



Evidence Summary: Badminton

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Version 1
February 2018

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Suggested Citation:

Clemens T, Richmond SA, Black A, Babul S, Pike I. *Evidence Summary: Badminton*. Active & Safe Central. BC Injury Research and Prevention Unit: Vancouver, BC; 2018. Available at <http://activesafe.ca/>.



Evidence synthesis tool

SPORT:	Badminton	Target Group:	Youth, adults, elite athletes, recreational players		
Injury Mechanisms:	<p>Movements involving turning, changing direction, shifting weight, pivoting or twisting, repetitive/overuse injuries, surface impact, and landing.</p> <p>Injuries to the lower extremities are most common. There is a high incidence of Achilles tendon rupture in badminton players.</p>				
Incidence/Prevalence	Risk/Protective Factors	Interventions	Implementation/Evaluation	Resources	
<p>All Injuries In Hong Kong, Yung et al. (2007) reported a total of 253 injuries (128 recurrent and 125 new injuries) among 44 elite badminton athletes (age 13-28) during a one year period. Elite senior athletes sustained more recurrent injuries (98 cases, 62.0%), while elite junior athletes sustained more new injuries (37 cases, 61.7%). The overall incidence of all injuries for all athletes was 5.04 per 1,000 player hours; it was highest for elite senior athletes (7.38), followed by elite junior athletes (5.03).¹</p> <p>In Sweden, Fahlstrom et al. (1998) conducted a five-year review of emergency department records and determined that 1.2% of all sport injuries that required emergency care were caused by badminton. The majority of the patients were recreational/beginner players. The lower extremities were affected in 92.3% of all cases. The most frequent injuries were: Achilles</p>	<p>There are relatively few high-quality studies that report risk and protective factors for badminton injuries. None of the existing studies found age, sex, or level of play to influence the risk of injury. However training load and previous injury were both identified as increasing injury risk in badminton players.</p> <p>Training Load Fahlstrom et al. (2002) found significant differences in the amount of training between players with and without Achilles tendon pain. The players who had a painful condition reported a higher weekly training load, with significant differences in the number of hours of total training, badminton training, endurance training, and strength training.¹ By contrast, Seme et al. (2013) found that players with acute should injuries trained 1.37 times less than uninjured players.²</p> <p>Previous Injury Yung et al. (2007) found that</p>	<p>High-quality studies on effective interventions for the prevention of badminton injuries as the cost-effectiveness of those interventions are needed.</p>	<p>Studies on implementation/evaluation of injury prevention interventions for badminton are needed.</p>	<p>Websites Badminton Information www.badminton-information.com/badminton-safety.html</p> <p>Badminton World Federation http://bwfbadminton.com</p> <p>OPHEA, The Ontario Physical Education Safety Guidelines http://safety.ophea.net/safety-plan/164/1864</p> <p>Safe Sport http://www.safesport.co.uk/badminton.html</p> <p>Sports Injury Clinic http://www.sportsinjuryclinic.net/sports-specific/badminton-injuries</p>	

<p>tendon ruptures (n=27, 34.6%), ankle sprains/fractures (n=23, 29.5%), knee injuries (n=13, 16.7%), and gastrocnemius strains (n=4, 5.1%).²</p> <p>In Malaysia, Goh et al. (2013) conducted a one-year prospective study of youth competitive badminton players and found an incidence rate of 0.9 injuries/player/1000 training hours. The authors reported that lower limb injuries were the most frequent and the knee was the most common site for injury.³ Shariff et al. (2009) conducted a review of all badminton players who attended the National Sports Institute Clinic of Malaysia. They found lower extremity injuries to be the most common (63.1%), and that the knee was the most common site for injury.⁴ Muttalib et al. (2009) conducted a cross-sectional survey of recreational badminton players in Malaysia. Twenty players (39.21%) complained of recent occurrence of either pain or stiffness after playing badminton. The most common areas sustaining injuries was the shoulder (30% of injuries), the lower back (30% of injuries) and the knee (20% of injuries).⁵</p> <p>Among elite badminton teams in Denmark, Jorgensen et al. (1987)</p>	<p>previous injury was significantly associated with the occurrence of a new injury ($p < 0.05$),³ and Seme et al. (2013) reported previous injury as a significant risk factor for sustaining an acute shoulder injury (OR=1.38, 95%CI 1.07-1.78).²</p> <p>Knee Position</p> <p>One study investigated whether increased knee valgus alignment and movement during single-leg landing after an overhead stroke was a risk factor for anterior cruciate ligament injury in badminton. Kimura et al. (2011) found significant differences in knee joint kinematics and knee valgus moment during single-leg landing after overhead stroke in different step directions. The authors determined that increased knee valgus angle and moment following back-stepping to the backhand-side might be related to the higher incidence of ACL injury during single-leg landing after overhead stroke.⁴</p>			
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found an incidence of 2.9 injuries/player/1000 badminton hours. In 74% of cases the cause was overuse.⁶

Lower Extremities

In New Zealand, Reeves et al. (2015), reviewed claims related to badminton injuries reported by the national insurance company from 2006-2011. They reported an estimated national incidence of 0.66%. By age, the most frequently injured were 10–19 year olds (22%), 40–49 year olds (22%), 30–39 year olds (14%) and 50–59 year olds (13%). Sixty-five percent of lower limb injuries were knee ligament sprains/tears. The most common causes of injury were movements involving turning (i.e., turning, changing direction, shifting weight, pivot, or twist) (34.4%) followed by general movements (i.e., running, moving sideways or backwards (22.5%), rather than specific badminton movements of lunging (10.9%) or landing from jumps (7.3%).⁷

Anterior Cruciate Ligament

Kimura et al. (2010) interviewed all badminton players who underwent ACL reconstruction in Japan between 2002 and 2007. Twenty-one badminton-related ACL injuries were recorded during the period, representing 7% of all

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registered ACL injuries. The most common injury event was a single-leg landing after an overhead stroke following a backward step (47.6%). The second most common mechanism was plant-and-cut (38.1%).⁸

Achilles Tendon

Two studies focused injury/pain to the Achilles Tendon. Fahlstrom et al. (1998), reviewed patients with badminton-related Achilles tendon ruptures and found that the majority of these injuries (29 of 31, 94%) happened at the middle or end of a planned game.⁹ In a cross-sectional study of eight elite Swedish badminton teams, Fahlstrom et al. (2002), found that Achilles tendon pain is relatively common among Swedish elite badminton players; twenty-one of the players (32%) reported current pain or pain during the previous 5 years in the Achilles tendon region.¹⁰

Shoulder

Although lower extremity injuries are the most frequent, shoulder injuries and pain are also prevalent among badminton players. Fahlstrom et al. (2006), conducted a study of elite badminton players from national teams and found that previous or present shoulder pain associated with badminton

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<p>was reported by 97 (52%) players (56% of male players and 47% of female players).¹¹ Fahlstrom et al. (2007) reported that shoulder pain is also a common symptom in recreational badminton players. Previous or present pain in the dominant shoulder was reported by 52% of the players in that study.¹²</p>				
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Review of Sport Injury Burden, Risk Factors and Prevention

Badminton

Incidence and Prevalence

Studies reporting the incidence and prevalence of badminton injuries have been conducted across all levels of play and in several different countries, primarily in Europe and Asia. The results of these studies are summarized below and organized by injury type.

All Injuries

In Hong Kong, Yung, Chan, Wong, Cheuk, and Fong (2007) reported a total of 253 injuries (128 recurrent and 125 new injuries) among 44 elite badminton athletes (ages 13-28 years) during a one-year period. Elite senior athletes sustained more recurrent injuries (98 cases, 62.0%), while elite junior athletes sustained more new injuries (37 cases, 61.7%). The overall incidence of all injuries was 5.04 per 1,000 player hours; it was highest for elite senior athletes (7.38), followed by elite junior athletes (5.03).

In Sweden, Fahlstrom, Bjornstig, and Lorentzon (1998), conducted a five-year review of emergency department records and determined that 1.2% of all sport injuries that required emergency care were caused by badminton. The majority of patients were recreational/beginner players. The lower extremities were affected in 92.3% of all cases. The most frequent injuries were: Achilles tendon ruptures (34.6%), ankle sprains/fractures (29.5%), knee injuries (16.7%), and gastrocnemius strains (5.1%).

In Malaysia, Goh, Mokhtar, and Mohamad (2013), conducted a one-year prospective study of youth competitive badminton players and found an incidence rate of 0.9 injuries/player/1000 training hours. The authors reported that lower limb injuries were the most frequent and the knee was the most common site for injury. Shariff, George, and Ramlan (2009) reviewed case notes of all badminton players who attended the National Sports Institute Clinic of Malaysia. They also found lower extremity injuries to be the most common (63.1%), with the knee being the most frequently injured body part. Muttalib, Zaidi, and Khoo (2009) conducted a cross-sectional survey of recreational badminton players in Malaysia. Twenty players (39.2%) complained of recent occurrence of either pain or stiffness after playing badminton. The most commonly injured areas were the shoulder (30% of injuries), the lower back (30% of injuries) and the knee (20% of injuries).

Among elite badminton teams in Denmark, Jorgensen and Winge (1987) found an incidence of 2.9 injuries/player/1000 badminton hours. In 74% of cases, the cause of the injury was overuse.

Lower Extremities

In New Zealand, Reeves, Hume, Gianotti, Wilson and Ikeda (2015), reviewed claims related to badminton injuries reported by the national insurance company from 2006-2011. They estimated a national incidence of 0.66%. The age groups that were most frequently injured were 10–19 year olds (22%), 40–49 year olds (22%), 30–39 year olds (14%) and 50–59 year olds (13%). Sixty five percent of lower limb injuries were knee ligament sprains/tears. The most common

causes of injury were movements involving turning (such as turning, changing direction, shifting weight, pivot, or twist) (34.4%) followed by general movements (such as running, moving sideways or backwards) (22.5%), rather than badminton-specific movements such as lunging (10.9%) or landing from jumps (7.3%).

Anterior Cruciate Ligament

Kimura, Ishibashi, Tsuda, Yamamoto, Tsukada and Toh (2010) interviewed all badminton players who underwent anterior cruciate ligament (ACL) reconstruction in Japan between 2002 and 2007. Twenty-one badminton-related ACL injuries were recorded during the period, representing 7% of all registered ACL injuries. The most common injury event was a single-leg landing after an overhead stroke following a backward step (47.6%). The second most common mechanism was a plant-and-cut maneuver (38.1%).

Achilles Tendon

Two studies focused on badminton-related injury/pain to the Achilles tendon. Fahlstrom, Bjornstig, and Lorentzon (1998) reviewed patients with badminton-related Achilles tendon ruptures and found that the majority of these injuries (29 of 31, 94%) happened at the middle or end of a planned game. In a cross-sectional study of eight elite Swedish badminton teams, Fahlstrom, Lorentzon, and Alfredson (2002), found that Achilles tendon pain is relatively common among Swedish elite badminton players; twenty-one of the players (32%) reported current pain or pain during the previous 5 years in the Achilles tendon region.

Shoulder

Although lower extremity injuries are the most frequent, shoulder injuries and pain are also prevalent among badminton players. Fahlstrom, Yeap, Alfredson, and Soderman (2006), conducted a study of elite badminton players from national teams and found that previous or present shoulder pain associated with badminton was reported by 97 players (representing 52% of all players). Fahlstrom and Soderman (2007) reported that shoulder pain is also a common symptom in recreational badminton players. Previous or present pain in the dominant shoulder was reported by 52% of the players in that study.

Limitations

While several studies on the incidence and prevalence of badminton injuries have been conducted, there is a paucity of population based badminton-injury studies that use a nationally representative sample. Further, the variability in the definition of injury used across the studies makes comparing injury rates and presenting a clear picture of the burden of badminton injuries difficult.

Risk and Protective Factors

There are relatively few high-quality studies that report risk and protective factors for badminton injuries. None of the existing studies found age, sex, or level of play to influence the risk of injury. However, two modifiable risk factors, training load and previous injury, were identified as increasing injury risk in badminton players.

Training Load

Fahlstrom, Lorentzon, and Alfredson (2002) found significant differences in the amount of training between players with and without Achilles tendon pain. The players who had a painful condition reported a higher weekly training load (14.3 ± 4.4 hours per week compared to 10.6 ± 5.6 hours per week), with significant differences in the number of hours of total training, badminton training (9.6 hours/week compared to 7.7 hours/week), endurance training (1.8 hours/week compared to 0.9 hours/week), and strength training (2.7 hours/week compared to 1.5 hours/week). By contrast, Seme and Kondric (2013) found that players with acute shoulder injuries trained 1.37 times less than uninjured players.

Previous Injury

Yung, Chan, Wong, Cheuk and Fong (2007) found that previous injury was significantly associated with the occurrence of a new injury ($p < 0.05$), and Seme and Kondric (2013) reported previous injury as a significant risk factor for sustaining an acute shoulder injury (OR=1.38, 95%CI 1.07-1.78).

Knee Position

One study investigated whether increased knee valgus alignment and movement during single-leg landing after an overhead stroke was a risk factor for anterior cruciate ligament injury in badminton. Kimura, Ishibashi, Tsuda, Yamamoto, Hayashi, and Sato (2011) found significant differences in knee joint kinematics and knee valgus moment during single-leg landing after overhead stroke in different step directions. The authors determined that increased knee valgus angle and movement following back-stepping to the backhand-side might be related to the higher incidence of ACL injury during single-leg landing after overhead stroke.

Limitations

There are few high-quality risk factor studies that identify modifiable and non-modifiable risk factors for badminton injuries. The available literature does not provide a clear picture of the risk factors for badminton injuries.

Opportunities for Prevention: Effective Interventions, Cost-Effectiveness, Implementation and Evaluation

High-quality studies on effective interventions for the prevention of badminton injuries as well as the cost-effectiveness of those interventions are needed. Further, studies on the implementation/evaluation of injury prevention interventions for badminton are needed.

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