The ABC's for Increased Running Speed in the Post-Operative Knee Athlete

Robert A. Panariello MS, PT, ATC, CSCS
Professional Orthopedic and Sports Physical Therapy
New York, New York

Professional Athletic Performance Center
Garden City, New York

The advances of Athletic Performance Training Techniques utilized by the Performance Professionals of today have resulted in bigger, stronger, and faster athletes when compared to those of decades past. This increase in athletic performance also presents the athlete with the risk of bodily injury, including the knee joint, during both performance training and athletic competition. This year 1 out of 3000 Americans will have sustained some type of knee pathology. Dr. M. Majewski reported in his 10 year study that 6,434 patients incurred 7,769 injuries related to the knee joint. Dr. James Bradley reported the incidence of knee injuries and associated knee surgery during the evaluation of 332 elite college football players participating in an NFL combine. Fifty-four percent (179 players) had a history of knee injury. Knee injuries totaled 233 (a rate of 1.3 per player) and eighty-six players (25.9%) had a total of 114 knee surgeries. The knee injury and surgical data for Dr. Majewski and Dr. Bradley's studies can be found in Figures 1 and 2 respectively.

7,769 Knee Injuries

Male	68.1%
Female	31.6%
ACL Lesion	20.8%
Medial Meniscus Lesion	10.8%
Lateral Meniscus Lesion	3.7%
MCL Lesion	7.9%
LCL Lesion	1.1%
PCL Lesion	0.65%

M.Majewski et al

Knee Injuries Figure 1

Football Knee Injuries/Surgery

Knee Injury	(Number)
MCL	79
Meniscal Injury	51
ACL	40

Knee Surgery	**(Number)**
Scope Meniscectomy	**39**
ACL Reconstruction	**35**
Scope Meniscal Repair	**13**

Bradley et al

Figure 2. Football Knee Injury and Surgery

These are just two examples of the numerous studies documenting both knee injury and the often associated knee surgery, utilized as an option to restore normal knee function in the injured athlete. In regard to the athletic knee, Anterior Cruciate Ligament (ACL) pathology is also a common occurrence, as approximately 100,000 ACL reconstructions are performed annually. The athlete's participation in multiple performance training sessions, team practices, and competitive events, place them at risk of possible of knee injury and associated corrective surgery.

Regardless of the type of knee surgery performed, post-operative rehabilitation, as well as the athlete's post-rehabilitation performance training is inevitable. The overall goal for the post-surgical knee athlete is to restore, if not improve, the athletes pre-injury level of athletic performance, so they may return to compete successfully in athletic competition.

The Lesson

My good friend Dr. Donald Chu, a physical therapist, athletic trainer, track and field coach and athletic performance specialist, who for the past 25 years has vastly contributed to my knowledge of plyometrics and the performance training of athletes, taught me a very important lesson regarding the post-operative knee athlete. In a conversation that occurred years ago, he stressed the importance of the re-establishment of full *active knee flexion range of motion* during the rehabilitation process to assist in the restoration of speed development in the post-operative knee athlete. For 20+ years I've incorporated Don's concept during the rehabilitation of my post-operative knee athletes, as I feel this is an important component of both the rehabilitation, as well as the performance training of the post-operative knee athlete. I personally have never seen Don's observation published in any sports rehabilitation or athletic performance publication; therefore I would like to share it in this commentary.

During our discussion of the post-op knee and sprinting, Don, brought up an interesting observation in athlete's who not only had knee surgery (of any type), but completed their knee rehabilitation as well. He frequently observed the inability of the athlete to actively

flex their knee far enough to position the heel of the foot against their buttocks during the sprinting gait cycle. This leg/heel position is necessary for the achievement of both proper sprinting technique and maximum speed performance (Figure 3). Don also

Figure 3 Sprinters Heel to Buttock

observed that this “lack of full active knee flexion” may still be present even years after surgery.

To test this observation, have the athlete face a wall and place the palms of both hands upon it. With their knee pointed toward the ground surface area, have the athlete attempt to perform “butt kicks”, by alternately actively flexing both knees. During this exercise the athlete attempts to have the heel of each foot strike their buttock to demonstrate their active knee range of motion (AROM). The heel of the non-surgical knee will hit the buttock, yet more often than not, the heel of the post-operative knee will not. The increased distance from the heel of the foot to the buttock in the post-op extremity creates a longer lever (moment) arm vs. the heel position of the non-op extremity. This increased moment arm will result in an increased time period during the “recovery” of the limb throughout the “swing” phase cycle of the running gait. This “slower swing phase” is due to a biomechanical disadvantage that will result in slower overall sprint times. This knee flexion AROM deficit will be present even though full passive knee flexion (PROM) has been achieved. It should be noted that some athletes have such large thigh muscle mass, that assuming this heel position is not possible. Often for these athletes, such as football linemen, extended sprint distances are not necessary to achieve success at their specific position of play.

The 40 Yard Dash

The 40 yard dash is a valued testing criterion by many coaches during the evaluation of athletes. This is especially true for football players. In a conversation with renowned track and field coach Loren Seagrave, he explained that during the sprinting cycle, the inability to actively place the heel on the buttock as described above will penalize the athlete by .01 seconds for each swing phase of the sprinting cycle. This made me contemplate that since there are usually 22 to 25 strides in a 40 yard dash, at .01 seconds lost per swing phase, a 40 yard dash time will be reduced by .22 to .25 seconds due to a non-corrected *biomechanical disadvantage* resulting from the athlete's knee surgery. The presence of this lack of active knee flexion/increased limb moment arm ensures that slower post-surgery vs. pre-surgery sprint times will occur regardless of the athlete's strength, proprioception, PROM, or flexibility.

Corrective Exercise Performance

To restore the athletes ability to actively bring the heel to the buttock, specific exercise implementation must occur during the rehabilitation process, and if necessary, during the performance training of these athletes. The athlete should achieve full PROM knee flexion (heel to butt) in the prone position, early in the rehabilitation process to ensure the required knee flexibility and heel position is possible (Figure 4). Standing active knee flexion activities should also be initiated as soon and safely as possible.

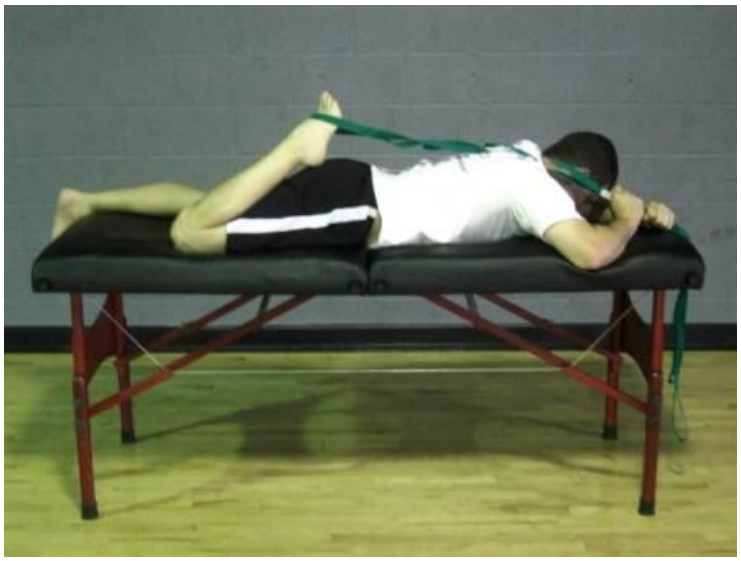

Figure 4 Prone Knee Flexion

Rehabilitation progressions should include modified track and field activities such as A and B marches to butt kicks, progressing safely to basic speed enhancement type exercises such as A and B skipping drills. When appropriate, additional advanced speed

enhancement activities may be incorporated during the rehabilitation and/or performance training of athletes, eventually resolving this active knee flexion ROM dilemma. Unlike the knee position assumed during the testing for this active ROM deficiency, it is advised that during the performance of these corrective knee exercises, whenever possible, the knee should be held high, the thigh parallel to the ground surface area, and the ankle positioned in dorsi flexion. Eventually over time, the athlete will accomplish the placement of their heel upon the buttocks, thus replicating the correct knee and foot position that occurs during sprinting.

During the rehabilitation of various knee surgeries, especially the ACL reconstructed knee, parameters such as full knee PROM, leg strength, proprioception, running and cutting abilities are restored, preparing the athlete for the subsequent performance training that they will partake. Active knee flexion activities used to restore the proper position of the knee, ankle and foot for the sprinting gait cycle is a criterion that should not be ignored. Achievement of this criterion during the athlete's knee rehabilitation will assist the athlete to the earlier attainment of their pre-surgical sprint times during the performance training phase of their knee recovery.

References

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