
by

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Abstract


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Previous research has shown that the way youth think about injury risk situations can affect their decisions about whether to engage in behaviors that can lead to injury. Factors shown to influence risk decisions include judgements about the injury (e.g., pain, susceptibility to and severity of possible injury) and attributions for injury (e.g., personal responsibility versus bad luck). For adolescents who engage in sports, the benefits are many and multifaceted, however, our understanding of how perceived benefits affect intentions to return to sports after injury is limited. Cognitions are also heavily involved in the development of Post-Traumatic Stress Symptoms (PTSS), which occur in approximately 20% of children after an unintentional injury. This dissertation included two studies. Study 1 applied a qualitative reflexive thematic approach (online interviews) to examine 14-17 year olds’ perceptions of the benefits and costs of skateboarding (Study 1, N = 26). Study 2 used a quantitative method to test a moderated mediation model to explain factors that impact youths’ decisions to return to the sport post injury, including benefits, injury appraisals, and PTSS (Study 2, N = 103). Implications of the results for injury prevention initiatives are discussed.

Keywords: injury, returning to sport, risk taking, PTSS, cognitive appraisals
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### Table of Contents

Abstract .................................................................................................................. ii

Acknowledgments ................................................................................................. iii

Table of Contents ................................................................................................. iv

List of Tables ........................................................................................................ vii

List of Figures ........................................................................................................ viii

List of Appendices ................................................................................................. ix

Chapter One: Understanding Factors Involved in Adolescent Unintentional Injury and Return to Sport Decisions .............................................................. 1

Unintentional Injury in Children and Adolescents ............................................... 1
  The Burden of Injury ......................................................................................... 1
  The Role of Risk Taking in Unintentional Injury ............................................ 2

Sports Related Injuries and Factors Affecting Returning to Sport Post-Injury ...... 5
  The Burden of Sports Related Injuries .......................................................... 5
  Return To Sport Post-Injury ........................................................................... 6
  Potential Benefits of Risk Taking ................................................................... 7

Psychological Effects of Unintentional Injury ...................................................... 9

Current Research ................................................................................................. 10

References ........................................................................................................... 12

Chapter Two: Adolescents’ Perspectives on Skateboarding and Injury Risk: The Benefits Outweigh the Risks ................................................................. 24

Abstract ............................................................................................................. 24

Introduction ......................................................................................................... 25
  Unintentional Injury and Sports-Related Injuries .......................................... 25
  Skateboarding-Related Injuries ....................................................................... 25
  The Benefits of Risk Taking in Adolescence ............................................... 26
  Current Study ............................................................................................... 27

Methods ............................................................................................................. 28
  Participants ................................................................................................. 28
  Measures ..................................................................................................... 28
  Procedure ..................................................................................................... 29
  Data Analysis ............................................................................................... 30
  Data Quality and Rigor ................................................................................ 32

Results ............................................................................................................... 32
  What are the perceived benefits of skateboarding? ...................................... 32
  What are the perceived risks of the sport? .................................................. 38
  What motivates skaters to return after becoming injured? ......................... 41
  Why do skateboarders not return to the specific trick that led to injury? ...... 42

Discussion ......................................................................................................... 43
Limitations and Future Research ................................................................. 48
References ................................................................................................. 49
Table 1: Demographics of the Sample .......................................................... 55
Figure 1: Benefits of Skateboarding ............................................................... 56
Figure 2: Motivations for Return to Skateboarding (General, Specific Trick) After Injury.... 57
Abstract .................................................................................................... 58
Introduction ................................................................................................. 60
  Unintentional Injury and Sports-Related Injuries ........................................... 60
  Benefits of Skateboarding ........................................................................... 61
  Post-Traumatic Effects from Injury ............................................................... 62
  Injury Appraisals: Pain, Vulnerability, Bad Luck ........................................ 63
  Current Study ............................................................................................ 64
Methods ...................................................................................................... 65
  Participants ................................................................................................. 65
  Measures .................................................................................................... 65
  Procedure .................................................................................................. 67
  Analytic Approach ..................................................................................... 67
Results ......................................................................................................... 68
  Model Results of Mediation Model ............................................................ 68
Discussion .................................................................................................... 70
  Implications of Findings ............................................................................. 73
Limitations and Future Research ................................................................. 76
References ................................................................................................. 78
Table 1: Summary Scores for Each Measure ................................................... 86
Figure 1: Proposed Model ............................................................................. 87
Figure 2: Statistical Analyses Revealed a Moderated Mediation Path Model .......... 88
Figure 3: Stage 1 is the Relationship between Pain at Injury and PTSS ................ 89
Figure 4: Stage 2 is PTSS to Intention to Return to Skateboarding ...................... 90
Chapter Four: Placing these Research Findings in a Broader Context ............... 91
  Integrating Study Findings ....................................................................... 91
  Contributions of Research to the Field ....................................................... 94
  Implications for Practice .......................................................................... 95
    Encouraging Safe Skateboarding Practices .......................................... 95
    “Threading the Needle” Between PTSS and Injury Prevention ............... 97
Areas for Future Research ........................................................................ 99
<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theoretical Considerations</td>
<td>99</td>
</tr>
<tr>
<td>Defining “Risk” in Skateboarding</td>
<td>100</td>
</tr>
<tr>
<td>Mental Health beyond PTSS, and PTSS Trajectories</td>
<td>101</td>
</tr>
<tr>
<td>Gender Differences in Risk Taking and PTSS</td>
<td>103</td>
</tr>
<tr>
<td>Beyond Appraisals – Other Factors to Consider</td>
<td>104</td>
</tr>
<tr>
<td>Conclusion</td>
<td>105</td>
</tr>
<tr>
<td>References</td>
<td>106</td>
</tr>
<tr>
<td>Appendix 1: Study 1 Interview Questions</td>
<td>113</td>
</tr>
<tr>
<td>Appendix 2: Benefits of Skateboarding Questionnaire</td>
<td>115</td>
</tr>
</tbody>
</table>
List of Tables

Study 1 Tables
   Table 1: Demographics of the Sample ................................................................. 55

Study 2 Tables
   Table 1: Summary Scores for Each Measure ....................................................... 86
List of Figures

Study 1 Figures

Figure 1: Benefits of Skateboarding ................................................................. 56
Figure 2: Motivations for Return to Skateboarding (General, Specific Trick) After Injury..... 57

Study 2 Figures

Figure 1: Proposed Model......................................................................................... 87
Figure 2: Statistical Analyses Revealed A Moderated Mediation Path Model ................. 88
Figure 3: Stage 1 is The Relationship Between Pain at Injury and PTSS ....................... 89
Figure 4: Stage 2 is PTSS to Intention to Return to Skateboarding............................... 90
List of Appendices

Appendix 1: Study 1 Interview Questions ................................................................. 113
Appendix 2: Benefits of Skateboarding Questionnaire .............................................. 115
Chapter One: Understanding Factors Involved in Adolescent Unintentional Injury and Return to Sport Decisions

Unintentional Injury in Children and Adolescents

The Burden of Injury

Unintentional injury is the leading cause of death in children under the age of 19 years in Canada and most developed nations (Statistics Canada, 2020; World Health Organization [WHO], 2021). In North America, unintentional injuries contribute to more childhood deaths than the next two most common causes of death combined (Centers for Disease, Control and Prevention [CDC], 2020; Cunningham et al., 2018; Dellinger & Gilchrist, 2019; Parachute, 2022). According to Parachute Canada, 210 Canadian children died each year between 2003-2012 from preventable unintentional injuries (Parachute, 2016). Injuries also lead to hospitalizations: in Canada in 2016-2017, for example, unintentional injuries were the 7th leading cause of hospitalization (Public Health Agency of Canada, 2013). Although childhood injury is a serious public health concern, there is a strong research base indicating that pediatric unintentional injuries are preventable (Canadian Paediatric Society, 2012; Philippankis et al., 2004; Rimsza et al., 2002). In fact, it has been estimated that approximately 85% of the circumstances that lead to injury related deaths in children under 18 years old can be prevented (Rimsza et al., 2002) with changes to the environment, product design, or individuals’ behaviors.

Not only is unintentional injury a serious threat to children’s physical health, it also poses a threat to their mental health, with many children reporting symptoms of depression and a reduced quality of life after sustaining an injury requiring medical attention (Kassam-Adams et al., 2015; Landolt et al., 2009). Additionally, childhood injuries are one of the most common potentially traumatic events in pediatric populations, with between 10 and 30% of children who
have sustained an injury experiencing post-traumatic stress symptoms (PTSS; e.g. avoidance, re-experiencing, increased arousal) up to a full year after the injury event (De Young et al., 2012; Kassam-Adams et al., 2013). Building on these findings, this dissertation research explored factors that impact youths’ decisions to return to sport post injury, including an examination of their perception of benefits, injury appraisals, and PTSS experience in reaction to the injury.

The following literature review considers the following: individual risk factors that impact unintentional injury in youth; the burden of sports-related injuries and the complexities regarding returning to sports after injury; research on PTSS in reaction to unintentional injury in youth.

The Role of Risk Taking in Unintentional Injury

We know that for adolescents in particular, risk taking behavior is common and plays a role in the incidence of injury, such that as risk taking behavior increases, so too does the likelihood of becoming injured (Pickett et al., 2006). Research has shown, however, that age, gender and the way in which youth think about injury risk all affect their decisions about engaging in risky behaviors.

Age Based Considerations in Risk Taking.

Compared to other developmental stages, adolescence is a time when youth are particularly prone to risk taking leading to injury. Unintentional injuries such as motor vehicle crashes, falls, and sports-related injuries are some of the leading causes of death and hospitalization for teens (Olsen et al., 2011). In general, adolescence is a developmental stage characterized by an increased desire for autonomy and greater social pressures from peers. These are factors that can lead to increased risk taking behavior (Casey et al., 2008), including making decisions with the influence of peers more so than parents (Duell & Steinberg, 2021; Morrongiello et al., 2013). As such, compared to younger children and to adults, unique factors
may be at work with respect to adolescent injury risk, particularly when with peers, which is often the case for recreational sports.

**Gender Based Considerations in Risk Taking.**

One of the most consistent findings in the childhood injury and adolescent sport literature is that males are more likely to engage in physical risk taking and experience more injuries than females throughout childhood and adolescence (De Boer et al., 2017; Morrongiello & Dawber, 1998; Wang et al., 2023). A variety of explanations have been offered, including biological factors such as temperament, greater exposure to risky activities in boys relative to girls (e.g., greater participation in certain sports), and gender socialization (Morrongiello & Dawber, 1999; Schwebel & Gaines, 2007). For example, parents are more likely to encourage boys to take more risks than girls, and encourage boys to ‘tough it out’ after getting hurt (Schwebel & Gaines, 2007). Injury appraisals, in particular, have emerged as especially relevant. Research indicates that girls tend to think in terms of “can I get hurt”, while boys tend to think in terms of “how hurt” they might get (Hillier & Morrongiello, 1998). Additionally, boys are more likely than girls to attribute their injuries to bad luck, rather than their own behavior, which increases the likelihood of repeating a risk behavior (Morrongiello, 1997). Research also indicates that boys are more likely to make choices about engaging in risky behaviors by considering how much fun they will have, while girls are more likely to weigh how safe/unsafe the potential activity is (Morrongiello & Dawber, 2004). As a result, boys engage in risk taking and repeat risk taking even if it led to injury, whereas girls tend to be more risk-averse and to avoid behaviors that led to past injury.

**Cognitive Appraisals About Injury.**

Past research exploring the cognitive factors that predict children’s risk taking behavior has demonstrated that different injury appraisals can reliably differentiate children who are more
likely to take risks versus those who are risk-averse (Dale et al., 2013; Hillier & Morrongiello, 1998; Morrongiello & Rennie, 1998; Lasenby-Lessard et al., 2013). In particular, if a child reports thinking that they are likely to become injured (appraisals of personal vulnerability) or that something is dangerous (high danger appraisals), they are more likely to avoid risk taking. The same is true for children who believe that injuries are due to their own actions, rather than bad luck (Morrongiello & Rennie, 1998). Conversely, children who appraise the risk of danger and vulnerability to injury as being low, and believe that injuries are due to bad luck, are more likely to take risks. In addition to appraisals of vulnerability, danger, and attributions for injury, research indicates the child’s perception of the severity of the injury also matters (Hillier & Morrongiello, 1998; Morrongiello, 1997; Morrongiello & Matheis, 2004). If a child perceives the severity of the potential injury to be minor, they are more inclined to take physical risks than if they perceive the potential severity to be great. These results have been demonstrated via child self-reports (Dale et al., 2013; Morrongiello & Rennie, 1998; Morrongiello, 1997), in the lab using risk taking intentions tasks (Morrongiello & Dawber, 2004; Morrongiello & Matheis, 2004), and in an ecologically valid risk taking task involving the child placing a balance beam at varying heights before walking across it (Lasenby-Lessard et al., 2013; Morrongiello & Matheis, 2007).

Research on cognitive appraisals in strictly adolescent populations has yielded similar results to what has been found for younger children, with perceptions of vulnerability to future consequences, perceptions of the riskiness of the situation (i.e. appraisals of danger) and severity of the possible consequence playing a key role in decision-making about risk behaviors (Dale et al., 2013; Jelalian et al., 1997; Millstein & Halpern-Felsher, 2002). Consistent with the childhood literature, adolescents who perceive the situation to be low risk engage more frequently in the behavior of interest, such as smoking or risky sex (Albert & Steinberg, 2011; Millstein &
Halpern-Felscher, 2002). Moreover, adolescents who perceive risk of injury to be low when driving (O’Brien & Gormley, 2016), playing soccer (Kontos, 2004), and playing sports (Kontos et al., 2000), tend to engage in greater risk taking.

Interestingly, although there is evidence to support the idea that appraisals of low risk of injury lead to risk taking, the reverse also has been found in adolescent populations, such that high risk appraisals actually predict greater risk taking. This trend has been found in studies assessing both injury risk (i.e., skateboarding, Kern et al., 2014), and other risky behaviors (i.e., smoking and risky sex, Johnson et al., 2002; Mills et al., 2008). It may be, therefore, that teens consider more than just injury-relevant factors in deciding about risk behaviors, at least some of the time. For a recreational sport like skateboarding, which is often done in a group context at a skatepark, youths’ decisions may include considerations of benefits that they experience from participating in the sport (e.g., related to social context, their personal connection to the sport). This possibility was examined in Study 1.

**Sports Related Injuries and Factors Affecting Returning to Sport Post-Injury**

**The Burden of Sports Related Injuries**

Participation in sports is a significant contributor to unintentional injury rates (Wang, Toigo, et al., 2023), with sports-related injuries being the leading cause of visits to the emergency department for children under the age of 19 in the US (Weiss & Elixhauser, 2016). In a recent Canadian survey of injury patterns in children aged 1-17, injuries occurred most frequently when playing sports/engaging in physical activity (Wang et al., 2023). Additionally, for youth aged 15-17, head injuries or concussions were the most commonly reported injury, and the percentage of both fractures and head injuries increased as youth grew older (Wang et al., 2023). This is consistent with previous research that demonstrates that head injuries occur most frequently during sports and represent over 80% of traumatic brain injuries among Canadian
adolescents (Rao et al., 2017). Thus, sports-related injuries represent an important public health concern for youth.

One particular sport that has gained popularity and poses significant risk of injury is skateboarding, which was recently introduced as a new sport in the 2020 Olympic Games (Rodríguez-Rivadulla et al., 2020). While research on skateboarding injury to date has been limited, the literature that exists indicates that adolescent skateboarders suffer the most severe injuries relative to other age groups (Shuman & Meyers, 2015). They also are at risk for repeated injuries, including head trauma (Partiali et al., 2020), strains and sprains (Ou et al., 2021), and overtraining syndrome (Shuman & Meyers, 2015). While this research demonstrates that skateboarders are a group at risk of injury, little is known about the factors that influence their decisions to engage in the sport and return to it after injury. The current dissertation addressed these gaps in knowledge.

**Return To Sport Post-Injury**

What is known about the factors that motivate return to sports in general after injury demonstrates that there is a high level of return to play after injury. For example, 90% of adolescents with an anterior cruciate ligament (ACL) reconstruction returned to sports in general, with 79% returning to the original pre-injury sport (Kay et al., 2018). However, less is known about the factors involved in why and how youth return safely to their sport, and little is known about these motivations for skateboarders specifically. These factors are particularly important to understand given that adolescents are particularly vulnerable to re-injury, and are more likely to return to sports than their adult counterparts (Webster & Feller, 2019). For example, for adolescents who return to sports after an ACL reconstruction, the rate of re-injury is as high as 32% (Matsuzaki et al., 2022), and those who return prior to nine months have a rate of new injury that is seven times that of youth who returned after nine months or later (Beischer et al.,
Similarly to ACL injuries, concussion re-injury rates are approximately 30% in youth, and the recovery time in adolescents relative to younger children is often longer with more persistent symptoms (Emery et al., 2021).

While returning to sports seems to present some inherent risk of re-injury, we also know that sports participation in general provides youth with many physical, psychological, and social benefits (McDowell et al., 2019; Slutzky & Simpkins, 2009; Varkevisser et al., 2019). An exploration of the benefits youth may experience from engaging in risky sports behaviors, even if these pose risk of injury, is one area that may motivate a return to sport, and is explored in the following section.

**Potential Benefits of Risk Taking**

An examination of youth risk taking is incomplete without considering the impact that perceived benefits have on behavioral decision making. Risk taking behavior is a key part of adolescent development and contributes positively to building psychosocial skills, a sense of independence and autonomy in youth, and promoting the development of self-regulation (Baumrind, 1987; Taubman-Ben Ari, 2004). Evolutionary theories of development suggest that the increase in risk taking that is common in adolescence is normative and important in order for youth to be able to meet key developmental milestones such as identity development, independence, and skill-building (Ellis et al., 2012). Some researchers have even made a distinction between “positive risk taking”, which are risks that are both socially acceptable and facilitate development (such as the risks taken in the course of sports related activities) and “negative risk taking”, which are socially unacceptable behaviors that hinder development, such as getting into a car with an intoxicated driver (Duell & Steinberg, 2021). In an early study assessing adolescents’ own perceptions of what constitutes risky behavior, Moore and Gullone (1996) found that adolescents’ views of risky behaviors varied, including perspectives on both
negative risky behaviors (i.e., smoking, drinking, taking drugs) and positive risky behaviors (i.e., sport risks). While students could generate clear negative outcomes of these risky behaviors (death, possible disability, punishment, social consequences), they also identified clear benefits, including pleasure, peer acceptance, freedom, material gain, and avoidance of negative outcomes (Moore & Gullone, 1996). In a study conducted on reckless driving in adolescence, results indicated that teenagers perceived the benefits of driving to be related to impression management (i.e., impressing others, demonstrating a sense of self-worth and ability), pleasure (i.e. driving being fun, giving the individual a sense of freedom, or leading to a feeling of calmness), thrill-seeking (i.e. sensation-seeking and daring), and a sense of control (i.e. a feeling of competency/feeling as though they have control over the vehicle and the situation) (Taubman-Ben Ari, 2004). Similarly, a study on costs and benefits of risky sex found that older adolescents conceptualized the benefits of having unprotected sex as being related to feelings of excitement, pleasure, and greater connection to the sexual partner (Parsons et al., 2000). Motivations for engaging in alcohol use are similar and include drinking to induce a positive mood and to build social relationships (Sheehan et al., 2013; Lannoy et al., 2017). Thus, many activities that pose risk of negative outcomes also have perceived benefits from youths’ point of view. Interestingly, what the research shows is that the appraisal of benefits from engaging in a risky activity is typically a stronger predictor of risky decision making than judgments about personal vulnerability to negative consequences (Siegel et al., 1994; Taubman-Ben Ari, 2004; Peters et al., 2008). Hence, examining youths’ perceptions about benefits of engaging in risk taking activities can provide unique insights into their decision making.

With respect to sports related injury risk, research on the perceived benefits that influence youth engaging in physical risk taking is very limited. Nonetheless, in activities like cycling and skateboarding youth report emotional and social benefits (i.e., identity and a sense of belonging,
positive emotions related to the activity), as well as physical benefits (i.e., improving after making mistakes, testing physical limits) from engaging in risk behaviors (Dale et al., 2013; Dumas & Laforest, 2009; Feighan & Roberts, 2017; Peachey et al., 2016). Skateboarding is unique in that it is both an individual sport and a social activity, hence, benefits can potentially be quite varied (Karsten & Pel, 2001; Dumas & Laforest, 2009). In Haines and colleagues’ (2010) examination of adult skateboarders’ motivations, for example, they found the benefits to include excitement, learning new tricks, and being part of the culture (Haines et al., 2010). This dissertation aimed to expand upon these results and examine whether these findings hold true in an adolescent population.

**Psychological Effects of Unintentional Injury**

Historically, the focus of the majority of unintentional injury prevention work has been predicated on the physical costs that injuries have on youth. Negative psychological effects of unintentional injuries are rarely discussed in the injury prevention literature, even though posttraumatic stress disorder has been estimated to occur in approximately one fifth of children after an unintentional injury (Le Brocque et al., 2010; Kahana et al., 2006), and injury leading to hospitalization is one of the leading causes of PTSD in children and adolescents (Marsac et al., 2013). The literature on PTSD in adolescent sport specifically is limited, however preliminary evidence demonstrates that PTSD symptoms including avoidance, hyperarousal, and intrusion are a concern in adolescent athletes who have torn their anterior cruciate ligament (ACL) (Padacki et al., 2018). Given the prevalence of PTSD in youth after unintentional injury, and the possibility for PTSD to affect adolescent return to sport, understanding factors involved in the development of PTSD for youth athletes is important.

A significant factor in the development of PTSD post-injury is the way in which youth think about their injury experiences. Cognitive models of PTSD development theorize that
maladaptive appraisals are a significant part of the maintenance of PTSD, such that if an individual thinks about/assigns meaning to the traumatic event and the events following in an overly negative way, it leads to a feeling of current threat (Ehlers et al., 2003; Ehlers & Clark, 2000). The negative appraisals then in turn inform the person’s behavior, such that they attempt to control the threat they’re perceiving in a dysfunctional way (i.e., avoidance of situations, behaviors, and thoughts related to the event, rumination, dissociation), which actually maintains the PTSS (i.e., experiencing symptoms of trauma though not sufficient for a diagnosis of PTSD) (Ehlers et al., 2003). While less research has been conducted on children and adolescents’ appraisals affecting PTSD development compared to adults, the available literature does indicate that youth’s negative appraisals about the traumatic event affect their development of PTSS (Bryant et al., 2007; Hitchcock et al., 2015; Mitchell et al., 2017). When applied to a sporting context, it follows that negative appraisals of the injury event are likely to contribute to both PTSS development and adolescent decision making around returning to their sport (e.g., potential for increased avoidance), and is an area that merits further exploration.

**Current Research**

The overall objective of this doctoral dissertation was to integrate the literature on behavioral and psychological factors associated with sports-related unintentional injury in youth skateboarding, which is a sport that is growing in popularity and poses a high risk of injury (Rodríguez-Rivadulla et al., 2019). Previous research examining the effect that cognitive appraisals have on behavioral decision making about risky behaviors demonstrates that the way children and youth think about situations with the potential for injury can affect future risk taking behaviors (e.g., Dale et al., 2013; Hillier & Morrongiello, 1998; Morrongiello & Rennie, 1998; Lasenby-Lessard et al., 2013), as well as predict PTSS post-injury (e.g., Ehlers et al., 2003; Hitchcock et al., 2015; Marsac et al., 2016; Mitchell et al., 2017). Additionally, while we know
that sports participation presents many benefits to youth, as well as physical and psychological costs when youth become injured, there is limited research on how these costs and benefits play a role in how youth experience their injury and make decisions around returning to their sport. Given that the injury experience plays an important role in both decisions about behavioral risk taking and in the development of PTSD in youth, it is important to examine how appraisals about the injury event and youth perceptions of the benefits of returning affect both outcomes, rather than each on its own. To do this, two separate studies were conducted. The first study (Chapter 2) engaged youth skateboarders to better understand their perspectives on the benefits and risks of skateboarding, and how these beliefs shaped participants’ intentions to return to the sport after injury. This study was qualitative in nature, and informed the development of a measure on the benefits of skateboarding that was implemented in study two (see Appendix 1). The second study (Chapter 3) examined how appraisals made by youth about their skateboarding injury experience affected the development of PTSS post-injury, and how PTSS predicted youth’s intentions to return to the sport in the future.

1 Note: Given that this dissertation involves two studies that were written in manuscript form, some essential content is repetitive across chapters
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Chapter Two: Adolescents’ Perspectives on Skateboarding and Injury Risk: The Benefits Outweigh the Risks

[Note: A version of this chapter was recently published in Journal of Pediatric Psychology]

Abstract

Objective. Skateboarding is an increasingly popular sport among youth, despite the fact that children and adolescents are the age groups most frequently injured when skateboarding. A greater understanding of the psycho-social factors that motivate participation in skateboarding, including why youth return to the sport after serious injury from skateboarding, is needed to inform injury prevention efforts. This study addressed that gap in knowledge. Method. Twenty-six Canadian adolescent skateboarders 14 – 17 years of age (20 males and 6 females) who had previously sustained medically-attended injuries while skateboarding participated in individual interviews to explore their perspectives on skateboarding and injury risk, including reasons for returning to the sport after injury. Results. Thematic analyses revealed that participants perceived many unique benefits from skateboarding, including: interpersonal benefits; mental and physical health benefits; pleasure; personal growth; and identity development. Participants uniformly identified that a major drawback was risk of injury, with trickle down effects of injury including a loss of social contacts (e.g., missing friends), challenges to individual identity from not participating, and injury specific negative outcomes (e.g., pain, physical limitations). When exploring reasons participants returned to the sport and to the trick or activity that precipitated their injury, the primary theme identified was that the benefits of skateboarding significantly outweighed the costs associated with potential re-injury. Conclusion. Results paint a nuanced picture of psycho-social factors that impact youths’ skateboarding and decisions to return to the sport after injury. Implications for injury prevention are discussed.

Keywords: adolescence; skateboarding; injury; prevention; beliefs
Introduction

Unintentional Injury and Sports-Related Injuries

Unintentional injury is the leading cause of death in youth under the age of 19 years in most developed nations (Centre for Disease Control and Prevention, 2021). Moreover, unintentional injury rates have been increasing. For example, age-adjusted unintentional injury rate increased 40% in the US between 1999 and 2017 (Olaisen et al., 2019). Injury rates for youth aged 12-19 years are particularly concerning, as these individuals are injured at approximately twice the rate of those in other age groups (Billette & Janz, 2011). While unintentional injuries occur in a variety of ways, adolescent participation in sports are a significant cause of unintentional injury (Wang et al., 2023). In the US, for example, sports-related injuries are the leading cause of visits to emergency departments for children under the age of 19 (Weiss & Elixhauser, 2016). Thus, pediatric sports injuries are a significant burden to individuals, families, and the broader society.

Skateboarding-Related Injuries

Skateboarding has historically been classified as a high-risk extreme sport and it has, at times, been discouraged by the medical community due to potential injury risk (Feletti & Brymer, 2018). Nonetheless, skateboarding has been rising in popularity and was recently introduced as a new sport in the 2020 Olympic Games (Rodríguez-Rivadulla et al., 2020). As the popularity of skateboarding has risen, so too have the injury rates, with children aged 11-14 representing the most commonly treated age group in emergency departments and adolescent skateboarders (14-17 years) suffering more severe injuries than other age groups (Shuman & Meyers, 2015). Though limited research has been conducted on the etiology of skateboarding injuries, evidence suggests that risk factors include fatigue and overuse, skill level,
environmental hazards, and the behavior of the skateboarder (Feletti & Brymer, 2018; Shuman & Meyers, 2015).

When considering how to reduce injuries associated with extreme sports, the solutions are not straightforward. Although physical risk taking increases the possibility of injury, it is also a sought-out aspect of extreme sports because it can be associated with increased self-efficacy, fun and enjoyment, and feelings of excitement and accomplishment (Boyd, 2019). There is limited research on the psychological factors motivating risk taking while skateboarding, but some evidence suggests that skateboarders are aware of the potential injury risks (Haines et al., 2010; Kern et al., 2013). The fact that awareness of injury risk does not deter youth from skateboarding suggests that there may be benefits that outweigh these risks. One aim of the current study was to identify what youth perceive these benefits to be and, in particular, to understand how they impact decisions to return to the sport after injury.

**The Benefits of Risk Taking in Adolescence**

While sports-related injuries are a significant public health concern, there are also considerable physical health benefits to participating in sports (Varkevisser et al., 2019). Additionally, psycho-social benefits can accrue from sports participation, including improving self-concept (Slutzky & Simpkins, 2009) and prevention of depression and anxiety (McDowell et al., 2019). When considering how to mitigate the injury risks of sports-related activities, it is important to consider the varied and significant benefits associated with engaging in the activity, and to examine these benefits from the perspective of the sport enthusiast.

Challenging oneself by risk taking has been theorized to promote social and psychological capabilities, a sense of independence and autonomy, and to help with developing self-regulation (Baumrind, 1987; Taubman-Ben-Ari, 2004). In fact, research demonstrates that adolescents’ appraisal of benefits of engaging in a risky activity (e.g., related to sexual activity,
alcohol and tobacco use, and nutrition behavior) is typically a stronger predictor of risk intentions and behaviors than are their perceptions of risk of negative consequences (Peters et al., 2008). In the few studies that have asked youth about benefits of recreational activities and sports-related events, they mention emotional benefits (e.g., experiencing positive emotions), as well as physical benefits from engaging in risky sports (Feighan & Roberts, 2017; Peachey et al., 2016). Although research is limited, there is the suggestion that skateboarding can be both an individual sport and a social group activity. For example, in Haines and colleagues’ (2010) discussions with adult skateboarders, they found that participants valued feeling excitement and being part of a group. Building on these sparse past findings, the current study explored the individual and group benefits of skateboarding from the perspective of adolescents who are the group who experience the most severe injuries while skateboarding.

**Current Study**

The aim of the current study was to understand youths’ perspectives on the benefits and risks of skateboarding, including what motivates them to engage in risk behaviors when skateboarding and return to do so even after serious injury. Specifically, this study addressed three topics: (1) the perceived benefits of skateboarding; (2) the perceived risks of the sport, and (3) motivators to return to skateboarding (both generally and to the specific trick) after experiencing a medically-attended injury while skateboarding. A qualitative method was used in which participants engaged in individual interviews that covered a range of skateboarding and injury related topics with a particular focus on perceived benefits and risks and rationales for returning to the sport after injury.
Methods

Participants

Twenty-six Canadian adolescent skateboarders (77% male; 65% White, 23% Asian, 23% Black) aged between 14 and 17 years ($M = 16.1$ years, $SD = 1.2$ years) participated in individual online interviews. As is commonly done in qualitative research, we continued to conduct interviews until data saturation was reached (i.e., no additional useful information was being reported; Morse, 2003). Inclusion criteria included: English speaking, living in Canada (i.e., free access to injury treatment), having been an active skateboarder at the time of experiencing a medically-attended injury (e.g., requiring medical care from a doctor, hospital, walk-in clinic, etc.) while skateboarding. Youth were required to provide detailed information about the injury (e.g., what happened, the type of injury, where treated, type of treatment required) to affirm their eligibility to participate. Participants mostly reported experiencing fractures, severe strains/sprains, cuts, and dislocations (96%), with concussions endorsed infrequently (4%) and resulting in one participant hospitalized.

Measures

Demographics

Participants provided information about age, gender identity, and ethnicity (see Table 1).

Open-Ended Questions Regarding Perspectives on Skateboarding and Injury Experiences

An interview guide was developed based on pilot interviews with youth and injury prevention experts’ suggestions about the types of questions to ask in order to focus the discussion on the three topics of interest; this guide is available in Appendix 1. The interview questions acted as a general guide but allowed the participant the flexibility to introduce concepts and ideas that were not asked about directly. Interviewing is a rigorous form of qualitative data
collection that has the benefit of allowing individuals to share their personal opinions, experiences, feelings, and attitudes (Sparkes & Smith, 2014). The interview started broadly with questions related to perspectives on skateboarding as a sport (e.g., likes and dislikes about the sport), then asked about benefits and risks, and then narrowed to discuss participants’ injuries, including if and why they decided to return to the sport and/or to repeat the trick that led to injury.

**Procedure**

Ethics approval was obtained from the Research Ethics Board at the university. Participants were recruited nationally across Canada via flyers posted in local skate parks and community message boards, as well as through online forums and groups dedicated to skateboarding (on Facebook, Instagram, and Reddit). Participants contacted the research team via email and then written consent of parents and assent of youth were obtained. Individual interviews were conducted via Microsoft Teams (range: 30 to 70 minutes), and youth then received a $20 virtual gift card of their choice. To ensure consistency across participants, all interviews were conducted by the same person.

Although there are diverging opinions about the need to reach data saturation (e.g., Braun & Clarke, 2019a), we adopted this approach. Specifically, new interviews were compared to previous interviews already collected and after three consecutive interviews with no new information, the data collection phase was stopped.

**Positionality and Philosophical Orientation**

RTA was chosen as an analysis method because it is not limited by any one theory and this flexibility allows for a broad examination of perspectives. An inductive, semantic, and essentialist approach was taken to data analysis, meaning that coding and theme development was directed by the explicit content of the data, and focused on reporting on an assumed reality.
This study utilized a phenomenological method, reflecting a relativist ontological and an interpretivist epistemological orientation. These orientations assume that reality is relative and constructed intersubjectively, and that we cannot separate ourselves as researchers from participants’ experiences. In this way, researcher subjectivity is an active part of the analysis process, and their identities, values, and perspectives acknowledged as present and part of the research process (Braun & Clark, 2013). The first author is a senior doctoral student with extensive clinical experience with interviewing adolescents, which was applied in this study. Additionally, the first author has her own experiences with athletics and sports-related injuries in her personal life as an avid runner. She is not a skateboarder herself, but related personally to many aspects of the themes that were identified during the analytic process. In order to account for the primary researcher’s subjectivity, she engaged in reflective conversation and writing with her academic supervisor, who was the second coder and is the second author.

**Data Analysis**

All interviews were recorded and transcribed verbatim either by the first author (50%) or using an automated transcription service (Otter.ai), The latter transcripts were then checked for accuracy against the recording, with minor wording corrections made, as needed. A reflexive inductive thematic analysis (TA) approach (cf. Braun & Clarke, 2019b) was used to analyze the responses given by participants about their experience of skateboarding. Responses were integrated and analyzed across relevant questions. The analysis was conducted according to Braun and Clark’s (2021) recent recommended steps for reflexive TA, including: (1) Data familiarization and note generation. In this first step, the primary researcher read and re-read the data in order to gain a general understanding of participant responses as a whole, made notes and generated initial codes; (2) Systematic data coding. In this step, words or short phrases that described the data were developed. Braun and Clarke (2013) note that “codes provide the
building blocks of analysis: if you imagine your analysis is a brick-built, tile-roofed house, your themes are the walls and roof; your codes the individual bricks and tiles” (p. 207). In this way, codes acted as the preliminary starting place for the analysis, which were then combined to construct broader themes or meaningful units in the following steps; (3) Generate initial themes. During this step, the preliminary codes were combined and used to construct broader themes within the data. While a code represents a descriptor of a piece of the data, a theme represents a pattern of responses across the data that capture information and convey meanings that are relevant to the research question (in this case, participants’ perspectives on skateboarding and their relationship to injury experiences while engaging in the sport). Themes were identified based on (a) frequency with which they appeared across participants (i.e., mentioned by a majority), (b) the extent to which the theme was sufficiently different from other themes, and (c) the importance of the theme to our research questions; (4) Review themes. In this step, themes were reviewed to ensure that the codes within each distinct theme were consistent in reflecting the meaning ascribed to the theme, while also being conceptually different from codes that make up other themes; (5) Theme conceptualization and Refinement. This step entailed refining the themes and assigning names and definitions for each theme; (6) Final report. Extracts from the data (i.e., quotations from participant interviews) were selected that were representative of each theme, and in the writing process the analysis was linked back to the research questions and the extant literature. Throughout the analysis process, the second author independently reviewed (see below) the transcripts, identified codes, and proposed themes with the first author to achieve a full accounting of meaning-focused themes in the data (Lincoln & Guba, 1985). This iterative processing of transcripts guided refinements in coding and constructing themes (Charmaz & Belgrave, 2012).
**Data Quality and Rigor**

There are no standardized practices in qualitative research that all researchers endorse for evaluating data quality and some would argue that this is not a relevant consideration (for discussion see, for example, Braun & Clarke, 2021, 2023). We chose to conduct a number of data quality checks that we deemed appropriate to ensure the quality of the findings and confidence in the conclusions, including checking coding agreement, investigator triangulation, and unitisation of coders (Campbell et al., 2013; Carter, 2014; McGannon et al., 2021; Smith & McGannon, 2018). Specifically, after the primary coder finished a transcript, a second coder reviewed the transcript, identified meaningful units and assigned codes (step 2 above). Comparing these with those of the primary coder revealed disagreements, which were resolved by discussion (Lincoln & Guba, 1985). Then, themes (meaningful units) were constructed and codes assigned to these (steps 3-5 above), with disagreements again resolved by discussion. Thus, the findings reported herein resulted from a rigorous coding process in which two coders reviewed all the transcripts and reached consensus through discussion about meaningful units to code, the codes to assign, and codes that integrated into higher-order themes that a majority of youth discussed and meaningfully related to our research questions.

The data underlying this article cannot be shared publicly due to the need to preserve the privacy of the participants.

**Results**

**What are the perceived benefits of skateboarding?**

As outlined below, participants reported many benefits from skateboarding (see Figure 1 for listing). They discussed a variety of interpersonal aspects of skateboarding, health benefits that included physical and mental health ones, and the sheer pleasure and fun of the sport. Additionally, they valued unique aspects of skateboarding that included freedom to behave as
they chose to, as well as the personal growth and expanded sense of identity they experienced from skateboarding. Each of these types of benefits are elucidated in greater detail below.

**Interpersonal Benefits**

All participants identified a social component to skateboarding that contributed to their love of the sport and their personal well-being. Participants endorsed feeling a strong sense of positive social connection that derived from their skateboarding friendships.

“There is that, that bond you create, uh that bond of friendship you, you create when you, when you skate with friends.” (16-year-old male).

This sense of social connectedness not only enhanced the quality of the friendships that skaters reported having but also encouraged participants to improve their skateboarding skills. This was framed as providing a positive social motivation for growing one’s skills.

“That’s one of the main things that is a good thing about being with your friends while skateboarding, like we push each other to try new things, and it’s super encouraging to each other.” (15-year-old male).

Participants also expressed the benefit of receiving support for their well-being from their skateboarding friends. This branched out from skateboarding-specific support into support for mental health, overcoming personal adversity, and a general sense of protectiveness that individuals provided.

“I would say each one of my friends and me included, we all struggle with something. But all of us, we find our happy space when we’re skateboarding. And it definitely helps with, sort of like a tougher mindset that comes with mental illness, and grief, and recovery. It definitely helps with all of those things.” (17-year-old male).

“When people are jerks towards you, and then you defend each other to them. It connects you. Through like- you have my back for this and stuff like that.” (15-year-old male).

While close friendships were clearly a strong part of the interpersonal benefits participants endorsed, they also shared a strong identification with the broader skate community.
They noted the benefits this connection to skate culture provided them, including a sense of acceptance.

“You’re not really alone at the park. Cuz there’s so much of a community there that you kinda just learn to know everyone somehow.” (15-year-old male).

As a part of the community offered by other skaters, participants also appreciated the opportunities for mentorship, particularly providing support to newer skaters.

“When I see them sitting down, I'll go and be like, ‘Why aren't you skating? You know, you can come skate with me and my friends. Show me your ollie. I'll give you tips’.” (14-year-old female).

**Health Benefits**

Participants emphasized the physical and mental health benefits of the sport. Skateboarding represented an opportunity to stay physically fit and be outside.

“It's my exercise… nothing else really motivates me to do exercise like that.” (14-year-old female).

“I just go outside, I get fresh air and move around.” (15-year-old male).

Participants universally felt that skateboarding has positively impacted their mental and emotional well-being. These positive effects included the perception that skateboarding has helped participants to face their fears, has served as a positive distraction from life stressors, has a powerful mood-boosting effect, encourages mindfulness, and contributes to building a positive mindset generally.

“Overcoming your fear feels so good.” (15-year-old male).

“And it's just like good therapy. Go out and skate for a couple hours. Don't think about anything except what you're getting on the board and there’s fresh air and physical movement. Because physical movement is good therapy anyway.” (15-year-old male).

“It's like a very exciting moment for me in the day when my buddy calls me and he's like, ‘Hey, you want to go skate?’ And that'll just change my mood.” (16-year-old male).

“It gets all the problems out of your mind. Whenever I ride, everything I'm stressed out about just like goes away, which is a good thing.” (17-year-old male).
“I think that I would suffer more mentally if I had to cut it out, than physically…. Yeah, I think that it does a lot of good for me emotionally and mentally.” (14-year-old female).

A common sentiment was that if they did not have skateboarding in their life, their mental and emotional well-being would suffer.

“If I couldn't skate, I don't know what I'd do with myself…how I would get through a lot of things.” (14-year-old female).

**Pleasure**

All participants endorsed pleasure as a benefit, loving the sport purely for fun and enjoyment, with many repeating the sentiment of ‘it’s just really fun’.

The opportunity to always extend the activity by learning different tricks contributed to the fun: “It's in general, a lot of fun, you know, especially getting to learn tricks” (14-year-old female). Participants shared that the general fun of the sport sparked feelings of joy, excitement, and fulfillment for them and that it ‘makes you feel alive’ (15-year-old male).

**Uniqueness of Skateboarding**

The respondents felt that skateboarding was unique compared to other sporting activities and they identified several benefits from this uniqueness. In particular, they talked about the culture surrounding the sport, the variety of ways one can be involved in the sport, and the freedom and creativity it offered them. For example, one participant shared that:

“I'm always out skating or talking to my friends who are skaters or watching videos about skateboarding. It's just ingrained in me.” (14-year-old female).

While another noted:

“Even when you learn everything, there's so many different obstacles, and you can be so creative with it. And there's even different types of skating.” (16-year-old male).

Another emphasized freedom and noted that:

“It's really that freeness that you get. There's no rules. There's no coaches. There's no set times. It's, you can do it however you want.” (15-year-old male).
**Personal Growth and Learning**

Many of the benefits youth derive from skateboarding were related to the themes of personal growth and learning, including learning new skills while skateboarding, the sense of accomplishment that occurs when successfully learning something new, the enjoyment of the risk and challenge of the sport in general, and the learning of lessons that can be applied to life beyond skateboarding.

When discussing learning new skills, participants all shared that the potential for improvement was a significant perceived benefit of the sport, despite the fact they were engaging in tricks or behaviors that were potentially risky. For example, one participant shared that when she fell, it meant that she was improving.

“I think sometimes falling is really - it. When I think about it, it’s scary, but when it happens it’s actually nice in a way, because it makes me feel like I’m learning.” (17-year-old female).

Another participant shared their perception that there is no ‘end’ to learning in skateboarding.

“There’s no stopping point. You can just keep learning. Even the people who are the best in the world learn every day. So that’s the best thing.” (15-year-old male).

The sense of accomplishment that comes along with learning was also a subtheme that was identified frequently. As participants grew in their skateboarding abilities, so too did their sense of pride in their progression. For example, one participant shared that:

“When you land a trick, it's like that's your own muscle memory. That's something that you worked for, you know? So, I think I just sort of liked it and kind of got hooked on the reward – the rewarding feeling of learning a new trick.” (14-year-old female).

The subtheme of challenge and risk is closely related to the accomplishment and learning subtheme and youth often interrelated these in their discussion. Specifically, participants shared that they actively seek out new challenges and enjoyed the risky elements of skateboarding
because these improved their skill progression and contributed to a greater sense of accomplishment when meeting new challenges.

“I think how challenging it is when you finally land the trick that you’ve been trying for weeks and weeks. You’ve gotten so hurt on it, and you’ve gone home, like barely able to walk, but then you finally get that trick. It just feels so good. And like, you’re shaking for hours afterwards.” (15-year-old male).

Many participants felt that the riskier or more challenging the trick was the greater the potential for growth and positive emotion when they did eventually succeed. This created almost a seeking of risk activities for the purpose of a strong sense of accomplishment once these were successfully mastered.

Finally, participants shared that they often learned lessons from skateboarding that were generalizable to their everyday lives, including the value of perseverance and not comparing one’s own progress to that of other people’s.

“It's taught me to not give up the first time around, because you never land anything first try. And that can be applied to everywhere in your life. (15-year-old male). Sometimes you can get into a ‘comparing’ kind of thing where you compare yourself to other people and you really shouldn't, no matter if they're better than you or worse than you, because it's pretty toxic. And it can really mess up your mindset for the sport. And I think every skateboarder has had that feeling before. So that's one thing that also helps you in the real world. Because once you learn to cope with that, it helps a lot when you grow up.” (15-year-old female).

**Identity Development**

The idea that skateboarding, and being a skater, were key aspects of participants’ identity and sense of self was a theme endorsed by nearly all participants.

“Everyone I know who skates, it really becomes part of their identity more than it does for other people who do other sports.” (14-year-old female).

Closely tied to the concept that skateboarding is part of participants’ personal identity were the frequent assertions that if they did not have skateboarding as an activity any longer (e.g., if they had to quit because of injury), they would lose a part of themselves. For example,
one participant shared that when you aren’t able to skate, “you aren’t able to be fully yourself” (17-year-old male). The concept of loss of identity was particularly relevant to discussions with youth about costs of injury (see next section).

**What are the perceived risks of the sport?**

Nearly every participant endorsed that their primary concerns were ‘costs’ related to injury. For example, one participant shared her fear of breaking a bone.

“I just have this part of my mind that keeps on thinking about breaking a bone. Like a lot of injuries don’t scare me, but something about breaking bones…I’m afraid it’s going to happen to me.” (17-year-old female).

More generally, participants all shared that ‘getting hurt’ was the primary downside to skateboarding. As such, fear of injury emerged as the predominant theme, with subthemes that included losing aspects of the sport that benefitted participants, as well as experiencing negative injury-specific outcomes.

**Loss of Benefits**

The primary sentiments that emerged from participants were all concerns about ‘missing out’. These included losing the opportunities for: seeing friends, being a part of the skate community, and learning and progressing. There also were fears surrounding losing skateboarding permanently.

“Seeing my friends having a good time with my other friends, it was like - ugh, that sucks. They get to go out and have fun while I’m stuck in my house with this cast on.” (15-year-old male).

Another noted that “you can’t do what you love” (15-year-old male), while another explained that the disappointment around missing out went beyond the pain of the injury itself and included not improving while others were.

“I mean, it's not even really the pain…. Like, the pain is bad, but it sucks to just see people go out and skate and get better. And I'm stuck on the sidelines.” (16-year-old male).
The idea that missing out on skating was worse than the pain of the injury itself also came up very frequently.

“That was definitely the worst part ever - not being able to skateboard… I would take the pain like double worse rather than not be able to skateboard for 6 months.” (15-year-old male).

Additionally, missing out on skateboarding led to a challenge to sense of self/identity for many participants, with many skaters sharing that being unable to skate/the fear of losing the sport permanently led to challenges in defining themselves.

“I can’t imagine my life without it. I do it every day, all the time. Like I leave the whole day and come back at like 9:00. It just, all of that just felt like, ‘it’s gone now’. Like now what am I supposed to do.” (15-year-old male).

Missing out on skating due to injury also negatively affected their health because physical benefits (e.g., fitness) were taken away, as were the mental health benefits participants derived from skateboarding.

“I couldn't skate for a good while, like I couldn't even go out and cruise around the neighborhood for a good four days. And that really took a toll on my mental health. Just because skateboarding is such an escape for me.” (15-year-old male).

It is also notable that even beyond the loss of the respite and escape from daily life that skateboarding usually provided to participants, some also experienced their injury as traumatizing and damaging to their mental health.

“I had to go see a therapist because I sort of fell into a bit of a depression.” (17-year-old male)

“Yeah, so it was, even still now, it’s a lot of PTSD from the accident… Honestly, it was terrifying. But yeah, the PTSD has been tough. I’d say probably the hardest part.” (17-year-old male).

It was evident from the comments, therefore, that some of the negative health aspects of the injury experience went beyond a loss of benefits and actually had a significant effect on some participants’ overall well-being.
**Negative Injury-Specific Outcomes**

In addition to loss of benefits, participants also described challenges associated with the injury itself, including physical limitations caused by the injury, experiencing the pain of their injuries, fears about medical intervention and long-term impact, and concerns about re-injury.

Physical limitations included the inconvenience caused by the injury. For example, one participant noted: “When I hurt my hip, I couldn’t really walk … and that got in my way, I don’t think I went to school that week.” (15-year-old male).

Pain and injury severity were also considerations that were distressing and scary to them.

“It doesn’t sound very scary, but it hurt.” (15-year-old male).

“I thought I was gonna die, like at that moment.” (16-year-old male).

Additionally, participants shared future-oriented concerns surrounding the potential need for further medical intervention or long-term disability.

“I'm definitely scared because I know there's a good chance that because I've played so many sports as a kid that I'll have to get surgeries, and quite a few, which is very sad.” (16-year-old male).

“She [doctor] also said that there might be a possibility it'll never fully heal…that was a scariest part of that six months.” (15-year-old male).

Many participants also shared that getting hurt increased their concerns about re-injuring themselves.

“I have this little fear in the back of my head. So, whenever I ride up the stairs, it's like, ‘oh, god, what if this is a time where you like hurt yourself [again], and you have to go back to being stuck at home forever?’” (15-year-old female).

Similarly to themes identified in the ‘fear of injury’ category, concerns about re-injury most often were related to the fear of missing out on skateboarding, rather than about pain or discomfort.
What motivates skaters to return after becoming injured?

Although all the participants interviewed had experienced a serious, medically attended injury, all participants had returned to the sport, which begged the question: what brings them back, even after getting hurt? This topic was explored with participants, and a distinction was made between returning to the sport versus returning to the specific trick or activity where they became injured (see Figure 2).

Return to the Sport

For all participants, the overarching response for why returning to skateboarding post-injury was that the benefits of the sport significantly outweighed the injury costs. All participants shared their belief that injury risk is a part of skateboarding and would not deter them from continuing to skate because of the benefits from skateboarding.

“Even after all those falls and injuries happen, it’s a part of skating, so I think when I started, I just accepted that I’m going to fall. And so when I did fall it’s hard to explain but it’s just a part of doing it.” (17-year-old female).

Within this overarching theme, there were six subthemes. Five of these were consistent with benefits of the sport previously identified and one subtheme was novel (see Figure 2).

With respect to the novel subtheme, some participants explained that after they got hurt, they changed their behavior, which increased their comfort in returning to the sport. A few changed their approach to skating to be more safety-oriented (e.g., wearing a helmet sometimes), and a few discussed returning to the sport at their own pace and only trying new tricks as their fear of injury decreased.

“After that, I’ve been wearing my helmet pretty consistently….. I almost always do, just because of that experience….. that was scary.” (15-year-old female).
Return to Specific Trick/Activity

While all participants had returned to skateboarding in general post-injury, there were mixed responses when participants discussed their return to the specific trick or activity they were doing when they became injured, with some indicating that they had not yet done so.

The main reason in favour of returning to the specific trick that led to injury was that the previously identified benefits outweighed the costs of injury. Two additional subthemes were identified. First, some participants shared their belief that they were optimistic they would not get hurt in the same way again.

“I don’t think that it will happen again. I look back at it in slow mo. Like I looked over it thousands of times. The way my board itself … it’s impossible for that to be twisted exactly, hit the stair and be turned, and I land on it…. the odds of that ever happening again are like so low.” (15-year-old male).

Second, some participants shared they had a complete absence of fear of re-injury.

“I feel like some people would let it get to their head and they would be scared going in to do it again, but since I’ve been skateboarding for a while now, I don’t really have that mindset anymore.” (15-year-old male).

Other participants shared that while they did experience fear or anxiety when returning to the trick, their fears became smaller as their injury improved, and as they exposed themselves to the feared activity.

“Well, it's all about confidence, right? If I am able to do it, then the fear will go away. Because right now there's kind of a fear of it - is it gonna happen again? But if I keep doing it and I get it consistently, then the fear will go away. I'll be confident and then I can try more and more stuff.” (15-year-old male).

Why do skateboarders not return to the specific trick that led to injury?

While the majority of participants had returned to the trick/activity where they became injured, a few had not, primarily because of the fear evoked by past images of the injury experience. Some reported this as akin to the experience of traumatic flashbacks: “The thought of going back and doing that exact trick down that exact stair set is haunting.” (15-year-old
male). There were also psychological fears related to imagining what other injuries might happen:

“It’s like the outcome is I can go this way and then I could sprain my ankle, I’ll go this way and I’ll fall forward and hit my face, or I’ll go this way and my foot might get caught off the board and I’ll break my ankle. So, it’s a lot of dark thinking — it’s kind of hit or miss. Like the only way to know is actually to try it, but that’s the scariest part.” (17-year-old female).

Thus, while all returned to the sport, they did not all return to repeat the trick that led to injury.

Discussion

Past research has revealed that many unintentional injuries to youth occur while participating in sports activities (Wang et al., 2023). Although an activity like skateboarding poses some inherent risk of injury, there continues to be increasing participation in the sport, particularly among youth (Rodríguez-Rivadulla et al., 2020). The findings from this study broaden our understanding of adolescents’ perspectives on the sport of skateboarding, including the benefits they experience, their awareness of the potential injury risks, and the interplay of these in making decisions about returning to the sport after a medically-attended injury from skateboarding.

Benefits named by respondents covered a range of topic areas. Some benefits were similar to those noted in previous research on youth sport participation (e.g., identifying with a cultural group, pleasure, and personal growth; Haines et al., 2010). But many benefits were uniquely identified in this study. In particular, nearly all participants reported that skateboarding is an important part of their social life, providing shared experiences with friends, and creating opportunities to establish new relationships. The sense of community also was very important to respondents who talked about the opportunities for mentorship, acceptance, the uniqueness of the sport, and social support. Relatedly, participants universally expressed that skateboarding was a
part of their personal identity and an important part of who they were as individuals. Additionally, benefits to psychological well-being emerged as a major theme discussed by all youth, and a major reason for returning to the sport after injury. These benefits were broad and included things like improving self-confidence, enhancing mood, facing fears, and building a positive mindset. Youth also reported that skateboarding helps them to escape the pressures of their daily lives and acts as a form of stress release, creating opportunities to be mindful and relaxed. Thus, the benefits to participants were quite varied and included not only improved physical health, enhanced social relationships, a feeling of acceptance by the skateboard community, but also positive impacts on many aspects of psychological well-being.

Despite these varied and extensive benefits, when asked about negative aspects of the sport, all participants mentioned injury as the main one. They reported awareness of risk of injury, however, this did not deter them because injury risk was ‘part of the sport’ and they believed that most skateboarders would experience injuries, just as they had. Thus, youth ‘normalized’ injuries and viewed these as commonplace rather than the exception. If everyone experiences injuries, then youth can attribute injuries to bad luck (i.e., these just happen), which undermines their personal capacity to recognize they can take action to help prevent these events. Past research on playground risk behaviors in children has shown that when youth attribute injuries to something other than their own behavior (e.g., bad luck, environment, peer) then they do not try to moderate these risk practices and take steps to enhance their safety (Morrongiello & Rennie, 1998; Morrongiello et al., 2007). The pattern of the present and past findings, therefore, suggests that the attributions individuals make for their injuries is a significant factor to consider in devising ways to motivate increased safety behaviors. Interestingly, the importance of considering attributions for injuries also has been found in research aimed at identifying ways to motivate parents’ safety practices (Morrongiello & Corbett, 2008).
When asked to elaborate on the ‘costs’ to them of being injured, youth discussed experiencing many personal challenges when they were injured and unable to skate. In fact, all participants discussed feelings of ‘missing out’ due to injury, with varying levels of suffering experiences reported. Participants noted significant costs to their interpersonal relationships, sense of self, and mental health and well-being when unable to skate due to injury. Thus, in addition to the physical impacts one might expect to be associated with skateboarding injuries (e.g., pain, limited mobility), youth emphasized the significant psycho-social costs to a far greater degree. These findings address a notable gap in the literature on youth sport, highlighting the scope of the psychological costs and state of suffering that youth experience. Not being able to skate due to injury results in youth losing their community of peers who they count on for companionship, fun, distraction, and support. Youth consistently viewed these psychological costs as substantial and the worst part about being injured.

Despite the many challenges associated with being injured that youth discussed, all of them had returned to the sport, and most had returned to try the specific trick or activity that had led to their injury. This return was motivated by the shared belief that the benefits of the sport substantially outweigh the injury risks and costs associated with being injured while skateboarding. Thus, fear of injury per se is not a deterrent to participating in the sport, even among those who have suffered a medically-attended injury. Injury prevention efforts may be more effective if efforts targeted toward skateboarders take a broader approach, not just emphasizing physical impact of injury but also acknowledging the social, emotional, and psychological benefits of the sport that are lost when injured (e.g., what they will miss out on if injured). For example, messaging that emphasizes the benefits of skateboarding and also the mental health costs of injury (e.g., isolation, stress, low mood), may facilitate more safety-oriented behavior in adolescents. In this sample, for example, a few participants indicated that
they changed their behavior to be more safety oriented after injury (e.g., modifying tricks, sometimes wearing a helmet) so they could continue to skate and access the benefits of the sport while also reducing their risk of serious injury and fear of missing out. Of course, in this study all youth had sustained an injury that required a visit to a doctor, consequently, whether skaters’ shift their behavior in response to less severe injuries remains to be determined in future research. Suffice it to say, the current findings suggest that interventions that emphasize the psycho-social consequences of injury may be an effective approach to evoke safer skateboarding practices in at least some youth. Identifying ways to shift attributions for injuries and the belief that serious injuries are part of the sport is probably also essential for increasing safer skateboarding practices. Presenting information on the potential long-term effects of repeated injury (e.g., limited mobility) while offering alternative ways to skate more safely (e.g., wearing safety gear like helmets, avoiding high-risk tricks that usually lead to falls before skaters have developed the necessary skills to manage them) and positive framing of smart decision making (e.g., ‘Skating smart will keep you skating rather than on the sidelines’) may achieve these outcomes. Similar strategies have proven effective in interventions aimed at improving the safety and supervision practices of parents of young children (see Morrongiello, 2018, for review).

Another consideration in injury prevention targeting skateboarding injuries has to do with the timing of delivery of these messages. Targeting youth when they seek treatment for an injury may enhance effectiveness because these can create ‘teachable moments’, that is, enhanced readiness to act on behavior change messaging (see Johnson, Rivara, Droesch, Dunn and Copass’ 2002 study on a brief emergency department intervention for evidence supporting behavior change in helmet/seatbelt use). Youths’ elevations in pain and/or fear at these treatment moments may increase perceptions of susceptibility and vulnerability to injury and make them more interested in hearing about ways to prevent injury in the future. Some youth in this sample, for
example, discussed how medical feedback about the current injury (e.g., possible long-term negative effects) led to them subsequently avoiding risky tricks, though they returned to the sport. Others discussed how the injury led them to ponder other severe injuries that could occur, which led to avoiding tricks that might be beyond their abilities. Targeting messaging that incorporates these points and is strategically timed in delivery may be effective to counteract youths’ optimism bias about re-injury and promote shifts to safer skateboarding practices.

Importantly, the current findings suggest that skateboarders may be a group who is at risk for negative psycho-social outcomes after they become injured. Because it is a sport that has many perceived psychological benefits and a strong group identity, the loss of those benefits due to injury can result in feelings of sadness, isolation, and even post-traumatic stress symptoms. Providing psycho-social support for skaters who are recovering from injury may be a useful strategy to prevent negative mental health outcomes and youth rushing back to the sport before they are fully recovered. One strategy to enhance psycho-social support, for example, might involve encouraging injured skaters to continue to interact with their friends as they recover in non-physical ways (i.e., filming friends doing tricks, watching skate videos together).

Additionally, skate clubs and indoor skate facilities might implement social engagements that can include injured skaters who are a part of their community, so they can continue to remain involved in the skate community as they heal, thereby limiting the negative psychological effects that arise from missing out. Future research examining the interplay between injury and psychological well-being may help to reveal which skaters are at risk of developing injury-related mental health challenges and who are most in need of supportive interventions. It would be useful to know, for example, how the severity of the injury and/or the length of time spent away from the sport differentially impact mental health difficulties in youth skateboarders.
Limitations and Future Research

Though this research addresses important gaps in the literature, there are some limitations to be addressed in future research. The sample was very homogeneous, with the majority of participants identifying as male. Though this reflects the state of the sport (i.e., the majority of skateboarders are male) and there were no notable differences in how males and females responded, the results may not effectively capture the nuances of what it means to be a female skateboarder in a male-dominated sport. Additionally, while all participants had experienced a medically attended injury, these injuries ranged in severity and length of time since the participant had experienced them. These factors were not studied though they may have affected participants’ reports of their injury experience. In future research it would be useful to examine how aspects of the injury experience (e.g., severity, time since injury, number of previous injuries) influence youth reports. Similarly, the sample included only youth who had been injured while skateboarding. Examining what the perceived benefits and risks are as reported by youth who have never been seriously injured while skateboarding may provide different insights and support different conclusions.
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Table 1: Demographics of the Sample

<table>
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<tr>
<th>Gender Identity</th>
<th>Frequency (%)</th>
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<tr>
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<table>
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<td>16 years</td>
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<td>Middle Eastern</td>
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*Numbers for ethnicity add up to more than 26 because some participants endorsed more than one ethnic background
Figure 1: Benefits of Skateboarding

Interpersonal

- Skate friendships
  - Skill development
  - Social support
  - Sense of community
  - Mentorship

Health

- Physical health
- Mental Health

Pleasure

- Fun
- Joy/Excitement

Uniqueness of Sport

- Skate culture
- Creativity
- Freedom
- Learning new skills
- Sense of accomplishment
- Risk/challenge
- Life lessons learned

Personal Growth/Learning

- Part of sense of self

Identity Development
Figure 2: Motivations for Return to Skateboarding (General, Specific Trick) After Injury

- Interpersonal
  - Identity Development
  - Health
  - Pleasure
  - Personal Growth/Learning
  - Changed Behavior Leading to Increased Comfort
  - Perceives Re-Injury to be Unlikely
  - Absence of/Decrease in Fear

Consistent with previously identified benefits

Novel subtheme for return to skating (general)

Novel subthemes for return to
Chapter 3: Returning to Sport after Injury: The Influence of Injury Appraisals and Post-Traumatic Stress Symptoms on Adolescent Risk Taking Intentions Post-Injury

[Note – A version of this is under journal review]

Abstract

Objective. Previous research has shown that how youth think about injury risk can affect their decision about whether to engage in behaviors that can lead to injury (Dale et al., 2013; Lasenby-Lessard et al., 2013). Appraisals also substantially influence the development of Post-Traumatic Stress Symptoms (PTSS), which occur in approximately 20% of children after a medically treated unintentional injury (Le Brocque et al., 2010). The current study examined how the injury appraisals of youth (perceived vulnerability, attribution to bad luck, pain experienced) affected the development of PTSS post-injury, and if PTSS or perceived benefits of the sport predicted youth’s intentions to return to a recreational sport, namely, skateboarding in the future. Method. 103 youth ages 14 to 17 who had sustained a medically-treated skateboarding injury within the last year provided survey data assessing injury appraisals, PTSS, the benefits of skateboarding, and intentions to return to the sport. Results. A two-stage moderated mediation path model was specified. In the first stage, there was a positive relationship between pain at injury and PTSS but this was negatively moderated by bad luck; that is, pain was less likely to lead to PTSS as youth made more attributions to bad luck for their injury. PTSS fully mediated the relationship between perceived pain at the time of injury and intentions to return to skateboarding. In the second stage of the mediation model, there was a negative relationship between PTSS and intentions to return to skateboarding but this was positively moderated by perceived benefits of skateboarding; that is, PTSS was less likely to lead to reduced intentions to return to the sport as perceptions of
benefits of the sport increased. **Conclusions.** Skateboarders are a group at risk for injury that can lead to PTSS, and they are also likely to return to the sport after injury despite PTSS. This research specifies a model that explains some of the factors that impact the decision to return to sport after injury. Implications for mental health support and injury prevention are discussed.

**Keywords:** unintentional injury, PTSS, risk taking, cognitive appraisals
Introduction

Unintentional Injury and Sports-Related Injuries

Unintentional injury is the leading cause of death in youth under the age of 19 years in most developed nations (Centre for Disease Control and Prevention, 2021), and rates of unintentional injury have increased in recent years (Olaisen et al., 2019). Adolescent participation in sports engenders many benefits, including physical health benefits (Varkevisser et al., 2019), psycho-social benefits like improved self-concept, and prevention of depression and anxiety (McDowell et al., 2019). Sport participation, however, also is a significant contributor to unintentional injury (Wang, Toigo, et al., 2023). In fact, sports-related injuries are the leading cause of visits to the Emergency Department for children under the age of 19 years in the United States (Weiss & Elixhauser, 2016). Thus, pediatric sports injuries are an important public health concern. One particular sport that is gaining in popularity and poses significant risk of injury is skateboarding.

Skateboarding was introduced as a new sport in the 2020 Olympic Games (Rodríguez-Rivadulla et al., 2020). As the popularity of skateboarding has increased, so have the concerns about injuries (Ou et al., 2021; Partiali et al., 2020; Shuman & Meyers, 2015). Of all age groups, adolescent skateboarders (14-17 years) suffer more severe injuries than other age groups (Shuman & Meyers, 2015). They also are unlikely to use protective gear such as helmets, which increases their risk of serious head injuries (Mitchao et al., 2022; Partiali et al., 2020). Youth engagement in skateboarding is a complex issue to understand because the sport poses elevated risk of injury, but it also offers a variety of benefits that youth value, including feeling proud of testing their physical limits and experiencing excitement from doing so (Haines et al., 2010; Kern et al., 2014; Seasons & Morrongiello, 2023). The benefits of engaging in risky activities are particularly salient for teens who seek activities with a strong group identity coupled with the
opportunity to enrich peer social relations, as is the case with skateboarding (Haines et al., 2010). In fact, skateboarding is unique in that it is both an individual sport and a social activity, because individuals who skateboard tend to support one another and look for acceptance from each other (Seasons & Morrongiello, 2023). Importantly, the peer context of skateboarding has been shown to offer a broad range of benefits that motivate youth to engage in the sport, while at the same time acknowledging injury outcomes are likely (Seasons & Morrongiello, 2023). Extending these past studies, the current study focused on youth who had experienced a medically-treated injury and examined their perception of benefits of skateboarding, as well as the subsequent effect the injury had on their psychological wellbeing (post-traumatic symptoms), and their appraisals about their specific injury experience (pain, attributions for the injury, beliefs about their vulnerability to injury). Relevant research on each of these topics is examined below.

**Benefits of Skateboarding**

Although risk behaviors (e.g., tricks) while skateboarding may lead to injuries, experimenting with risk taking behavior has been theorized to be a way of developing social and psychological capabilities, a sense of independence and autonomy, and promoting the development of self-regulation (Baumrind, 1987). As such, risky behaviors can present the opportunity for unique benefits to an adolescent’s development (Taubman-Ben Ari, 2004). Youths’ self-reports indicate that this is the case for skateboarding also, with psycho-social peer-based benefits of particular value to them (Seasons & Morrongiello, 2023).

Adolescents often engage in risk taking despite their awareness of the risks involved. In fact, research demonstrates that perceived benefits are often stronger predictors of risk taking than are perceptions of negative consequences (Peters et al., 2008; Taubman-Ben Ari, 2004). This tendency to engage in a risky behavior due to the benefits expected has been shown in multiple domains, including social, health and safety, and recreational behaviors (Zhang et al.,
Consistent with this, in interviewing youth skateboarders who had been injured doing so and returned to the sport, they universally reported that the benefits they experienced outweighed the potential consequences of re-injury (Seasons & Morrongiello, 2023).

**Post-Traumatic Effects from Injury**

The rationale for much injury prevention research has historically been rooted in the physical costs that injuries have on children and adolescents (e.g., Haddon’s Matrix; Runyan, 2003). The psychological costs of unintentional injuries have received much less attention in the injury prevention literature, even though the incidence of psychological problems (i.e., posttraumatic stress disorder), has been estimated to occur in approximately 20% of children after an unintentional injury, with an additional 25% of children meeting partial criteria for diagnosis post-injury (Kassam-Adams et al., 2013). More severe injury outcomes in children and adolescents (e.g., hospitalization) are more likely to cause trauma symptoms, such as re-experiencing the traumatic event, avoidance of stimuli associated with the event, and hyperarousal (Marsac et al., 2014). The mechanism of injury does not seem to matter for post-traumatic stress reactions, with the literature mostly showing no differences between children injured in traffic accidents, assaults, sports injuries, burns, and falls (Meiser-Stedman et al., 2007).

Post-traumatic stress symptoms (PTSS) merit consideration in the context of sports-related injuries when considering how symptoms affect a return to the sport because athletes often construct their identity and sense of self around their sport (Brewer et al., 2007). Hence, an injury that prevents participation can evoke considerable psychological stress, in addition to the pain and treatment challenges that may occur. For example, a study of youth athletes who had torn their anterior cruciate ligament (ACL) found that they experienced significant psychological trauma and symptoms (e.g., avoidance, intrusive thoughts, and hyperarousal) as a result of their
sports-related injury (Padaki et al., 2018). There is evidence also that youth who score high in identity as an athlete may be particularly susceptible to PTSS post-injury (Padaki et al., 2017).

For skateboarders, who typically have a strong identity with the sport (Seasons & Morrongiello, 2023), PTSS is important to consider, particularly with regard to if it impacts youths’ decisions about returning to the sport after injury.

**Injury Appraisals: Pain, Vulnerability, Bad Luck**

The way youth think about their injury and the events that follow is particularly important during the time immediately after the event when they are routinely interacting with medical professionals and are often restricted from their usual activities in some way (Price et al., 2015). During this time, there is the potential for children to experience negative mental health symptoms that are related to their physical recovery (i.e., medical procedures) in addition to the potentially traumatic injury event itself (Price et al., 2015). In particular, the appraisals made about the injury event (e.g., perceptions of pain, vulnerability to future harm, attributions to bad luck) have been shown to shape the development of PTSS, as well as influence behavioral intentions about risk behaviors in the future.

**Pain**

Children who report experiencing severe pain after an injury experience significantly more PTSS (Hildenbrand et al., 2016; Meijel et al., 2019). Additionally, fear of continued pain post-injury has been associated with a slower recovery from sports related concussions (Arnold et al., 2022). Thus, pain plays a role in the development of PTSS, as well as in physical recovery time and comfort level in returning to the sport (Crombez et al., 2012). The appraisal of pain may be particularly relevant for understanding why skateboarders return to the activity even though they view injury as an inevitable part of the sport (Seasons & Morrongiello, 2023).
Vulnerability & Bad Luck

Past research has shown the youths’ appraisal of injury vulnerability and their attribution for injury both influence their risk taking decisions. Children who rate their vulnerability for injury as high are more likely to avoid a risk behavior, whereas attributing injuries to bad luck (i.e., not preventable) predicts children’s engagement in risk taking behaviors even if these elevate risk of injury (e.g., Dale et al., 2013; Morrongiello & Rennie, 1998). Additionally, anticipating that there is high vulnerability to future harm is an appraisal that has been associated with PTSS development in youth (Bryant et al., 2007; Hitchcock et al., 2015). In the current study, therefore, we measured skateboarders’ appraisals of injury vulnerability and the extent to which they attributed their injuries to bad luck in order to determine if these related to their intentions to return to skateboarding.

Current Study

The present study sought to integrate the literature on risk behaviors and PTSS in the context of unintentional injury, and explored how youth’s appraisals of the injury experience affected not only their intention to re-engage in skateboarding, but also the role that PTSS played in their return to sport. Focusing on skateboarders 14 to 17 years of age, two research questions were addressed: (1) Do post-traumatic stress symptoms (PTSS) in the peri-traumatic period mediate the relationship between the youth’s subjective experience of an injury event (i.e., perceptions of pain, appraisals of vulnerability, and attributions of the injury being due to bad luck) and the individual’s intention to re-engage in risk taking behaviors that led to their injury; and (2) Do youths’ perceptions of the benefits of skateboarding act as a moderating variable to protect against PTSS and/or lead to repeat risk taking and return to the sport in spite of PTSS (see Figure 1 for the model that was tested).
Methods

Participants

A total of 103 Canadian adolescent skateboarders (78.6% male, 19.4% female, 1.9% non-binary; 58.3% White, 12.6% Black, 12.6% Asian, 8.7% Indigenous Canadian, 1.9% Latinx/Hispanic) aged between 14 and 17 years (\(M = 15.8\) years, \(SD = 1.0\) years) participated. Inclusion criteria included: English speaking, living in Canada (i.e., free access to injury treatment), having been an active skateboarder at the time of experiencing a medically-treated injury (e.g., requiring medical care from a doctor, hospital, walk-in clinic, etc.) while skateboarding, and having been injured within the last year. Youth were required to provide detailed information about the injury (e.g., what happened, the specific type of injury, where they were treated, type of treatment required) to affirm their eligibility to participate. The primary injury types reported were strains/sprains (44.7%) and fractures/breaks (35.9%), with concussions (6.8%), cuts/bruises (2.9%), and “other” injuries (9.7%, including “multiple injuries”) reported less frequently.

Measures

All measures were taken via an online survey.

Demographics

Participants provided information about age, gender identity, and ethnicity.

Child and Adolescent Trauma Screener

To screen for PTSD symptom severity, an adaptation of the Child and Adolescent Trauma Screen (CATS) was used. The CATS is a brief, self-report measure of PTSS severity that maps onto the DSM-V (Sachser et al., 2017), and has been used in pediatric populations to assess PTSS after unintentional injury (Marsac et al., 2019). Given the retrospective nature of
this study, the measure was adapted to fit a symptom checklist format, rather than its typical 
Likert scale response options. Participants selected each of the symptoms they experienced in the 
two weeks following the most severe skateboarding injury they experienced in the past year that 
required being seen by a medical professional.

**Pain Ratings**

A question adapted from the PROMIS pediatric pain intensity measure (Mara et al., 2021) assessed participants’ subjective experience of pain intensity at the time of injury. 
Specifically, participants rated what the extent of their pain was at the time of injury, with scores ranging from 0 (no pain) to 10 (worst pain you can imagine).

**Injury Appraisals**

Vulnerability appraisals. To assess youths’ appraisals of their vulnerability to injury 
associated with skateboarding at the time they became injured, they were asked the following: 
“Sometimes when we are about to do something challenging we think about the possibility of 
getting hurt. Thinking back to the time you got hurt, at that time how likely did you think it 
was that you would get hurt?” Answers ranged from 1 to 5, with higher scores indicating greater 
perceived vulnerability to injury.

Attributions to bad luck. This question assessed the adolescent’s belief about how much 
of the cause for injury was due to bad luck (0-100%).

**Benefits of Skateboarding**

A questionnaire examined participants’ perceptions of the benefits of skateboarding (cf. 
Seasons & Morrongiello, 2023, see Appendix 1). Items (N = 36) covered a broad range of topics 
that youth identified as important to them in past qualitative interviews, including 
connection/community, mental/physical health benefits, and challenge/risk (e.g., “The 
skateboarding community is very welcoming”, “Skateboarding helps me get away from thinking
about tough things in my life”, “There are risks from skateboarding and that’s one of the things I like about it”). The responses to each item were measured on a six-point Likert scale ranging from “Disagree Strongly” (score of 0) to “Agree Strongly” (score of 6). The total score was analyzed, with higher scores indicating greater perceived benefits of skateboarding. Internal consistency was high for this measure (Cronbach’s alpha = .98).

**Intentions to Return to Sport**

First, participants were asked whether they had returned to the sport and, if not, they rated how likely they were to return to the sport in the future (0-100), with increasing number values representing increasing likelihood to return (e.g., 100 = had returned to the sport).

**Procedure**

Ethics approval was obtained from the Research Ethics Board at the university. Participants were recruited nationally across Canada via flyers posted in local skate parks and community message boards, as well as through online forums and groups dedicated to skateboarding (on Facebook, Instagram, and Reddit). Participants contacted the research team via email and were screened for eligibility before being sent a personalized link to the online survey. Participants were required to read through the consent form and consent to participation prior to proceeding to the survey. After completing the survey, youth received a $25 virtual Amazon gift card.

**Analytic Approach**

To test the hypotheses in the theoretical model, a two-stage moderated mediation path model was specified whereby the relationship between subjective appraisals (pain at injury, injury appraisal of vulnerability, and attributions for injury to bad luck) and intention to return to skateboarding is mediated by PTSS. Given that our sample size was relatively small (N = 103), and our model included the estimation of an indirect effect, a first stage moderation (attribution
to bad luck) and second stage moderation (perceptions of the benefits of skateboarding), the model and all hypotheses were estimated in Mplus 8 using Bayesian estimation rather than the usual maximum likelihood estimation (MLE). The proposed model is depicted in Figure 1.

As per Schultzberg and Muthen (2018), there are a number of benefits of using Bayesian estimation for parameter estimates over the traditional MLE method, including: (a) allows for random parameter estimates; (b) outperforms MLE when dealing with small samples; (c) is more computationally efficient; and (d) allows for the incorporation of prior parameter information.

With respects to the current research, the main motivation for utilizing Bayesian estimation is that it performs better than MLE for small samples as it is not based on large number theory. In addition, given that no priors were used in the estimation of this model (i.e., uninformative priors) the parameter estimates are the same as those obtained using MLE.

**Results**

Model results are depicted in Figure 2. As shown, a two-stage moderated mediation path model was specified. Note that the data are available on request. Summary scores for each measure are given in Table 1.

**Model Results of Mediation Model**

With regards to the simple mediation model (standardized values), pain at injury was found to be positively related to PTSS ($b = 0.391, p < .05$), PTSS was found to be negatively related to intentions to return to skateboarding ($b = -0.736, p < .05$), and the direct effect of pain at injury on intention to return to skateboarding was not significant. No significant direct effects were found for injury appraisals of perceived vulnerability and attributions of injury to bad luck. Given this implies that PTSS mediates the effect of pain at injury on intention to return to skateboarding, the indirect effects were estimated to confirm this mediation. Examining the indirect effects within the path model, full mediation was confirmed as the total effect of pain at
injury on intentions to return to skateboarding (-0.284, p < .05, 95% C.I.[-.551, -.084]) can be broken into a significant indirect effect (-0.289, p < 0.05, 95% C.I.[-0.509,-0.087]) and a non-significant direct effect (0.011, p > 0.05, 95% C.I.[-0.071, 0.071]. Furthermore, the credibility interval (C.I.) of the indirect effect did not include a zero value. In summary, results demonstrated that the higher the pain ratings by participants at the time of injury, the greater the PTSS, and the greater the PTSS, the more intentions to return to skateboarding decreased.

**Model Results of Two Stage Moderated Mediation Model:**

Having established that the effect of pain at injury on intentions to return to skateboarding is fully mediated by PTSS, the moderator variables of attributions to bad luck and benefits of skateboarding were introduced into the model as follows: as attributions to bad luck was posited to moderate the first stage of the mediation (pain to PTSS), the cross-product of pain x bad luck was added as a predictor of PTSS. Simultaneously, with benefits proposed to moderate the second stage of the mediation (PTSS to risk taking intentions), the cross product of PTSS x benefits was added as a predictor of risk taking intentions. The results show that for the moderation of the first stage of the mediation, attributions to bad luck negatively moderate the relationship between pain at injury and PTSS (-0.240, p < .05, 95% C.I.[-0.557, -0.004]), such that as participants’ beliefs about the injury being due to bad luck increased, the relationship between pain and PTSS becomes weaker. The appraisal of vulnerability was not a significant moderator. A Johnson-Neyman plot of the moderation shows that the relationship between pain at injury and PTSS remains negative throughout the values of the moderator (see Figure 3).

Furthermore, the results indicate that in the second stage of the mediation, perceived benefits of skateboarding positively moderates the relationship between PTSS and intentions to return to skateboarding (0.643, p < .05, 95% C.I.[0.433, 0.422]. Thus, the more benefits to the sport that participants endorsed, the weaker the negative relationship between PTSS and
intentions to return became (i.e., greater benefits corresponded to greater intentions to return to the sport despite PTSS). However, as shown in Figure 4, this moderation does not occur when the level of the moderator drops below -1 standard deviation. At this point the effect of PTSS on intentions to return to skateboarding is no longer significant.

Combined, these results suggest that PTSS fully mediates the relationship between pain at injury and intentions to return to skateboarding while the indirect effect of pain at injury on intentions to return to skateboarding \( (b = -0.289, p < 0.05, 95\% \text{ CI}[0.509, -0.087]) \) is itself negatively moderated by attributions to bad luck (via pain at injury \( \rightarrow \) PTSS) in the first stage of the mediation and positively moderated by benefits of skateboarding (via PTSS \( \rightarrow \) intentions to return to skateboarding) in the second stage of the mediation.

**Discussion**

Previous research has shown that injury appraisals and the way youth think about risk situations affects their decisions to engage in or avoid behaviors that can lead to injury (Dale et al., 2013; Morrongiello & Rennie, 1998). Injury appraisals also can impact the development of PTSS, which occurs in approximately 20% of children after an unintentional injury (Kassam-Adams et al., 2013). For youth who become injured when engaged in sporting activities, appraisals and PTSS are particularly relevant to consider because these activities often are a salient contributor to youths’ identities and things they value in their daily lives. As such, competing needs of safety versus affiliation may arise as youth decide whether or not to return to the sport. Skateboarding is unique in that it is both an individual sport and a social activity, with strong group norms and the offer of a close-knit community of peers part of the appeal to youth (Seasons & Morrongiello, 2023). Thus, skateboarders who experience injuries are often negatively affected by loss of the peer community and psychosocial benefits that they value about the sport. Perceived benefits, therefore, play an important role in youths’ decisions about
whether or not to return to skateboarding after injury (see Seasons & Morrongiello, 2023, for further discussion). In addition to perceived benefits, PTSS and attributions of injury to bad luck also contributed significantly to influence intentions to return to sport after injury, with some factors playing a moderating role and others a mediational one. The current findings broaden our understanding of factors that motivate youth to return to or avoid the sport after injury.

PTSS fully mediated the relationship between pain at injury and intentions to return to the sport. As one might expect, as pain intensity increased so too did PTSS, and as youth experienced greater PTSS they were less likely to return to skateboarding. This finding is not surprising considering that injury leading to hospitalization is one of the leading causes of PTSD in youth (Marsac et al., 2011) and avoidance of stimuli associated with the traumatic event is a key symptom of PTSD (DSM–5; American Psychiatric Association, 2013). With respect to pain, our results are consistent with past research demonstrating that injury-related pain is a significant predictor of PTSS, with children who report experiencing severe pain after an injury experiencing significantly more PTSS (Hildenbrand et al., 2016; Meijel et al., 2019). In fact, in Meijel and colleagues’ study, in the group who reported the most severe subjective pain, their pain ratings accounted for 10% of the variance in the severity of their PTSS (Meijel et al., 2019). Moreover, pain ratings taken proximally to the injury event were associated with PTSS three months later. Thus, the experience of pain from injury can have a significant long-term effect on youths’ mental health and experience of PTSS, and through this relationship, also influence youth to avoid returning to their sport.

Although our results demonstrate that greater pain ratings lead to greater PTSS, attributions of injury to bad luck negatively moderated this relationship. As participants’ attributions for injury to bad luck increased, the relationship between pain and PTSS weakened. Possibly, youths’ contextualizing the pain as due to bad luck (i.e., a chance event, not
preventable, could happen to anyone) promotes acceptance and eliminates concerns that they were somehow particularly vulnerable to injury/future harm, which are appraisals that influence PTSS development in youth (Salmon et al., 2007). This interpretation is also consistent with past research on youth skateboarders that found youth expect injuries to occur when skateboarding and this normalization of injury as ‘just part of the sport’ results in them not viewing themselves as any more vulnerable to these events than other skateboarders (Seasons & Morrongiello, 2023). This may also explain why vulnerability ratings did not significantly contribute to the model; it is possible that for our participants, interpreting their injuries as unpreventable and part of the sport was an adaptive way of assigning meaning to the injury event. This interpretation may have reduced feelings of threat associated with the appraisal of vulnerability to future harm, which is predictive of PTSS (Ehlers et al., 2003).

While trauma-related appraisals are one of the strongest predictors of PTSD development in youth (Mitchell et al., 2017), our results did not find a significant relationship between trauma appraisals and PTSS. This result merits further exploration, and implies that perhaps adolescent skateboarders’ acceptance and normalization of injury is psychologically protective. Additionally, these results illustrate an interesting dilemma that youth may experience. Psychologically, viewing injuries as due to bad luck may prevent the development of PTSS, which is positive for their mental health. However, believing that injuries from skateboarding are expected and not preventable may also lead to youth repeating risky skateboarding tricks or activities, contributing to elevate their risk of another injury occurrence. In fact, skateboarders are a group particularly at risk of overtraining syndrome (Shuman & Meyers, 2015), repeated head trauma (Partiali et al., 2020), and repeated strains/sprains (Ou et al., 2021).

In addition to attributions to bad luck, a second moderator affected the relationship between PTSS and intentions to return to skateboarding. Specifically, perceived benefits of
skateboarding positively moderate the relationship between PTSS and intentions to return to skateboarding: the greater the perceived benefits, the greater the intentions to return to the sport 

despite PTSS. This result is consistent with previous findings from qualitative research that demonstrated skateboarders unanimously judge the benefits of skateboarding to outweigh the consequences of injury; despite the many challenges associated with injuries that were reported by youth (e.g., missing out on social connections, impacts on mental and physical health, loss of identity), all participants had returned to skateboarding because of the benefits it offers them (Seasons & Morrongiello, 2023). The current study expands on this finding and illustrates the value that youth place on skateboarding: benefits such as building social relationships and community, developing a sense of personal identity, and psychological and physical wellbeing associated with the sport act as incentives for youth to re-engage with skateboarding, even in the context of PTSS.

Implications of Findings

The implications of these findings are multifaceted and include both a focus on preventing future injuries while skateboarding and supporting youth experiencing PTSS.

First, while perceived benefits may act positively to help youth to re-engage with skateboarding, it is also possible that because youth are re-engageing despite PTSS, they may return too quickly, in a way that increases their risk of injury or before they have processed the PTSS they are experiencing. For example, youth may return immediately to the trick or activity in which they became injured, rather than gradually working up to more challenging tricks. Contrary to what might seem logical, past research indicates that children who have experienced serious (i.e., medically treated) injuries in the past are actually more likely to experience injuries in the future, rather than less likely (Karaszia & van Dulmen, 2011; Morrongiello & Lasenby-Lessard, 2007). This trend has also been found for risk taking: recurring injuries predict greater
future risk taking by youth, not less risk taking (Mangus et al., 2004). These findings may occur because as youth gain experience with an injury-risk activity (e.g., skateboarding) they are less afraid of getting hurt and more likely to shift their appraisals of potential severity of injury to be lower, which supports continued engagement in the risk activity (Dale et al., 2013; Morrongiello & Lasenby-Lessard, 2007; Lasenby-Lessard & Morrongiello, 2011).

Thus, because skateboarders are likely to return to the sport and be at risk for experiencing multiple injuries throughout their sport career, it would seem particularly important to intervene and provide psychoeducation about both injury prevention and the potential negative mental health effects of injury (described below). Both the timing and nature of this intervention are important to consider carefully. Delivering the intervention at the time of injury treatment may create a ‘teachable moment’ (i.e., situations that offer the potential to encourage positive behavioral change to unhelpful or harmful behaviors) that serves to enhance the impact and effectiveness of messaging delivered to youth (see Cohen et al., 2010 for discussion of teachable moments). With regards to content of the intervention, one could emphasize the use of safety equipment including helmets, which are currently rarely used by adolescent skateboarders (Mitchao et al., 2022; Partiali et al., 2020); limiting to tricks that are within their capabilities; and potentially finding other ways to connect with their skateboarding peers as they recover from injury (e.g., filming others) so they do not return to the sport before they are fully physically recovered. Previous research provides preliminary support for the idea that at least some youth skateboarders are open to modifying their behavior post-injury, with some youth identifying that their injury encouraged them to use safety gear or avoid an immediate return to the trick in which they became injured (Seasons & Morrongiello, 2023). Building on this openness to behavior change post-injury in a healthcare setting would likely be beneficial in preventing future injury, and in encouraging youth to return to skateboarding in a safer way.
Second, returning to the sport can potentially have a positive impact to reduce PTSS. From a psychological perspective, a gradual re-exposure to the situation in which the traumatic event occurred, in combination with developing safety and coping skills to manage trauma-related fear and anxiety are part of many psychotherapeutic interventions for PTSD (Dorsey et al., 2016). Because of this, a return to skateboarding could be a psychologically healthy way of processing PTSS, provided that youth are not engaging in activities that have a high potential for re-injury (e.g., risky tricks) and that they do not start back until their initial stress response has dissipated. For many individuals who experience a traumatic medical event, a period of elevated stress after the event is normative rather than pathological (Kazak et al., 2006) and similar findings have been found in studies examining the trajectory of PTSS/PTSD following pediatric injuries (DeYoung et al., 2012; Price et al., 2015). Thus, for youth who have high athletic identities (i.e., potentially more vulnerable to PTSS, Padaki et al., 2018) and who perceive strong benefits associated with a sport, returning to the sport may serve to promote recovery from PTSS, providing they re-engage in the sport in a gradual and safe way that that does not elevate risk for future injury. Return to sport is not only beneficial for promoting PTSS recovery, but is also important to skateboarding youth generally speaking, because it offers multifaceted psychosocial benefits, including fostering positive identity, creating a sense of community belongingness, and enhancing their mental health (Seasons & Morrongiello, 2023). In sum, skateboarders may benefit both from being provided with psychoeducation about the physical risks that risk taking when skateboarding poses, as well as encouraged to safely return to the sport that affects their life in a positive way.
Limitations and Future Research

While this research addresses important gaps in the literature on youth returning to sport after injury, there are some limitations that merit further research. The sample lacked diversity with respect to gender, with the majority of participants being male. Although this is reflective of the state of the sport, the results may lack the nuance of what it means to be a female skateboarder in a male dominated sport. This may be particularly relevant given that women tend to develop more severe PTSD symptoms than men (Jin et al., 2014). Additionally, PTSS was measured in a checklist format, which gives an overall rating of PTSS, but did not allow for further examination of the specific nature of the symptoms that participants were experiencing (e.g., hyperarousal, avoidance, reexperiencing). In future research, an examination of each domain of PTSS may provide further insight into how this population experiences PTSS linked to skateboarding injury, which may inform future treatment recommendations that are tailored to suit the needs of this particular sport population.

Second, this study was retrospective in nature. The original plan was for a longitudinal design, recruiting youth at the time of treatment for injury and tracking their appraisals throughout recovery for several months, but the COVID-19 pandemic necessitated a shift to retrospective measures and an online format. Nonetheless, future research that is prospective and longitudinal would add depth to our understanding of PTSS development, and may allow us to better understand the trajectories of PTSS in youth skateboarders. It would also enable us to examine how different aspects of the injury experience (e.g., severity) affect PTSS development in youth.

Last, there were no measures of personality attributes included in this research. Incorporating these in future studies is important because personality may substantially influence how youth think about injury risk and their likelihood of returning to sport. Individuals scoring
high in sensation seeking, for example, tend to seek out risk experiences for the exhilarating feelings they provide and they may merit unique intervention approaches (Wang, Shi, & Schwebel, 2019; Zhang et al., 2016). Expanding to include personality measures, therefore, may provide important insights into sub-populations that can be used to tailor interventions to reduce injury risk among unique groups of athletes.
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Table 1: Summary Scores for Each Measure

<table>
<thead>
<tr>
<th>Measure</th>
<th>Mean (Standard Deviation)</th>
<th>Range Possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Return to Sport Intentions</td>
<td>95.30 (13.30)</td>
<td>0-100</td>
</tr>
<tr>
<td>Attributions to Bad Luck</td>
<td>28.16 (24.93)</td>
<td>0-100</td>
</tr>
<tr>
<td>Pain Intensity</td>
<td>6.54 (2.05)</td>
<td>0-10</td>
</tr>
<tr>
<td>Child and Adolescent Trauma Screener (Adapted)</td>
<td>2.87 (2.16)</td>
<td>0-12</td>
</tr>
<tr>
<td>Vulnerability Appraisals</td>
<td>2.43 (.93)</td>
<td>1-5</td>
</tr>
<tr>
<td>Benefits of Skateboarding</td>
<td>4.53 (.93)</td>
<td>1-6</td>
</tr>
</tbody>
</table>
Figure 1: Proposed Model

INJURY EVENT
- Medically attended unintentional injury

Subjective Appraisals
- Pain
- Perceived vulnerability
- Injury due bad luck

PTSS

Perceived Benefits

Behavioural Risk Intentions
- Risk-avoidant
- Risk-taking
**Figure 2**: Statistical Analyses Revealed a Moderated Mediation Path Model
Figure 3: Stage 1 is the Relationship between Pain at Injury and PTSS
Figure 4: Stage 2 is PTSS to Intention to Return to Skateboarding

Note. At -1 standard deviation and below of the moderator (perceived benefits of skateboarding), the stage 2 relationship becomes non-significant.
Chapter Four: Placing these Research Findings in a Broader Context

Integrating Study Findings

Research on the costs of unintentional injuries reveals that injuries obtained in a sporting context are a significant public health issue: sports-related injuries are the leading cause of emergency department visits for children and youth in the United States (Weiss & Elixhauser, 2016). Additionally, the mental health consequences of sports-related injuries are concerning: athletes exhibit greater rates of trauma-related disorders than the general population (Aron et al., 2019), with PTSS affecting not only the mental wellbeing of athletes, but also their ability to return to their sport post-injury (Padaki et al., 2018; Xin Yang et al., 2022). Mental health challenges in athletes have been recognized as an important issue in sport by the International Olympic Committee (IOC). The IOC practice guidelines to support mental wellbeing in athletes note that mental health challenges influence increased risk of injury in elite athletes and delay physical recovery (Reardon et al., 2019). While research has been conducted on PTSS in adult and elite athlete populations (Aron et al., 2019; Reardon et al., 2019), less is known about prevalence of trauma related disorders in youth participating in recreational sports. What is known, however, appears consistent with the adult literature. For example, in a study examining trauma symptoms in adolescent athletes who had torn their ACL, it was found that participants experienced significant trauma related avoidance, intrusive thoughts, and hyperarousal related to their sporting injury (Padacki et al., 2018). It also has been shown that youth with a high athletic identity (i.e., strong connection and identification with their sport) may be particularly vulnerable to PTSS development (Padacki et al., 2017). This consideration appears especially relevant to skateboarding, which is a sport that is not only increasing in popularity, but also has a strong community and culture surrounding it (Dumas & Laforest, 2009).
PTSS affects athletes’ physical recovery from injury, and their ability to return to their sport (Reardon et al., 2019). It also increases fear of future injuries, and the incidence of repeat injuries because of avoidance (e.g., of attending physiotherapy), inhibited effort, or increased risky behavior (Reardon et al., 2019). Despite the fact that there are links between the injury experience, mental health challenges, and how these factors affect decision making about returning to a sport, how these issues are interrelated is not yet well understood. This dissertation aimed to understand the factors that affect athletes’ decision making around returning to sport post-injury in the context of youth skateboarding, which is an under-studied and emerging area of sports research.

Study 1 of this dissertation was a qualitative study to advance our understanding of youth skateboarders’ perspectives on the sport. This study examined the benefits youth experience from skateboarding as well as the costs, and how both of these factors influenced their decisions about returning to the sport. The results indicated that participants universally felt that the benefits of the sport (including interpersonal, mental and physical health, pleasure, uniqueness, personal growth, and identity development related benefits) outweighed the costs. Moreover, injury costs went beyond the physical (e.g., pain), and included the loss of the psychosocial benefits, particularly mental health related benefits. These findings reinforce past conclusions that the benefits of engaging in a risky behavior are more likely to predict risky behavioral intentions than are appraisals of high vulnerability to negative consequences (Parsons et al., 1997; Peters et al., 2009). The fact that youth in Study 1 accepted injury as part of the sport indicates that the benefits youth derive from their sport play a strong role in how they decide to re-engage in skateboarding. This acts as a sort of “double edged sword”, where the benefits of skateboarding contribute to psychosocial wellbeing, but also lead to worse social-emotional health when sidelined due to injury. Additionally, it is possible that strong perceived benefits
may lead to more skateboarding re-injuries because the strong identification with the sport may lead youth to return to the sport before they are fully healed from their injuries.

Due to the importance that benefits played in Study 1 participants’ decisions about returning to skateboarding, it was included in Study 2, which aimed to examine benefits in the context of injury experiences (pain) and appraisals (attributions to bad luck), as well as PTSS. Study 2 found that the greater the injury-related pain youth experienced, the greater the PTSS, and in turn, the less likely they were to return to skateboarding. This result is consistent with past research demonstrating that pain is a significant predictor of PTSS after medically attended injury (Meijel et al., 2019). Additionally, results showed that the relationship between pain and PTSS weakened for adolescents who were more likely to attribute their injury as being due to bad luck. This finding is consistent with what emerged in Study 1, namely, that youth viewed injury to be expected and a part of the sport of skateboarding. While this attribution seems to be psychologically protective for youth in that it mitigates the relationship between pain and PTSS, it is also possible that it lessens the likelihood that youth skateboarders might engage in injury prevention behaviors for themselves.

Last, Study 2 found that perceived benefits of skateboarding positively moderated the relationship between PTSS and intentions to return to skateboarding, such that the greater the perceived benefits, the greater the intentions to return to the sport despite PTSS. This confirmed what participants identified in Study 1: that the benefits of the sport were so important to them that they were likely to return despite potential consequences. Thus, Study 2 extends the findings from Study 1 by placing benefits in a broader research context and examining the role the injury experience (pain, attributions to bad luck) had in the development of mental health challenges (specifically PTSS), and in turn, how benefits moderated the impact of PTSS on returning to the sport.
Contributions of Research to the Field

This dissertation research represents an important contribution to the literature on adolescent skateboarding. It expands our understanding of the factors involved in returning to the sport after injury, highlighting the importance of the sport to skateboarding youth and the multifaceted benefits it provides to them.

More broadly, our findings were consistent with a number of aspects of the literature on return to sport in adolescents. In our Study 1, all participants had returned to skateboarding, though not all participants had returned to the trick or activity in which they became injured. This is consistent with research that identifies a high level of return to play after injury for adolescent athletes (e.g., 79% of youth returning to sport after ACL reconstruction; Kay et al., 2018). Interestingly, our rate of return for Study 1 participants was higher than what has typically been reported in the literature on return to sport in adolescence. This could be due to a number of different reasons, including injury type (e.g., some injuries were less severe than the injuries typically examined in the return to play literature); the time since injury (e.g., many participants may have fully recovered from their injury); and the strong perceived benefits for youth who are a part of the skateboarding community. Additionally, while it was beyond the scope of this dissertation research, it is likely that peer influence and social connections are also relevant factors influencing return to play and injury for skateboarders, as has been established in the general return to sport literature (Matsuzaki et al., 2022; Morrongiello et al., under review). Further research on social based motivational factors involved in return to play in skateboarders would help in addressing these possibilities.

With respect to injury costs, the overarching theme related to the risks of skateboarding identified in Study 1 centered around participants’ fear of re-injury, which is consistent with previous research that establishes that fear of re-injury is a primary reason that adolescents do
not return to their sport (Webster & Feller, 2019). Our Study 1 findings extend this research by examining more in-depth what the fear of re-injury meant to youth, whose injury related fears went beyond the physical and emphasized the loss of psychosocial benefits. Our Study 2 results also build on preliminary research that demonstrates that PTSS is a concern for adolescent athletes (Padacki et al., 2018). Our results expanded on concerns around PTSS in adolescent sport by elaborating on the relationship between pain, PTSS, and intentions to return to play. Future research in this area should continue to explore the effect that cognitive appraisals and perceived benefits have on PTSS and return to play, and might consider applying our model to different sports.

**Implications for Practice**

*Encouraging Safe Skateboarding Practices*

One of the primary findings from this dissertation research pertains to the perceived benefits of skateboarding. Consistent with past research on risk taking in youth, it was found that the perceived benefits outweighed the costs of injury, and for many youth, the risk taking aspect of skateboarding itself was considered a benefit of the sport. In this way, promoting injury prevention without considering the perceived benefits of the sport would be an incomplete way of encouraging a safer approach to skateboarding. This makes sense in the context of theoretical models such as the Health Belief Model (HBM; Rosenstock, 1966), which emphasizes that appraisals of perceived consequences of negative outcomes alone are not sufficient to encourage engagement in a health-promoting behavior. The Health Belief Model (HBM; Rosenstock, 1966) was originally developed to explain preventative health behavior, and has since been applied to many health behaviors, including smoking cessation, vaccination, condom use, and exercise (Carpenter, 2010). It has also successfully been used to develop public health interventions by targeting messages related to the appraisals involved in the HBM. There are four primary
variables involved in the HBM: perceived susceptibility, perceived severity, perceived benefits and perceived barriers (Rosenstock, 1966). If an individual perceives themselves to be personally susceptible to a certain negative health outcome, and if they believe the consequences of the negative outcome to be severe for them, they will be more likely to engage in a preventative health behavior (Carpenter, 2010). These appraisals alone are not enough, however. The individual must also perceive the preventative health behavior to have sufficient benefits to prevent the negative health outcome, and there need to be minimal barriers to engaging in the prevention behavior (Carpenter, 2010). In addition to the cognitive aspects of the HBM, the model also includes a cue to action, in which the individual is hypothesized to be motivated to use the prevention behavior by another source (i.e. encouragement from other people, a change in the person’s bodily state) (Rosenstock, 1966). This final piece of the model has been rarely examined in the research literature (Carpenter, 2010).

The HBM has been applied frequently in the injury prevention literature, particularly with respect to helmet use (Ross et al., 2011; Lajunen & Räsänen, 2004). For example, associations have been found between each construct of the HBM and helmet usage both with respect to cycling (Kilinc & Kartal, 2022; Ross et al., 2011) and a variety of other activities (Kamakshi & Maheswari, 2021). The HBM also has been applied in the skateboarding context (Peachey et al., 2016), where results demonstrate social cues to action being positively associated with helmet use. In this way, the HBM valuable practical implications when applied to our population. Our results demonstrate that youth are aware of injury risk, and so interventions focused on the varied benefits of engaging in a health promoting behavior may be more effective than simply emphasizing the risk of injury. For example, highlighting that wearing safety equipment (e.g., helmets), and knowing skateboarders’ own limits (e.g., progressing from jumping one stair to two, rather than one stair to five) allows for youth to continue to reap the
varied benefits of the sport may be an effective way of intervening. Due to the multiple different areas of benefits identified (e.g., psychological, social, identity-based, learning, pleasure, etc), multiple different avenues of intervention could be pursued with respect to emphasizing the importance of safety behaviors. For example, one message could pertain to mental health benefits (e.g., “wearing a helmet ensures you get to keep skateboarding as a source of stress relief”), while another could emphasize social benefits (e.g., “progressing at a pace that is manageable for you keeps you skating with your friends”). These types of injury prevention messages have been shown to be helpful in shifting behaviour to be more safety oriented in children (Morrongiello & Schwebel, 2017, Morrongiello et al., 2017; Morrongiello et al., 2020), particularly when delivered by children’s peers. Additionally, psychoeducation on the relationship between pain, PTSS, and reluctance to return to sport is also important to provide to youth, who may be unaware that potential PTSS may hamper their return to the sport and increase their risk of repeated injury (Reardon et al., 2019). The timing of these messages is important, and might be the most beneficial when delivered immediately after an injury occurs, when being treated in a healthcare setting because it can create ‘teachable moments’ (i.e., increased readiness to act on behavior change messaging) (Johnston et al., 2002). When considered in the context of the HBM, intervention by medical professionals may also act as a ‘cue to action’ that encourages implementation of a health promoting behavior (Rosenstock, 1966).

“Threading the Needle” Between PTSS and Injury Prevention

On the surface, recommendations from an injury prevention perspective and recommendations from a PTSS treatment perspective may appear to be at odds with each other; injury prevention efforts often focus on interventions targeted toward reducing behaviors that present risk of injury (e.g., Damashek & Peterson, 2002), whereas engaging in behaviors is a key
part of many PTSS treatment protocols that emphasize exposure (Dorsey et al., 2016). However, this is not the case. For youth who present with PTSS post skateboarding injury, our hope would not be that they avoid re-engaging in skateboarding, but that they are able to re-engage in the sport in a gradual manner that returns them to their pre-injury skill and comfort level, before progressing to new and more challenging tricks/activities. Given that PTSS actually increases risk of future sports-related injuries because of avoidance (e.g., of attending physiotherapy), inhibited effort (e.g., the concept of not “committing” to a trick – a concept raised frequently related to injury risk in Study 1), and potentially increased risky behavior (which is a symptom of PTSD) (Reardon et al., 2019), it is all the more important that skateboarders are aware of how PTSS can affect their return to the sport. While it is difficult to assign objective risk to different skateboarding tricks and activities (and difficult to make clear recommendations around return to play for skateboarders given the lack of research on the sport to date), it may be helpful for skateboarders to reflect on their skill level prior to injury by watching videos of themselves skating, or writing down tricks or skills they had previously mastered before returning. Once they do return, it would likely be beneficial to test out their capacity to skate slowly and in a graded manner (e.g., starting by just skating on flat surfaces with no tricks), consistent with the literature on using graded exposure to treat trauma (Dorsey et al., 2016). Lastly, it is important that skateboarding youth take their mental wellbeing and pain levels into account when deciding on the difficulty and risk levels of the tasks they hope to engage in when returning.

It is also important to consider the many biopsychosocial benefits skateboarding provides to youth when encouraging them to re-engage safely in the sport. Preliminary evidence out of Hull Services, a mental health agency based in Calgary, Alberta, and the University of Calgary has shown that programs such as “Push to Heal”, which is a skateboarding-based mental health program that integrates the Neurosequential Model of Therapeutics (Perry, 2009) have been
helpful in improving the mental health of maltreated children (Hull Services, 2022). Results from this work demonstrated that skateboarding increases emotion regulation and self-efficacy, as well as decreases psychological distress in youth who have experienced trauma. This work aligns well with what was discovered over the course of this dissertation research, namely that skateboarding can act as a valuable mental health resource for young people. As such, it is imperative that we promote skateboarding as a wellness tool while also mitigating the risk of injury as much as possible, so that youth who skateboard do not lose access to this important part of their life.

**Areas for Future Research**

**Theoretical Considerations**

Theories such as Self Determination Theory (SDT) (Ryan & Deci, 2002) may be helpful in conceptualizing future research directions in the area of return to sport for skateboarders. SDT is a macro-level theory with multiple mini theories built in, but its core tenets suggest that humans have three basic needs that influence intrinsic motivation, or our desire to engage in an activity without external influences: autonomy (i.e., our innate need to make decisions for ourselves), relatedness (i.e., feeling connected to our community), and competence (i.e., feeling proficient in the task we are attempting) (Ryan & Deci, 2002; Ryan & Deci, 2017).

Understandably, this theory is highly applicable to sports participation, because engaging in sports is often intrinsically motivating to humans; we tend to play sports because we find them physically and psychologically rewarding (Ryan & Deci, 2017). Research on these three basic needs in a sporting context support the idea that these needs affect intrinsic motivation. For example, Smith and colleagues found that athletes who reported higher levels of goal related autonomy were more likely to achieve their goals by the end of the season because of their increased effort (Smith et al., 2011). Another study that examined all three needs found that as autonomy, relatedness, and competence increased, so too did children’s intrinsic motivation to
engage in sports (Sebire et al., 2013). Lastly, a study of youth soccer players demonstrated that those players who were higher in perceived autonomy were more likely to persist in playing soccer, whereas peers who had lower satisfaction of relatedness and autonomy needs were more likely to drop out of their sport (Calvo et al., 2010).

When considered in the context of our results, SDT may have valuable applications for future research. Our Study 1 participants identified significant benefits of the sport related to all three of the basic needs identified in SDT, including the freedom and flexibility of skateboarding (autonomy), the value of skateboarding related friendships and community (relatedness), and feelings of accomplishment when overcoming a block or learning a new skill (competence). In this way, themes identified by Study 1 participants imply a high degree of intrinsic motivation in adolescent skateboarders, which perhaps also contributed to their high rate of return to play. Deepening our understanding of how the injury experience affects youth’s experience of these three core needs is a valuable area of future research. For example, when considering how SDT might apply to our Study 2 findings, it is possible that those participants who were less likely to return to the sport due to pain and PTSS may have experienced decreased feelings of competence (e.g., that they could return safely), relatedness to their peers and community (due to missing out because of injury), and autonomy (because of physical limitations). It might also be valuable to evaluate how the perceived benefits of the sport, which acted as a moderator between PTSS and return to sport in our Study 2, might correlate with these three needs to increase motivation to return to sports post-injury.

Defining “Risk” in Skateboarding

As identified previously, it is difficult to define an objectively “risky” behavior or trick when skateboarding, and in fact, skateboarding injuries have been proposed to be most likely caused by a multitude of factors, including the trick itself, internal risk factors (e.g., age, sex,
flexibility), external risk factors (e.g., park or street), inciting events (e.g., an unexpected obstacle), and training load (e.g., too high so as to cause overuse injuries, or just right so as to encourage physical fitness) (Martinez et al., 2021). With respect to mechanisms of injury, the most common way in which skateboarders become injured is falls from the skateboard (Martinez et al., 2021, Partiali et al., 2020), but it is unclear what precedes these falls. Martinez and colleagues (2021) have proposed criteria for tracking and defining skateboarding injuries, but as of yet, our understanding of how these injuries occur, and what might qualify as an objectively “risky” behavior is limited. Future research that is observational in nature and tracks the events leading up to skateboarding injuries, may help us to better understand the etiology of skateboarding injuries and develop guidelines on returning to the sport post-injury. Building this understanding may also help in creating guidelines on supporting youth with PTSS post-injury; understanding what types of behaviors might be more likely to lead to injury would allow us to collaborate with skateboarding youth to make recommendations on where to start when encouraging them to face the potential fear and avoidance that might arise for them post-injury.

**Mental Health beyond PTSS, and PTSS Trajectories**

This dissertation research contributed valuable information to the knowledge base about return to sport after injury for youth skateboarders, and also explored how the injury experience and PTSS affects youth’s intentions to return. We chose to examine PTSS because it is commonly occurring in children after medically attended injuries (Kassam-Adams et al., 2013), and we hypothesized that PTSS was likely to affect youth’s decision making around return to sport, which was the case in our results. However, this dissertation did not explore the effect that other mental health symptoms (e.g., depressive symptoms, anxiety symptoms) that occur after injury might also have on return to sport. The literature indicates that post-injury depression and anxiety symptoms are present in youth in addition to PTSS (Barber et al., 2014). The
symptomatology of both anxiety disorders and depressive disorders includes elements of avoidance (e.g., fear-related avoidance in anxiety, and a loss of interest in previously enjoyed activities in depression), so it follows that both of these disorders likely have an effect on skateboarders’ return to the sport. Additionally, the sports psychology research indicates that athletes experience symptoms of anxiety and depression after sporting related injuries (Jeckell & Fontana, 2021; Kotler et al., 2021; Padacki et al., 2017; Reardon et al., 2019) that can affect their return to play. There was evidence that mental health challenges beyond PTSS were present in our Study 1 participants, who reported low mood and increased fear of re-injury after getting hurt. In this way, a more fulsome examination around how multiple/different mental health challenges might affect skateboarders’ return to the sport post-injury would likely be an important area of future research.

Additionally, with respect to PTSS, consideration of how PTSS evolves over time is a valuable area of future research in order to better support skateboarders’ mental health post-injury. There is evidence that for many individuals who experience a potentially traumatic medical event a period of elevated stress and challenges is normative, rather than pathological (Kazak et al., 2006). Studies examining the trajectory of PTSS/PTSD following pediatric injuries support this assumption, providing evidence that there are four distinct trajectories following injury: resilient (limited PTSS following injury), recovery (initial PTSD or elevated PTSS that the children recover from within 1-3 months), chronic (elevated PTSS/PTSD for 6-24 months post-injury), and delayed onset (new PTSD diagnosis 6 months post-injury) (DeYoung, et al., 2012; Le Brocque et al., 2010). The majority (57-72%) of children in these studies were in the resilient trajectory category, with 18-33% of children in the recovery group, and the least amount of children in the chronic and delayed onset groups (8-10% and 2% respectively). These studies provide support for the assertion that the majority of children experience a normative period of
adjustment and distress post-injury (Price et al., 2016). It would be useful therefore to examine how PTSS in skateboarders changes over time, and the role that it plays in the return to sport for this population.

**Gender Differences in Risk Taking and PTSS**

Both studies in this dissertation were comprised of a primarily male sample, which reflects the state of the sport (which is predominantly male), but also possibly obscures potential gender differences between our male, female, and nonbinary participants. Given that gender differences exist with respect to PTSS development (with females being at higher risk for PTSS development and symptom severity; Jin et al., 2014; Brosbe et al., 2011) and with respect to risk taking propensity (with males being more likely to be risk-seeking and more likely to sustain injuries than females; De Boer et al., 2017), it is likely that there are gender-based differences in both trauma symptoms and risk perceptions between females and males that were not captured in this dissertation research. The imbalance in research on gender related factors is also present in the return to sport literature, with samples often predominately made up of males (Drole & Paravlic, 2022). What is known about gender differences in return to sport demonstrates that while there appear to be no differences in rate of return to sport between males and females, males are 1.5 times more likely to return to their previous competency level of sport than females (Ardern et al., 2014b). Additionally, fear of re-injury is higher in female athletes than males, which likely influences their willingness to engage in sports-related risks (Ardern et al., 2014b). In this way, there are likely factors specific to the female gender that are important to explore with respect to return to sport. Future research on the gender differences with respect to return to play, the mental health effects of skateboarding injuries, and decision-making around return to sport in this population would be valuable in order to further tailor intervention suggestions.
Beyond Appraisals – Other Factors to Consider

Study 2 of this dissertation focused on how the injury experience (pain, appraisals of vulnerability, attributions of the injury being due to bad luck) affected PTSS development, and how perceived benefits of skateboarding moderated the relationship between PTSS and behavioral intentions. As such, we focused primarily on in-the-moment, cognitively based factors and how these affected mental health and return to the sport. However, what we learned from our Study 1 results was that the costs of injury were multifaceted, and went beyond individual perceptions and experiences of injury to encompass concerns around losing access to social benefits, physical benefits, psychological benefits, and so on. The fact that injury costs were so varied makes sense when considering that the etiology of both injury and PTSS development is complex and multidimensional. For example, while we examined appraisals of vulnerability with respect to trauma-related cognitions, we did not find a significant relationship between this appraisal and PTSS development or injury avoidance. This may be because while appraisals are typically a strong predictor of PTSS development, there are many other factors involved in PTSS development than those that are cognitively based, including gender, exposure to previous trauma, pre-existing psychological symptoms, early physiological reaction (e.g., higher heart rate upon hospital admission), parent PTSS, and low social support (Brosbe et al., 2011; Marsac et al., 2011). When considering how to build on the research presented in this dissertation, it might be valuable to examine how the complex biopsychosocial injury costs identified by youth in Study 1 might influence the development of PTSS and other mental health challenges in this population, and how these in turn affect their decision making around return to the sport.
Conclusion

This dissertation provides important insights into the factors involved in return to sport after injury for adolescent skateboarders, including appraisals about the injury experience (e.g., perceptions of pain, attributions to bad luck), perceived benefits of skateboarding, and PTSS. It extends previous research on return to sport by examining the motivations behind return to play in a uniquely injury-prone population. It also considers how the costs of injury affect youth skateboarders’ psychosocial wellbeing in both qualitative and quantitative studies. These two studies complemented each other; Study 1 allowed for depth of exploration on skateboarders’ injury experiences and the benefits of skateboarding, and Study 2 allowed for testing of a model of how benefits, injury appraisals, and trauma symptoms affected intentions to return to the sport. The results of both studies suggest that skateboarders are a group that benefits greatly from engagement in their sport. Results also demonstrate that skateboarders are vulnerable to negative outcomes from the injury experience that affect their ability to engage in the sport that is so important to their identity and well being. As such, future research aimed at identifying ways to support skateboarders to return to play in a physically and psychologically healthy manner will be valuable.
References

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Appendix 1: Study 1 Interview Questions

I am going to ask you some questions about the benefits of skateboarding. Take as much or as little time as you would like.

1) What is it about skateboarding you really like? [Anything else?]
   a. [How would you complete this sentence: “For me, the best part about skateboarding is ..........”]

2) Is there anything about skateboarding that you don’t like or that makes you nervous?
   a. [Anything else?]

3) When you go skateboarding, do you skateboard mainly on the streets or at a skate park? Why?
   a. [Explore benefits of each location, from their point of view]
   b. [What if anything do you not like about skateboarding on/at [location]? Is there anything that makes you nervous?]
   c. How often percentage wise would you go on skate park vs road? Do you skateboard to the skate park on the road?

4) I know that you were injured when skateboarding. Tell me what happened when you got hurt when you were skateboarding?
   a. How badly were you hurt? On a scale of 1-5, with 1 being very minor (i.e. small bump or bruise, not very painful), and 5 being a serious injury?
   b. How much pain (1-5)?
   c. How severe was the injury (1-5)?
   d. What were you doing when it happened?
   e. Was this a new trick?
   f. Who were you with?
   g. Where were you skateboarding? [Had you been there before?]

5) Have you been hurt that way (doing that specific action) before?

6) Have you been hurt in any other ways while skateboarding before?
   a. How did those injuries happen?
   b. In general, when you fall or get hurt, how bad do those injuries usually get on a scale of 1-5?

7) What was the worst part about getting hurt?
   a. Tell me some of the ways being injured got in the way of you living your life
   b. At the beginning of the interview, you mentioned the things you liked about skateboarding were _____. Did any of those things change after you got hurt?
   c. Is there anything that was really scary about that experience?
   d. [What was the scariest thought you had about your injury?]
   e. [What about in the few days after you got hurt? What were the scary thoughts that kept coming back?]
8) I know from what we talked about early on that there are [a lot of] good things you like about skateboarding. What keeps you coming back to the sport even after injury?

9) What makes you want to try new tricks or skills

*Ask question 10 - 12 ONLY if they were injured doing a trick or skill*

10) What makes you want to try tricks like “X” again? Have you tried tricks like “X” again? [omit if no tricks mentioned for injury]

11) What, if anything, are you nervous/worried about when trying “X” trick again? OR, what makes you nervous about trying a new trick?

12) Is there anything that would prevent you from trying “X” trick again? What would that be?

13) Do you use any gear to prevent injury when you skateboard, like a helmet or elbow pads or gloves or knee pads?

14) What about your friends - do they use any safety gear? [If so, what gear do they use?]

15) Is there anything else you want me to know about why skateboarding is important to you, or what benefits to skateboarding you see?
Appendix 2: Benefits of Skateboarding Questionnaire

The following survey aims to understand your thoughts about the benefits of skateboarding. Please rate how much you agree or disagree with the following questions.

First, decide if you agree or disagree, and then indicate how much (strongly, somewhat, a little).

Response Options (were included under each question but have been omitted here to save space):

<table>
<thead>
<tr>
<th>Disagree Strongly</th>
<th>Disagree Somewhat</th>
<th>Disagree a Little</th>
<th>Agree a Little</th>
<th>Agree Somewhat</th>
<th>Agree Strongly</th>
</tr>
</thead>
</table>

1. Skateboarding is a good way of getting to meet/know people
2. Skateboarding brought me even closer than I already was to my existing friends
3. My friends and I challenge each other and help each other to learn tricks
4. I like proving to myself that I can do new skills. It is a great feeling of accomplishment.
5. I like competing with myself when I’m learning new skills. It is a very satisfying feeling.
6. My skateboarding friends helped me get through some tough times in my life
7. My skateboarding friends have supported my mental health
8. I know my skateboarding friends have my back and support me- they care about my mental health
9. Skateboarding is a fun thing to do
10. Skateboarding is a fun activity I can do with my friends
11. I like that skateboarding gets me outside in the fresh air
12. Skateboarding is a great form of exercise
13. I enjoy sharing my skating knowledge with skaters less experienced than me
14. Skateboarding gives me the opportunity to be a mentor to other skaters and I value this
15. The risk elements of skateboarding hooked me on the sport
16. There are risks from skateboarding and that’s one of the things I like about it
17. The challenge of skateboarding is really exciting for me
18. It’s very challenging and I feel alive and excited when I’m skateboarding
19. There’s never an end to the things you can learn when skateboarding
20. There’s always something new to learn when skateboarding
21. I face my fear every time I step on a skateboard, and that is important to me
22. Skating helps me to face my fears by forcing me to step outside my comfort zone.
23. It feels like my life problems fade away when I’m skateboarding
24. Skateboarding is a form of stress release for me
25. Skateboarding helps me get away from thinking about tough things in my life
26. Skateboarding helps me to focus on being present and “in the moment”
27. Skateboarding helps me to focus my mind on the here and now
28. Skateboarding positively impacts my mood
29. If I didn’t have skateboarding, I think my mood would suffer
30. I feel adventurous and free when I’m skateboarding
31. The community at skate parks is very accepting
32. The skateboarding community is very welcoming
33. Skateboarding is a big part of who I am
34. Skateboarding is a part of my identity as a person
35. Skateboarding has taught me some good life lessons (i.e., you fall down, you get back up)
36. Skateboarding taught me that in life, if you don’t succeed you should try again