ACTIVE & SAFE

Evidence Summary:
Inline Skating

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BC INJURY research and prevention unit

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

SPORT:	Inline Skating	**Target Group:**	Participants in inline skating
Injury Mechanisms:	The main injury mechanisms include falling, doing tricks, and skating on ramps/ledges/railings.		

Incidence/Prevalence	**Risk/Protective Factors**	**Interventions**	**Implementation/Evaluation**	**Resources**
Injury Type Studies that examined hospital data found that fractures are the most common injury experienced in inline skating.[1,2,3] The most common site fractured in inline skating is reported as the forearms, wrist, elbow, and hand.[1,2,3,4] Patients also report suffering from contusions, lacerations, and soft tissue injuries.[1,2,3] Several studies reported on injury using self-reported data.[5,6,7,8] The majority of studies found that inline skaters who sustained an injury suffered from contusions and abrasions, few suffered fractures.[5,6,7,8] **Incidence** Studies have found that between 40.2% to 48% of patients who presented to the hospital suffered a fracture or	**Personal Protective Equipment Use (PPE)** From review of the literature, the reported proportions of PPE use in inline skating is low. In one study 7% of participants reported wearing helmets, wrist guards, elbow pads, and knee pads.[9] Meanwhile 46% reported wearing no protective equipment whatsoever.[9] Participants who were not wearing wrist guards were significantly more likely to suffer an injury to the wrist than those who were wearing wrist guards (Adjusted OR: 10.4, 95% CI: 2.9-36.9).[10] Additionally, participants who were not wearing elbow pads were significantly more likely to suffer an injury to the elbow (Adjusted OR: 9.5, 95% CI: 2.6-34.4).[10] **Equipment/Terrain use** Inline skaters who were skating on ramps, railings, or ledges were more likely to be injured than those who were skating in other areas (Adjusted OR: 8.5, 95% CI:	No interventions to reduce injury in inline skating were found from this review; however, some studies direct attention to recommendations to reduce the risk of injury: One study reports that inline skaters are reluctant to wear protective equipment by inline skaters. Many reported that it is not necessary and a hindrance to their performance while skating.[8] Few participants stated they wore protective equipment at all time while the majority of participants did not wear protective equipment at all.[1,8] It is imperative to design educational programs on usage of protective equipment with such a low usage rate.[11] Educational programs need to be targeted towards inline skaters of all skill levels, not just novice skaters.[1,9,10] Experienced inline skaters were found to suffer more injuries than novice skaters in some studies.[9] Therefore	No implementation or evaluation studies were found in this literature review.	**Websites** Centers for Disease Control and Prevention: Inline Skating Activity Card HealthyChildren.org: Skateboarding and In-Line Skating National Safety Council: Inline Skating Parachute: Safe inline skating Stop Sports Injuries: Inline Skating Injuries Texas Children's Hospital: Scooter, Skateboard and Inline Skates Safety The City of Calgary: In-line skating safety

dislocation due to inline skating.[1,2] One study found that the forearm (19.3%), followed by the wrist (4.2%), hand (3.4%), and elbow (3.4%) were the most common fractures sustained.[2] Another study found that the wrist (26%), elbow (19%), and shoulder (12%) were the most common fractures sustained by inline skaters.[1] Patients also suffered contusions with 20.1%-21% of patients suffering at least one contusion.[1,2] Another study found that 20% of patients presented with at least one laceration.[2] Inline skaters who self-reported their injuries had a different prevalence of and pattern of injuries. Only between 5% to 13.4% had suffered a fracture while inline skating.[5,6,7,8] Contusions and abrasions were common. Between 22.4 to 35% had suffered a contusion while 34.3% to 35% suffered an abrasion.[5,8] Another study found that 31% of interviewees reported suffering a sprain during their inline skating career.[7]	2.5-29.1).[9] **Exposure** The amount of time spent inline skating per week was found to be a risk factor as those who skated more than 10 hours a week were more likely to be injured compared to those who skated less than 10 hours (Adjusted OR: 4.0, 95% CI: 1.8-8.9).[9] **Manoeuvres** Inline skaters who performed tricks and stunts were found to be at higher risk for injury (Adjusted OR: 1.8, 95% CI: 1.1-3.0).[9]	comprehensive educational programs need to be aimed at all skaters rather than novice skaters.		
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Review of Sport Injury Burden, Risk Factors and Prevention

Inline Skating

Incidence and Prevalence

Several studies examined the prevalence of injury on inline skating. Overall, the most common injury was fractures, followed by soft tissue injury. Frankovich et al. (2001) conducted a study in three emergency departments in London, Ontario, Canada over 15-months. Of the 121 patients included in the study, fractures represented 40.2% of injuries. The most common site fractured was the forearm comprising of 19.3% of patients, followed by the wrist (4.2%), hand (3.4%), and elbow (3.4%). The second most common injury sustained were contusions with 20.1% of patients sustaining a contusion. A study by Adams et al. (1996) demonstrated similar results. They reviewed records of 85 patients who presented to an emergency department and of the 85, 41 (48%), presented with a fracture or dislocation 17 (20%) with at least one laceration, and 18 (21%) with at least one contusion. The most common areas for fractures/dislocations were the wrist (26%), elbow (19%), and shoulder (12%).

Heitcamp et al. (2000) interviewed 75 inline skaters and found that 35% had suffered from contusions, and 35% had suffered from abrasions while 5% had suffered a fracture, similarly from Jaffe et al. (1997) where most patients reported bruises and abrasions while only 5.5% reported having suffered a fracture. Jerosch et al. (1998) interviewed 1036 participants and 626 reported having suffered an injury. Most were soft tissue injuries (61%) and sprains (31%) while fractures only accounted for 8% of injuries reported. Young et al.(1998) interviewed 313 inline skaters and 63 reported having suffered an injury. The most common injuries were abrasions (34.3%), contusions (22.4%), and fractures (13.4%).

Limitations of these studies include the potential for underestimation of all injuries that may have occurred due to the inability to capture those that attended medical clinics or did not seek medical attention for their injury. In addition, there is a difference in self-reported injuries compared to those examined in the emergency department. Those examined in the emergency department are more likely to have suffered severe injuries than those who were interviewed outside of a medical setting. Self-report data are prone to recall bias, and participants may have under or overestimated the seriousness of their injury.

Risk and Protective Factors

Two studies examined risk factors for inline skaters. Schieber et al. (1996) interviewed 161 participants injured while inline skating. Of all skaters interviewed, 7% reported they wore helmets, wrist guards, knee pads, and elbow pads at the time of injury while 46% did not. The adjusted odds of suffering a wrist injury when not wearing a wrist guard compared to those wearing a wrist guard was 10.4 (95% CI: 2.9-36.9), meaning that inline skaters were 10.4 times more likely to suffer a wrist injury if they were not wearing wrist guards. Inline skaters were 9.5

times more likely to suffer an elbow injury if they were not wearing elbow pads (95% CI: 2.6-34.4) and of the skaters in this study, only 28% of participants reported wearing elbow pads at the time of injury (Schieber et al., 1996).

Seldes et al. (1999) conducted a study where they approached inline skaters in parks across the United States. They interviewed 938 participants. Those that were skating on ramps, railings, or ledges were 8.5 times more likely to be injured (95% CI: 2.5-29.1). Those that reported skating more than 10 hours a week were 4 times more likely to be injured than those who skated less than 10 hours a week (95% CI: 1.8-8.9). Performing tricks or stunts was considered a predictor of injury regardless of all other factors (Seldes et al., 1999).

Data for these studies were based on self-report and were subject to recall bias. The interviewers independently verified the safety gear the participant was wearing at the time; however, there may have been self-selection as people may have stopped skating after being injured.

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

There were no intervention studies found that demonstrate a reduction in injury in inline skating; however, some studies direct attention to recommendations to reduce the risk of injury. The most common recommendation to prevent injury in inline skating is to use personal protective equipment; however, studies report difficulties in convincing participants to do so (Schieber et al., 1996; Seldes et al., 1999). An observational study looking at helmet use among participants in wheeled activities was conducted in Ontario in 2009. This study observed 164 inline skaters during the two-month period and found that only 21 skaters (12.8%) wore helmets (Page, Macpherson, Middaugh-Bonney, & Tator, 2012). Seldes (1999) found that only 6% of all inline skaters interviewed wore helmets, wrist guards, elbow pads, and knee pads, consistently. Many participants believe that safety equipment is not necessary, and may provide an opportunity to examine the effectiveness of education programs that support their effectiveness.

Novice skaters are at higher risk of injury; however, the most experienced inline skaters were reported to suffer the most injuries out of all those interviewed (Seldes et al., 1999). The authors of this study concluded that educational programs should not only be aimed at novices but at inline skaters of all levels. The educational programs should not only reinforce the usage of safety gear but other behaviors to reduce injuries.

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