COMMON INJURIES IN ICE HOCKEY—STRENGTH AND CONDITIONING CONSIDERATIONS

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Ice hockey is a fast, skillful, physically-demanding sport where players skate at high speeds over 25 miles per hour (mph) (equal to about 40 kilometers per hour [kph]), undergo intensive physical contact, and shoot pucks over 100 mph (160 kph) (13,15). Ice hockey players have a relatively high incidence of injury resulting in time loss, including missed games and potentially long-term damage (9,18). For example, of all sports competing in the 2010 Olympics, the risk of injury was highest for ice hockey players (5). Ice hockey also had the highest rate of athlete-to-athlete trauma (5). Additionally, ice hockey players are at high risk of repeated injury (9,17).

Besides helping athletes perform to their optimal potential, the strength and conditioning coach often deals with injury resilience and return to sport. For the purposes of this article, we will focus on three common areas of injuries that occur with ice hockey players—the shoulder, hip and groin, and knee—along with some recommended strategies for the strength and conditioning professional (5,9,17).

SHOULDER

Ice hockey is a high-speed contact sport and includes the "shoulder check." The shoulder check is a type of physical contact whereby a player leads with their shoulder, hitting another player in attempt to separate the player from the puck, and thus inherently increases risk of shoulder injury (20). Hostetler found the greatest percentage of ice hockey-related injuries among youth hockey are in the upper extremity, accounting for 44% of injuries (8,13). Of these, acromioclavicular (AC) joint injuries in the shoulder are the most common among both amateur and elite ice hockey players, representing 51% and 50%, respectively, of all shoulder injuries in male and female players at the international level (9,13,14,19). All injuries, including AC joint injuries, were shown to be relatively higher with increased level of play and increased contact, and during in-game situations (19). A grade II AC joint injury is the most common, which includes a tear of the AC ligament and a partial dislocation of the joint; while grades III and onwards, which includes a complete separation of the joint and a complete tear of the AC and coracoclavicular ligaments (CC), may result in more missed games (19). Following an AC joint separation in ice hockey players, the recovery rate is approximately 2 – 4 weeks, 6 – 8 weeks, and 4 – 6 months following grade I, II – III, and IV – VI, respectively (19). Grades I – III for AC joint separations are typically managed conservatively through physical therapy and pain medication, while nonresponsive grade III and grades IV – VI often require reconstruction surgery (19).

An underlying risk factor in AC joint separation is shoulder instability (19). Effective rehabilitation programs have demonstrated effectively stabilizing the shoulder, although the immense forces placed during the "shoulder check" may be sufficient to overcome the adequately rehabilitated joint (19). In a high contact sport such as ice hockey, possessing adequate overall strength of surrounding musculature may be especially warranted when considering stabilization exercises for the AC joint.

The AC joint is stabilized not only by static components, but by dynamic components, which may greatly impact injury resilience and effective rehabilitation (11). The deltoid-trapezium complex may be an important factor in providing AC joint dynamic stability (11). Thus, periscapular muscle strengthening and sport-specific exercises should be included (11). Additionally, trunk musculature becomes active during glenohumeral movements and should receive attention during shoulder injury prevention and rehabilitation, including exercises focusing on a combination of trunk stability and shoulder exercises (3). Although research is lacking on the effectiveness of farmer's walks, this exercise combines both trunk and shoulder stability, overall strength for handling the "shoulder check," and the added benefit of grip strength for the hockey player. Thus, it is included in Table 2, which includes some exercise examples for both AC joint injury resilience and return to sport.

For minimizing risk of recurrent AC joint sprains, a recommended strategy is to incorporate functional testing and programming of specific exercises based on the results (19). With this in mind, working in conjunction with a trusted physical or athletic therapist may be a sound approach for the strength and conditioning coach, especially for ice hockey players with a history of AC joint sprains.

TABLE 1. BERN STATEMENT: FUNDAMENTAL COMPONENTS OF EXERCISE PROGRAMS TO MANAGE SHOULDER INJURY RISK IN OVERHEAD AND CONTACT OR COLLISION SPORTS (16)

Exercises should be conducted for sport specificity
Exercise should include multiple joints (involve the kinetic chain)
Programs should require minimal equipment and should take no longer than 10 – 15 min in total *Note: This was not stated but assume the recommendation above pertains solely to addressing shoulder injury risk*
Programs should be implemented 2+ times per week, and may be part of the warm-up or sport-specific resistance training
Programs with a competitive element is recommended
Programs should focus on rotator cuff imbalances, shoulder girdle strength through range of motion, and dynamic trunk function

TABLE 2. AC JOINT INJURY PREVENTION AND RETURN TO SPORT EXERCISES

FOCUS	EXERCISE EXAMPLE
Rehabilitative (phase 3)	Rowing exercises (11) Blackburn exercises – Ys and Ts (11) Lawn mower, disco exercises (11)
Rehabilitative (phase 4) / injury prevention "Kinetic chain exercises to recruit core, trunk, and leg musculature to facilitate force coupling and periscapular activation to scapulothoracic and glenohumeral and joints" (11)	Overhead press (11) Medicine ball chest pass, progressing to single arm (11)
Combining trunk stability with isolated shoulder strengthening	Side plank with external rotation (3)
Combining dynamic trunk stability with shoulder strength as well as supported musculature, sport specific	Farmer's walks
Combining dynamic shoulder and trunk strengthening, progressing to sport-specific exercises	Chop and lift Medicine ball side toss Medicine ball chest pass (with optional throws to a partner performing single-leg standing on BOSU to integrate dynamic shoulder stabilization, trunk strengthening, stability, and upper body power)..

In the 2022 Bern Consensus Statement on Shoulder Injury Prevention, Rehabilitation, and Return to Sport for Athletes at All Participation Levels, the Delphi group agreed that shoulder injury prevention exercises should be included for all athletes, regardless of if they have a history of shoulder injury (16). The purpose of Table 1 is to share the Bern Consensus Statement for informational purposes only as it pertains to managing shoulder injury risk; it may not be applicable to the strength and conditioning practices among the weight room within many sports, including ice hockey. For example, many strength and conditioning coaches would implement sessions greater than two times per week.

Readers should note that for the rehabilitative phases Table 2, Phase 3 focuses on scapular retraction exercises, dynamic strengthening of the shoulder girdle, continuing of closed-chain exercises, and commencement of open-chain exercises to further promote strengthening and stability of the shoulder girdle. Phase 4 includes advanced shoulder girdle strengthening and kinetic chain exercises to recruit core and leg musculature along with sport-specific exercises (11).

HIP AND GROIN

Adductor strains and groin pain are commonly reported complaints among ice hockey players, especially early in the competitive season (13). Adductor strains occur five times more frequently during on-ice training and during the pre-season games than during the regular season (13). This may be due to the increased on-ice technical training and on-ice intensity. The powerful skating technique, including both the forward and cross-over skating movement patterns, requires strong eccentric contraction of the adductors (13).

Limited hockey specific off-season training is a risk factor for adductor strains, in addition to adductor-to-abductor ratios of less than 80% and previous adductor injuries (13,18). Certain ice hockey movements, such as powerful forward and cross-over skating, require a strong eccentric contraction of the adductor muscles (12,13). This indicates that sufficient strength is important and should be of consideration by the strength and conditioning coach when implementing an offseason training program.

Besides adductor strains, femoral-acetabular impingement (FAI) is the other most commonly reported hip injury in ice hockey players (2,9,12,13). FAI is highly prevalent in adult ice hockey players and even more so among ice hockey goaltenders (2,9,12,13). FAI, also referred to as "hip impingement," is a condition that occurs when the femoral head impinges on the acetabulum during range of motion (13). FAI can be difficult to diagnose in the early stages. Brunner showed that youth ice hockey players with both asymptomatic and symptomatic FAI did not show functional deficits (2).

Furthermore, FAI is typically an incidental finding (4). FAI causes stiffness and pain, and can lead to premature arthritis (1). The repetitive loading of the hip from the skating motion can cause microtrauma and subsequent pathological remodeling of the femoral head, leading to FAI (10).

According to Byrd, there are no formal injury prevention programs; however, more recently there has been some research investigating the effects of FAI treatment in the early diagnostic stages (4). During early diagnostic stages, conservative treatment has been based on rest, stretching, and strengthening focused on the core and hip muscles (15). Maintaining a combination of mobility, endurance, strength, and power at the hip complex is suggested for injury resilience and return to sport following injury (12). To help reduce tension and enhance mobility, rolling out using a foam roller or lacrosse ball, trigger point release, and hip stretches are recommended (15). Salas recommends dead bug, bird dog, various glute bridge variations, single-leg balance on a BOSU® ball, mini-band glute bridges, external banded hip rotation, Bulgarian squats, Pallof press, anti-rotation, as well as various exercises that are also recommended for adductor strain injury prevention and rehabilitation listed in Table 3 (15).

KNEE

Of all ice hockey player-related injuries, 30 – 45% occur in the lower body, with the knee being the most common injury site (13). The medial collateral ligament (MCL) sprain is the most commonly reported knee injury among ice hockey players, and is one of the most prominent injuries in ice hockey players (9,13,14,17). In elite level ice hockey, MCL sprains are the second most common cause of missed games, typically sustained from valgus stress on the knee from player contact (6). In international ice hockey, Tuominen found that MCL sprains comprised 56.6% of the knee injuries, with 51.2% of MCL sprains being grade 1 (17). Meniscus tears comprised 14.5% of knee injuries, while ACL sprains comprised 10.5% of knee injuries (17).

To reduce risk of injury, a combination of sport-specific aerobic and anaerobic fitness, strengthening, and neuromuscular control can help ice hockey players withstand the unavoidable contact with other players (6). Strengthening exercises could include the squat, deadlift, resisted lunge, and step-up variations. Single-leg RDLs would add an element of neuromuscular control, as well as slideboard exercises similar to the example exercises in Table 3. To further challenge both power and neuromuscular control simultaneously, the strength and conditioning coach could incorporate plyometric and agility drills in conjunction with strength exercises. To enhance anaerobic fitness, especially for peak pre-season conditioning, finisher sled or short incline sprints can be performed immediately following strength exercises. For example, to enhance aerobic fitness, the ice hockey athlete could perform continuous hill repeats at a lower submax output, with jogging down between repeats.

OTHER INJURY CONCERNS AND PREVENTION STRATEGIES

When working with ice hockey players, it is important for the strength and conditioning coach to consider and include exercises that address areas of common complaints or “trouble areas” for the specific athletes. When working with ice hockey players for example, a common complaint is thoracic spine tightness. Using lacrosse balls, foam rollers, and specific dynamic stretches can be an effective method to mitigate thoracic spine tightness. The thoracic spine, for example, is critical for kinetic chain functioning within athletes, yet has been widely overlooked in terms of evidence-based exercise prescription (7). Sufficient mobility and strength in the thoracic spine is required to both limit excessive load/stress on other components within the body, and optimize performance (7). With this in mind, it is important to view the body as a functioning unit, working together, and it isespecially important to ensure the spinal column is functioning well, as it may be key to sport injury prevention.

TABLE 3. RECOMMENDED EXERCISES FOR ADDUCTOR STRAIN INJURY PREVENTION AND REHABILITATION (18)

EXERCISE	SUGGESTED REPETITIONS/TIME
Warm-up on bike (18)	10 min
Ball squeezes (18)	12 – 15
Side lunge kneeling pelvic tilts (18)	12 – 15
Sumo squats (18)	8 – 12
Standing adduction (cable or band) (18)	8 – 10
Slideboard: bilateral adduction Slideboard: moving involved leg into sagittal plane (18) Slideboard: unilateral lunges with reciprocal arm movements	8 – 12 each
Standing resisted stride lengths using cable column to simulate skating (18)	12 – 15

These exercises could be included within the warm-up, performed as circuits, or performed as sets within other exercises.

TABLE 4. EXAMPLE ROUTINE FOR DAY 1

	EXERCISE	SUGGESTED REPETITIONS/TIME
A1	Warm-up on bike (18)	10 min
A2	Roller and mobility work as needed, targeting T-spine, adductors for example	10 min
2 – 3 sets		
B1	Dead bug	10 – 12
B2	Mini-band glute bridge	12 – 15
B3	Side lunge kneeling pelvic tilts (18)	12 – 15
B4	Blackbird exercises Ys and Ts	10 – 12
B5	Plank to side plank	10 – 12 (or work up to 60 s if using time)
3 – 4 sets		
C1	Chop and lift	8 – 10
C2	Single-arm cable row	8 – 10
C3	Slideboard bilateral adduction on odd sets and slideboard unilateral lunges with reciprocal arm movements on even sets	12 – 15 (or work up to 60 s if using time)
3 – 4 sets		
D1	Sumo squats	8 – 12
D2	Landmine or alternating dumbbell overhead press	8 – 10
D3	Medicine ball side toss	8 – 10
D4	Medicine ball chest toss	8 – 10
D5	Sled sprint	10

CONCLUSION

It has been said that performance and injury prevention go hand in hand. Besides helping an ice hockey athlete prepare for peak performance, injury prevention and resilience should be a priority for the strength and conditioning coach. Understanding which common injuries ice hockey athletes are faced with, along with individual specific issues, can be instrumental in helping the athlete not only play to his or her best level, but to enjoy their sport with reduced risk of injury.

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Tammy Kovaluk has over a decade of experience as a strength and conditioning coach. She has worked with both teams and individuals in most sports with a special interest in dynamic correspondence and metabolic conditioning for hockey and American football. Kovaluk was the strength, speed, and assistant wide receiver coach for Belmont High School football. She works with a variety of hockey athletes from youth to the National Hockey League (NHL) prospects and is the current strength and conditioning consultant for Beyond the Edge International Search and Rescue. She has also worked as a clinical corrective exercise specialist alongside Dr. Rob Hasegawa, Team Canada's chiropractor. Kovaluk holds a Master of Science degree in Kinesiology and Sport Conditioning through AT Still University, where she was awarded a certificate for academic excellence. She is also a Certified Strength and Conditioning Specialist® (CSCS®) through the National Strength and Conditioning Association (NSCA), Certified Speed and Agility Specialist (CSAS) through the International Youth Conditioning Association (IYCA), and is certified as a Level 2 Function Movement Screen™ (FMS™).

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