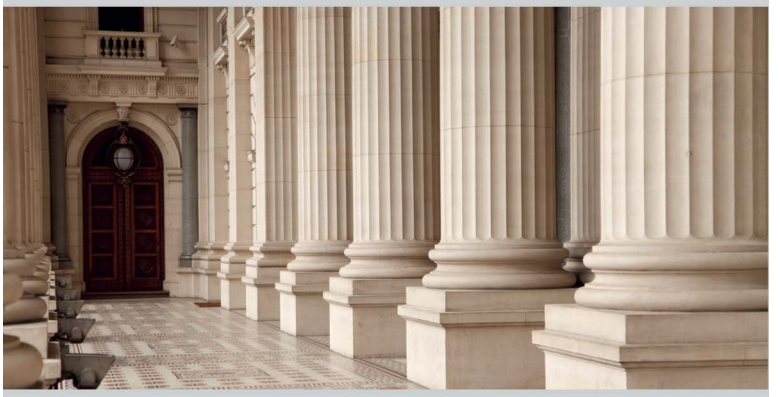

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