



# **Evidence Summary: Figure Skating**

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The British Columbia Injury Research and Prevention Unit (BCIRPU) was established by the Ministry of Health and the Minister's Injury Prevention Advisory Committee in August 1997. BCIRPU is housed within the Evidence to Innovation research theme at BC Children's Hospital (BCCH) and supported by the Provincial Health Services Authority (PHSA) and the University of British Columbia (UBC). BCIRPU's vision is *to be a leader in the production and transfer of injury prevention knowledge and the integration of evidence-based injury prevention practices into the daily lives of those at risk, those who care for them, and those with a mandate for public health and safety in British Columbia.*

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## Evidence synthesis tool

<b>SPORT:</b>	Figure skating		<b>Target Group:</b>	Competitive figure skaters (singles, pairs, ice dance, synchronized skating)	
<b>Injury Mechanisms:</b>	The main injury mechanisms are falling, improper training, and equipment failure. Pairs skaters and ice dancers tend to suffer injuries due to falls from acrobatic elements, lifts, and throws from jumps. Synchronized skaters tend to suffer from injuries due to elements that require perfect synchronization with several skaters at once				
<b>Incidence/Prevalence</b>	<b>Risk/ Protective Factors</b>	<b>Interventions</b>	<b>Implementation/ Evaluation</b>	<b>Resources</b>	
<p>There are several different disciplines in figure skating including singles, pairs, and ice dancers.</p> <p><b>Singles</b> Overuse injuries are the most common in singles figure skating. One study found that 75% of female singles and 82% of male singles skaters reported at least one overuse injury during their figure skating career.<sup>1</sup></p> <p><b>Pairs</b> Acute injuries are much more common in pairs figure skating than other disciplines. 59% of female pairs skaters and 52% of male pair skaters reported suffering such an injury during their career.<sup>1</sup> In respect to injury rates, one study found that pairs skating had the highest number of injuries with 1.83 injuries per participant.<sup>2</sup></p>	<p>Equipment may present an injury risk in figure skating; however, literature in this area is lacking. The figure skate boot limits the movement of the ankle and calf muscle, where a stiff boot will not allow figure skaters to effectively use the ankle in take-off and landing manoeuvres.<sup>1-3</sup></p> <p>Overtraining, training during growth spurts, and skaters with decreased levels of flexibility is thought to contribute to higher rates of injuries; however, literature in this area is insufficient and of low quality.<sup>3,4</sup></p>	<p>The recommendations cited here are based on studies examining the prevalence and risk factors for injury in figure skating; therefore these recommendations should be interpreted with caution.</p> <p>Future work in this area includes rigorous examination of these recommendations and evaluation of interventions to reduce injury in the context of both recreational and professional level figure skating.</p> <p>Training in a harness with new elements, limiting repetitive jumps during practice, and avoiding introducing new techniques during growth spurts may minimize the risk of injury in figure skating.<sup>1,2</sup></p> <p>Another recommendation is that figure skaters train off-ice and make conditioning a priority.<sup>1,3,4</sup> Literature outside of figure skating, including soccer, basketball, rugby, and other sports, suggest neuromuscular training is an effective intervention to reduce the risk of injury, particularly</p>	<p>No implementation or evaluation studies were found in this literature review; however, recommendations include are listed in the interventions column.</p>	<p><b>Websites</b></p> <p><a href="#">Children’s Medical Center: Figure skating safety</a></p> <p><a href="#">HealthyChildren.org: Figure Skating</a></p> <p><a href="#">Ice Rink Safety Tips: 7 Dos and Don’ts to Prevent Injuries to Kids (Huffington Post)</a></p> <p><a href="#">North Jersey Figure Skating Club: Ice Safety</a></p> <p><a href="#">Skate Smart: How to identify potential injuries both on and off the ice</a></p> <p><a href="#">Stop Sports Injuries: Figure Skating Injuries</a></p> <p><a href="#">US Figure Skating: Developing an injury prevention strategy</a></p> <p><a href="#">US Figure Skating: Injury prevention exercises with an emphasis on balance, proprioception and foot/ankle</a></p>	

<p><b>Ice Dancing</b> Ice dancers tend to have the lowest rates of injury out of the three disciplines. 13% of female ice dancers and 25% of male ice dancers reported any kind of injury during their skating career including overuse and acute injuries.<sup>1</sup></p> <p><b>Common Injury Sites-All Disciplines</b> The majority of injuries across all figure skating disciplines occur to the ankle (27.7%) and knee (18.6%).<sup>2</sup></p>		<p>lower extremity injury.</p>		<p><a href="#">strengthening</a></p> <p><a href="#">US Figure Skating: Stretching. Designed specifically for Novice/Junior/Senior Skaters and Coaches</a></p>
<p><b>Works Cited:</b> 1. Dubravcic-Simunjak, S., Pecina, M., Kuipers, H., Moran, J., &amp; Haspl, M. (2003). The incidence of injuries in elite junior figure skaters. <i>American Journal of Sports Medicine</i>, 31(4), 511-517.</p> <p>2. Fortin, J. D., &amp; Roberts, D. (2003). Competitive figure skating injuries. <i>Pain Physician</i>, 6(3), 313-318.</p>	<p><b>Works Cited:</b> 1. Dubravcic-Simunjak, S., Pecina, M., Kuipers, H., Moran, J., &amp; Haspl, M. (2003). The incidence of injuries in elite junior figure skaters. <i>The American Journal of Sports Medicine</i>, 31(4), 511-517.</p> <p>2. Dubravcic-Simunjak, S., Kuipers, H., Moran, J., Simunjak, B., &amp; Pecina, M. (2006). Injuries in synchronized skating. <i>International Journal of Sports Medicine</i>, 27(06), 493-499.</p> <p>3. Porter, E. B., Young, C. C., Niedfeldt, M. W., &amp; Gottschlich, L. M. (2007). Sport-specific injuries and medical problems of figure skaters. <i>Wmj-Madison-</i>, 106(6), 330.</p>	<p><b>Works Cited:</b> 1. Porter, E. B., Young, C. C., Niedfeldt, M. W., &amp; Gottschlich, L. M. (2007). Sport-specific injuries and medical problems of figure skaters. <i>Wmj-Madison-</i>, 106(6), 330.</p> <p>2. Smith, A. D., &amp; Ludington, R. (1989). Injuries in elite pair skaters and ice dancers. <i>The American Journal of Sports Medicine</i>, 17(4), 482-488.</p> <p>3. Dubravcic-Simunjak, S., Pecina, M., Kuipers, H., Moran, J., &amp; Haspl, M. (2003). The incidence of injuries in elite junior figure skaters. <i>American Journal of Sports Medicine</i>, 31(4), 511-517.</p> <p>4. Dubravcic-Simunjak, S., Kuipers, H., Moran, J., Simunjak, B., &amp; Pecina, M.</p>		

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# Review of Sport Injury Burden, Risk Factors and Prevention

## Figure Skating

### Incidence and Prevalence

There are differences in injuries between singles figure skaters, pairs figure skaters, ice dancers, and synchronized skaters. Dubravcic-Simunjak et al. (2003) examined junior elite skaters at several competitions. They found that 80 out of 107 female single skaters and 85 out of 104 male single skaters suffered from an overuse injury at least once during their career; the most common injury type. In pairs skating, 36 out of 61 female and 32 out of 61 male pair skaters suffered from an acute injury, making acute injuries the most common form of injury. Ice dancers sustained the least amount of injuries with 9 out of 68 females and 17 out of 68 males suffering an injury (Dubravcic-Simunjak, Pecina, Kuipers, Moran, & Haspl, 2003).

Fortin and Roberts (2003) examined elite figure skaters and found that 90 singles skaters reported 119 injuries for an injury rate of 1.32 injuries per participant. In pairs skating, 60 skaters (male and female) reported 110 injuries for an injury rate of 1.83 injuries per participant. Fifty-eight ice dancers (male and female) reported 56 injuries for an injury rate of 0.97 per participant. Most injuries occurred to the ankle (27.7%) and knee (18.6%) over the duration of each skater's career (Fortin & Roberts, 2003).

The studies were limited as they only examined competitive figure skaters and did not include recreational figure skaters. Fortin did not have any access to medical records and relied on diagnosis on site before the patient received medical care. Dubravcic-Simunjak et al. (2006) examined synchronized skating injuries but did not segregate synchronized skating injuries from other skating injuries. These studies relied heavily on self report which may be prone to recall bias.

### Risk and Protective Factors

Dubravcic-Simunjak et al. (2006) were the only authors to quantify risk factors in their ice skating discipline. Synchronized skating requires a significant amount of coordination during certain required elements. Seventy-one out of 247 injuries (28.7%) occurred when skaters were performing the "intersection" element which requires skaters to skate in-between other members of their team (Dubravcic-Simunjak, Kuipers, Moran, Simunjak, & Pecina, 2006). Fifty-two out of 247 injuries (21%) occurred when the skaters performed the "block" element which requires skating together in groups of three or more (Dubravcic-Simunjak et al., 2006).

Other studies found in this review made conclusions regarding risk factors in figure skating; however, these associations were not quantified. Dubravcic-Simunjak (2003) noted that acute injuries occurred more often than overuse injuries in pairs skating and ice dancing due to falls from acrobatic elements, lifts, and throws from triple and quadruple jumps. Ankle injuries were the most common (Dubravcic-Simunjak et al., 2003).

Several studies discussed the high intensity of the sport. Children begin training at younger ages and at a higher intensity level than in the past. Overtraining, especially at a young age, is thought to contribute to higher rates of injuries. Training during growth spurts is also thought to contribute to higher rates of injuries as skaters have less flexibility during these times and are trying to over-compensate which leads to them placing more excessive force on their bodies (Dubravcic-Simunjak et al., 2003; Porter, Young, Niedfeldt, & Gottschlich, 2007; Smith & Ludington, 1989). Unfortunately they did not quantify these conclusions. These conclusions were inferred based on the number and nature of injuries in figure skating.

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

Recommendations have been made based on the risk factors and injury prevalence rates from several studies rather than testing said interventions. These include training new elements in a harness, limiting repetitive jumps during practice, particularly those that are novice skaters, and avoid introducing new skills during growth spurts (Porter et al., 2007; Smith & Ludington, 1989). It is also recommended that figure skaters train and condition off-ice in addition to their on-ice training. The figure skating boot should be properly fitted to the wearer's foot and replaced when worn out (Porter et al., 2007). Another recommendation is that figure skaters train off-ice and make conditioning a priority. Literature outside of figure skating, including soccer, basketball, rugby, and other sports, suggest neuromuscular training is an effective intervention to reduce the risk of injury, particularly lower extremity injury (Kjaer & Larsson, 1992; Porter et al., 2007; Smith & Ludington, 1989).

## References

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