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Beach Sprints Rowing: Injury and Illness Prevalence at the 2022 World Championships

Joseph Michael DeLeo ,[1,2] Kathryn Ackerman ,[2] Evert Verhagen ,[3] Andrew C Fry ,[1] Fiona Wilson [4]

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[1]Health, Sport, and Exercise Sciences, Jayhawk Athletic Performance Laboratory-Wu Tsai Human Performance Alliance, University of Kansas, Lawrence, Kansas, USA
[2]Sports Medicine, Female Athlete Program-Wu Tsai Human Performance Alliance, Boston Children's Hospital, Boston, Massachusetts, USA
[3]Amsterdam Collaboration on Health & Safety in Sports, Department of Public and Occupational Health, Amsterdam Movement Sciences, Amsterdam UMC Locatie VUmc, Amsterdam, The Netherlands
[4]Physiotherapy, School of Medicine, Trinity College Dublin, Dublin, Ireland

Correspondence to
Mr Joseph Michael DeLeo;
Joseph.DeLeo@ku.edu

ABSTRACT

Background Injury and illness surveillance helps establish the infrastructure to provide adequate medical support at regattas and is the foundation for developing prevention strategies.

Objective(s) To assess the prevalence and characteristics of injuries in the 4 weeks before the start of the 2022 World Rowing Beach Sprints Finals (WRBSF) (the '*Prevalence Survey*') and describe the incidence and nature of new-onset injuries and illnesses incurred during the WRBSF (the '*Incidence Survey*').

Methods Athletes completed: (1) a prevalence survey recording injuries the 4 weeks before the WRBSF and (2) a recording of injuries and illnesses that occurred during the 3-day regatta.

Results Fifty-nine of 152 eligible WRBSF athletes completed the prevalence injury survey. Twenty-three (38.9%) reported experiencing at least one injury within the 4 weeks before the WRBSF. The most prevalent anatomical injury sites were the forearm (11.86%), lumbar spine (10.17%), knee (8.47%), ankle (6.78%) and hand/fingers (6.78%). During the competition, only two illness occurrences were reported; both were respiratory infections. Two athletes reported injuries: a hamstring strain and a concussion.

Conclusion Rowers presenting to the WRBSF described injuries leading up to the event that were similar to those common in classic rowing. Rowers at the event suffered injuries of the lower limb that were different from classic rowing and may be related to the addition of running to this event. An event concussion should be considered as a more likely injury in this type of rowing and future events should be prepared to manage such an injury.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Beach Sprints Rowing has been added to the Olympic programme and will make its debut at the Los Angeles 2028 Olympic Games.

WHAT THIS STUDY ADDS

⇒ This is the first study to assess injury in a Beach Sprints rowing population prior to an event as well as injury and illness incidence during the elite-level event, thereby addressing a gap in the literature. New injuries that are not commonly reported in classic rowers before should be considered, including hamstring injury and concussion.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ This study identifies injuries that are common to both Beach Sprints and classic rowing such as the forearm, rowing-related low back pain, and knee injuries. It also identifies injuries that may be unique to Beach Sprints rowers prior to and during competition. This information can be used by medical staff to better support athletes at future events, coaches in their athletes' physical preparation for competition and venue planning for the Los Angeles 2028 Olympic Games.

INTRODUCTION

Three types of competitive rowing are supported by World Rowing, the international governing body for the sport[1]: classic, coastal, and indoor rowing. Coastal rowing is separated into a distance event ('coastal rowing') and 'Beach Sprints'. Presently, only classic rowing is part of the Olympic programme for the 2024 Paris Olympic Games; Beach Sprints will officially be added to the programme for the 2028 Los Angeles Olympic Games.[2 3]

The first World Rowing Beach Sprint Finals (WRBSF) were held in Shenzhen, China, in 2019. The event includes head-to-head racing in singles (solo), mixed (women and men) doubles and mixed coxed quadruple sculls. Athletes begin the race on the beach, running 10–50 m to their boat (a Le Mans start), transitioning into the hull while clearing breaking waves as boat handlers steady the equipment. The athletes then row out into the ocean, slalom around two buoys, turn around a third buoy 250 m from the shoreline and row straight back. As the boat nears the shore, one rower from each hull jumps out and sprints 10–50 m up the beach to hit the finish line buzzer;[4] figure 1 shows a diagram of the Beach Sprints race course [5] . This race format starkly contrasts with classic rowing; classic rowers race with up to six

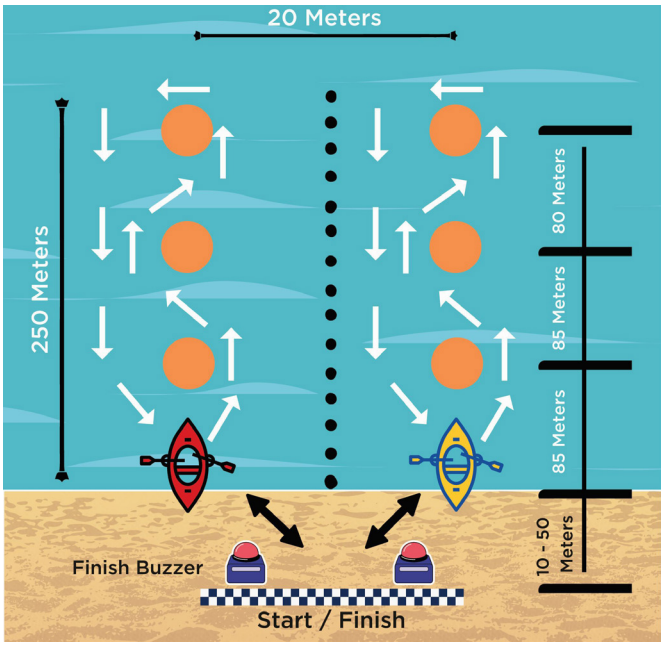

Figure 1 Beach Sprints Race Course diagram. Adapted from World Rowing Beach Sprints 2022 Team Managers Manual.[5]

boats straight across, buoyed lanes along a 2000-m course with no required transitions into and out of equipment or slalom racing. Additionally, classic rowing consists of both sculling (two oars per rower) and sweep (one oar per rower) boat classes, while Beach Sprints only has sculling divisions.

Preventive efforts are essential for protecting athletes' health, minimising the burden of sports-related illness and injury and enhancing athletes' performance capacity. To effectively implement prevention strategies, it is necessary to first establish the sport-specific injury and illness prevalence, incidence, severity and risk factors.[6] There has been significant growth in Beach Sprints rowing since its 2019 introduction; figure 2 illustrates the sport's growth from 2019 to 2023.[1]

Prior research has characterised injury and illness in multiple competition levels of classic rowing, establishing that overuse injuries, particularly of the lumbar spine, are common,[7–10] informing prevention and training strategies. However, despite Beach Sprints' increased popularity, little is known about illness and injury associated with coastal rowing participation. Training demands and on-water motion patterns are quite similar between the disciplines, yet beach sprint athletes face unique demands involving the land-to-water (to land) transition, heavier shells and oars and effects of wind and waves. Thus, there are unique injury risk factors that warrant exploration to better inform prevention, medical management and training strategies for beach sprint rowers.

The aims of the present study were to assess the prevalence and characteristics of injuries in the 4 weeks preceding the 2022 WRBSF and describe the incidence and nature of new-onset injuries and illnesses incurred during the WRBSF.

METHODS

The study was completed at the WRBSF in Saundersfoot, Pembrokeshire, Wales. The competition consisted of nine events across three categories (men, women, and mixed): Coastal Men's Single Scull, Coastal Junior Men's Single Scull, Coastal Junior Men's Double Scull, Coastal Women's Single Scull, Coastal Junior Women's Single Scull, Coastal Junior Women's Double Scull, Coastal Mixed Double Scull, Coastal Mixed Coxed Quadruple Scull and Coastal Junior Mixed Double Scull.

Participants

Eligible study participants were athletes ≥18 years of age at the time of the competition, selected to represent their country, registered for the WRBSF and able to complete a survey in English. The study encompassed two components: (1) a Prevalence Survey on injuries in the 4 weeks preceding the WRBSF and (2) athletes' self-report of new-onset injuries and illnesses that occurred during the WRBSF (Incidence Survey). The Prevalence Survey was collected during the WRBSF. The Incidence Survey was emailed out at the conclusion of the WRBSF (athletes opted-in to participate at the end of the Prevalence Survey) and remained open for 2 weeks postcompetition. Informed consent was obtained electronically at the beginning of each survey.

For this study, 'pre-existing injury' refers to injuries including pain, ache, stiffness, swelling, instability/giving way and/or locking that the athlete experienced in the 4 weeks preceding the WRBSF. This definition was

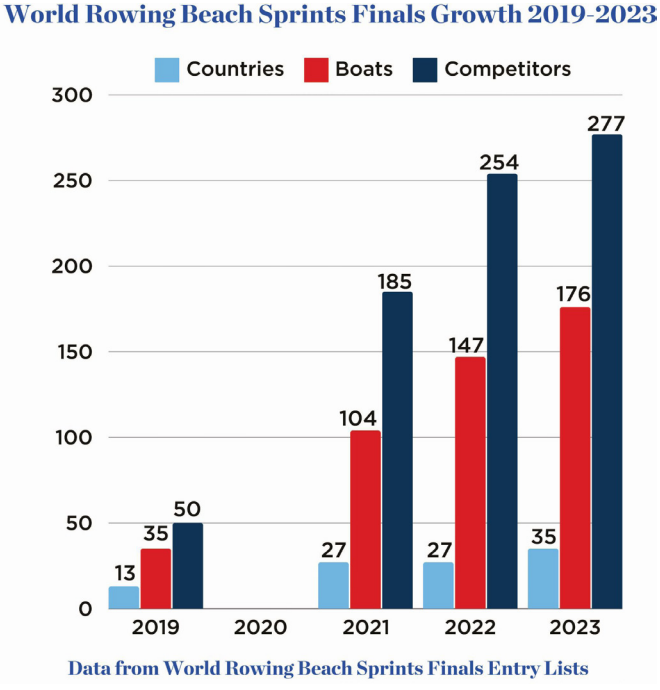

Figure 2 Beach Sprints participant growth 2019–2023.

informed and written based on the definitions provided by the International Olympic Committee.[11 12]

An 'in-competition injury'[11] was defined as any musculoskeletal complaint or concussion newly incurred due to competition and/or training during the WRBSF that received medical attention, regardless of subsequent absence from competition or training. Athletes were directed to report reinjuries (ie, injuries of the same type and location) only if they had returned to full participation after the previous injury. An 'in-competition illness' was defined as any physical complaint (unrelated to injury)[12] incurred during the WRBSF that received medical attention, regardless of subsequent competition/training participation.

Prevalence survey on prior injuries and incidence survey

The Prevalence Survey focused on only capturing athletes' injuries, not illnesses, during the 4 weeks prior to the WRBSF. Athletes were directed to report their most severe injury and describe other injuries separately. Athletes were asked to report all experienced injuries, regardless of training/competition participation consequences; location and duration of each injury; how the injury first occurred; how many training days were limited in the prior 4 weeks due to injury and their perception of how performance was impacted. Both surveys were based on the 2009 and 2013 World Aquatics Championships Pre-Existing Injury Survey[13 14] and adapted for rowing athletes. Aligned with the in-competition injury and illnesses definition, we requested athletes report all injuries (traumatic and overuse) as well as all illnesses newly incurred in competition or training during the WRBSF.

Implementation

Athletes were invited to complete the Prevalence Survey at the registration tent between 13 October and 16 October 2022. These surveys were collected on an iPad using an anonymous link from Qualtrics (Provo, Utah). WRBSF event organisers also circulated (via a recruitment PDF on WhatsApp) the Prevalence Survey to all team managers to share with athletes on the first morning of regatta competition.

Statistical analyses

Statistical analyses were performed in Microsoft Excel (Redmond, Washington) and Jamovi (Sydney, Australia).[15] Categorical variables were reported as frequency and percentages. Continuous variables were evaluated descriptively using means and SD or median (IQR) for non-normally distributed data. All variables of interest were tested for normality using the Shapiro-Wilk test. The frequency distribution for injury location and type was calculated and included 95% CIs.

RESULTS

Response rate and coverage

A total of 254 competitors from 27 countries participated in the WRBSF.[16] From the pool of 254 athletes, 152 were ≥18 years at the time of competition and eligible to participate in the study. Our response rate for the Prevalence Survey was 38.8% (59 of 152 athletes).

Table 1 Participant characteristics

Variable	All	Female	Male
N	59	22	37
Median age (IQR)*	26 (9.5)	28.0 (8.8)	23.0 (9.0)
Continent	–	–	–
Africa (%)	9 (15.3)	4 (6.8)	5 (8.5)
Asia (%)	1 (1.7)	0 (0.0)	1 (1.7)
Australia/Oceania (%)	1 (1.7)	0 (0.0)	1 (1.7)
Europe (%)	37 (62.7)	14 (23.7)	23 (39.0)
North America (%)	11 (18.6)	4 (6.8)	7 (11.8)

*Denotes non-parametric variable and is reported as median and interquartile range (IQR).

Prevalence survey on prior injuries

A total of 59 athletes (female: n=22, male: n=37), from five different continents, ages 18–48 years, participated in the Prevalence Survey (table 1). Twenty-three of 59 rowers reported injuries, resulting in an overall injury prevalence of 38.9%. The most prevalent anatomical injury sites were the forearm (11.86%), lumbar spine (10.17%) and knee (8.47%) (figure 3, table 2). Athletes who perceived performance limitations in the 4 weeks pre-WRBSF were 34.8% for 1–3 days, 26.1% for 4–7 days, 17.4% for 8–14 days and 8.7% for 15–27 days (table 3). Athletes reported injuries occurred with: (1) a gradual onset (43.5%),[2] an identifiable event (eg, a fall) (21.7%),[3] suddenly during competition (21.7%) or[4] unrelated to training/competition (13.1%) (table 3).

Incidence survey on new-onset injuries and illnesses during the WRBSF

Thirty six of 59 athletes (61.0%) opted-in to participate in the Incidence Survey by providing their e-mail address. Eleven of 36 athletes (30.5%) completed the Incidence Survey (table 4).

Two athletes (both female) reported illnesses during the WRBSF. Both reported their illnesses involved the respiratory system (including the ears, nose or throat) and were caused by the environment. Two athletes (one male and one of the females) reported injuries that occurred during the competition. The male rower reported a muscle strain/rupture/tear during heat warm-ups, citing that it occurred during the fastest part of running 'accelerations,' with an estimated 2 days of missed training. One of the female rowers who incurred a respiratory illness also reported sustaining a concussion during training, with an estimated absence of 14 training/competition days.

Figure 3 Top five anatomical injury sites of Beach Sprints rowers at 2022 World Championships.

DISCUSSION

The purpose of our study was to assess the prevalence and characteristics of injuries in the 4 weeks preceding the WRBSF as well as describe the incidence of new-onset injuries and illnesses incurred during the event. Our study is the first to provide injury and illness surveillance in Beach Sprints Rowing, thereby addressing a gap in the literature. Nearly 40 percent of study participants sustained at least one pre-regatta injury, with the forearm and lumbar spine the most common injury sites. The highest proportion of injuries occurred as gradual onset. During the regatta, two athletes reported respiratory illness, one of whom sustained a concussion, and another a hamstring strain. Our results highlight important similarities and differences between injury and illness patterns in beach sprints versus classic rowing to form a basis for future research and prevention strategies.

In our cohort of athletes, forearm injuries were the most common (11.86%) followed by the lumbar spine (10.17%), only one athlete (1.69%) reported chest wall/rib injury in the 4 weeks leading up to WRBSF. Though these injury sites are common concerns across all rowing disciplines, our ordinal prevalence estimates differ somewhat from several classic rowing-based studies. In an eight-season prospective study of 153 elite Australian rowers, Trease *et al*[7] found that the lumbar spine (21.1%) and chest wall (16.1%) accounted for the highest percentage of all injuries, whereas the forearm was responsible for only 5% of total injuries.[7] Similarly, in a cross-sectional injury surveillance study of masters rowers, Smoljanovic *et al* found that the lumbar spine was also the leading site of injury at 32.6%.[10] These differences are likely, in part, a result of the varied demands for beach sprints compared with classic rowing. First, the on-water distance (500 m) of beach sprints is 75% shorter than that of classic rowing (2,000 m). Recent research in classic rowing has shown that shorter race distances demand a greater anaerobic contribution.[17 18] Therefore, training for beach sprints requires less volume, with a greater emphasis on high-intensity activity, primarily involving running, agility and transitions into and out of the boat. Prior research has identified high training volume and erg training (especially sessions ≥30 min) as risk factors of lumbar spine injury.[19 20] It is possible that the varied training and competition demands contributed to the lower prevalence of lumbar spine injuries in our beach sprint cohort. Of note, risk factors for rowing-related low back pain also include sculling and competing/training in rough water,[19] both of which are inherent to the sport of beach sprints. The stability demands and rough water in beach sprints are markedly different than classic rowing. Therefore, future research should examine the influence of boat stability and water conditions on injury risk to clearly understand the exacerbating factors specific to beach sprints.

Conversely, we found a higher proportion of forearm injuries in our cohort than in classic rowing analyses. Forearm injuries are multifaceted, but can often be attributed to fatigue and technique,[21] as well as improperly sized oar handle grips and rough conditions, which results in wet grips, leading to tightened hand grip.[22] Boats for beach sprints are also larger and heavier than those

Table 2 Characteristics of injuries and complaints in the 4 weeks prior to and at the start of the 2022 World Rowing Beach Sprints Finals

Variable	All N	Female N	Male N
Injuries/physical complaints in prior 4 weeks	–	–	–
No injuries/physical complaints (%)	36 (61.02)	14 (23.73)	22 (37.29)
Yes, cannot participate due to injury/physical complaint (%)	2 (3.39)	1 (1.69)	1 (1.69)
Yes, reduced participation, with injury/physical complaints (%)	5 (8.47)	3 (5.08)	2 (3.39)
Yes, full participation, with injury/physical complaints (%)	16 (27.12)	4 (6.78)	12 (20.34)
Number of injuries reported (95% CI)	(.416 to 1.04)	(.181 to 1.18)	(.338 to 1.18)
0 (%)	36 (61.02)	14 (23.73)	22 (37.29)
1 (%)	12 (20.34)	4 (6.78)	8 (13.56)
2 (%)	6 (10.17)	2 (3.39)	4 (6.78)
3 (%)	3 (5.08)	1 (1.69)	2 (3.39)
4 (%)	1 (1.69)	1 (1.69)	0 (0.0)
6 (%)	1 (1.69)	0 (0.0)	1 (1.69)
Location of injury/physical complaint	–	–	–
Forearm (% prevalence) (95% CI)	7 (11.86) (3.61 to 20.12)	3 (5.1) (–0.01 to .29)	4 (6.8) (0.003 to 0.21)
Lumbar spine (% prevalence) (95% CI)	6 (10.17) (2.46 to 17.88)	0 (0.0) (0 to 0)	6 (10.2) (0.03 to 0.28)
Knee (% prevalence) (95% CI)	5 (8.47) (1.37 to 15.58)	1 (1.7) (–0.04 to 0.14)	4 (6.8) (0.003 to 0.21)
Ankle (% prevalence) (95% CI)	4 (6.78) (0.36 to 15.58)	3 (5.1) (–0.01 to 0.29)	1 (1.7) (–0.02 to 0.08)
Hand/fingers (% prevalence) (95% CI)	4 (6.78) (0.36 to 15.58)	1 (1.7) (–0.04 to 0.14)	3 (5.1) (–0.01 to 0.17)
Foot/toes (% prevalence) (95% CI)	3 (508) (–0.52 to 10.69)	1 (1.7) (–0.04 to 0.14)	2 (3.4) (–0.02 to 0.13)
Hip and groin (% prevalence) (95% CI)	2 (3.39) (–1.23 to 8.01)	1 (1.7) (–0.04 to 0.14)	1 (1.7) (–0.02 to 0.08)
Thoracic spine (% prevalence) (95% CI)	2 (3.39) (–1.23 to 8.01)	1 (1.7) (–0.04 to 0.14)	1 (1.7) (–0.02 to 0.08)
Wrist (% prevalence) (95% CI)	2 (3.39) (–1.23 to 8.01)	1 (1.7) (–0.04 to .14)	1 (1.7) (–0.02 to 0.08)
Shoulder (including clavicle) (% prevalence) (95% CI)	2 (3.39) (–1.23 to 8.01)	1 (1.7) (–0.04 to .14)	1 (1.7) (–0.02 to 0.08)
Lower leg (% prevalence) (95% CI)	1 (1.69) (–1.60 to 4.99)	1 (1.7) (–0.04 to .14)	0 (0.0) (0 to 0)
Thigh (% prevalence) (95% CI)	1 (1.69) (–1.60 to 4.99)	1 (1.7) (–0.04 to .14)	0 (0.0) (0 to 0)
Abdomen (% prevalence) (95% CI)	1 (1.69) (–1.60 to 4.99)	0 (0.0) (0 to 0)	1 (1.7) (–0.02 to 0.08)
Chest/ribs (% prevalence) (95% CI)	1 (1.69) (–1.60 to 4.99)	0 (0.0) (0 to 0)	1 (1.7) (–0.02 to 0.08)
Neck (% prevalence (95% CI)	1 (1.69) (–1.60 to 4.99)	0 (0.0) (0 to 0)	1 (1.7) (–0.02 to 0.08)
Head/face (% prevalence) (95% CI)	1 (1.69) (–1.60 to 4.99)	0 (0.0) (0 to 0)	1 (1.7) (–0.02 to .08)

Table 3 Injury impact

Variable	All N (%)	Female N (%)	Male N (%)
How did this injury/physical complaint first occur?	–	–	–
Due to a clearly identifiable event, for example, a fall	5 (21.7)	1 (4.4)	4 (17.4)
Gradual onset, no single event	10 (43.5)	2 (8.7)	8 (34.8)
Suddenly during normal training/competition	5 (21.7)	5 (21.7)	0 (0.0)
Other, not related to training/competition	3 (13.1)	0 (0.0)	3 (13.1)
Days of limited performance in previous 4 weeks?	–	–	–
0	3 (13.0)	1 (4.3)	2 (8.7)
1–3	8 (34.8)	4 (17.4)	4 (17.4)
4–7	6 (26.1)	1 (4.4)	5 (21.7)
8–14	4 (17.4)	2 (8.7)	2 (8.7)
15–27	2 (8.7)	0 (0.0)	2 (8.7)
Rowers' perception of severity at start of competition (%)	–	–	–
None/not at all	6 (26.1)	2 (8.7)	4 (17.4)
Minor	11 (47.8)	4 (17.4)	7 (30.4)
Moderate	4 (17.4)	1 (4.4)	3 (13.0)
Major	2 (8.7)	1 (4.35)	1 (4.35)
Performance affected at start of competition (%)	–	–	–
None/not at all	10 (43.4)	3 (13.0)	7 (30.4)
Minor	6 (26.1)	2 (8.7)	4 (17.4)
Moderate	5 (21.8)	1 (4.4)	4 (17.4)
Major	2 (8.7)	2 (8.7)	0 (0.0)

used in classic rowing, resulting in more drag opposing the oar and, thus, more force exerted on the oar and forearm. In our cohort, it is plausible that training and competing in open water for beach sprints contributed to this higher prevalence of injury. Due to the shorter history of beach sprints, there has also been less time to optimise the oar and shell design as well as grip and rigging techniques to minimise injury while maximising performance. Thus, existing equipment may contribute to the variations in injury risk and should be examined in future research.

[232322] Recent reviews by Thornton *et al* and Hosea *et al* indicate that knee injuries in classic rowing are primarily due to the high compressive forces acting upon the knee, land training, and moving the loaded knee joint through its full range of motion across hundreds of strokes [21 24].

Table 4 Competition injury/illness survey

Variable	All N (%)	Female N (%)	Male N (%)
N	11 (100.0)	7 (63.6)	4 (36.4)
Do you have an injury/illness to report?	–	–	–
No, I do not have an injury/illness (%)	8 (72.7)	5 (45.4)	3 (27.3)
Yes, I do have an injury/illness (%)	3 (27.3)	2 (18.2)	1 (9.1)
When did injury first occur at regatta? (%)	–	–	–
Training (%)	1 (50.0)	1 (50.0)	0 (0.0)
Heats (%)	1 (50.0)	0 (0.0)	1 (50.0)
What body part was injured?	–	–	–
Head	1 (50.0)	1 (50.0)	0 (0.0)
Thigh	1 (50.0)	0 (0.0)	1 (50.0)
What was the cause of the injury?	–	–	–
Non-contact trauma, weather conditions, other	1 (50.0)	0 (0.0)	1 (50.0)
Field of play conditions	1 (50.0)	1 (50.0)	0 (0.0)
What was the affected system of your illness?	–	–	–
Respiratory/ear, nose, throat	2 (100.0)	2 (100.0)	0 (0.0)
What was the cause of your illness/symptoms?	–	–	–
Environmental	2 (100.0)	2 (100.0)	0 (0.0)

Knee injuries in classic rowing are typically classified as generalied patellofemoral pain syndrome, and tendon disorders[21 24] . Wilson *et al* and Finlay *et al* reported an overall prevalence (12 months prospective, including training and racing) of 16% and 20% (respectively) of all injuries located in the knee in classic rowing.[23 25] This compares with 8% in this study, indicating that it may be comparable or even higher in beach sprints rowing, given the different time periods in these studies compared to the current study. Higher prevalence of knee injuries may occur in beach sprints rowing as it involves sprinting and transition components into and out of the rowing shell. Of the five reported knee injuries in our study, one was due to a clearly identifiable event (a fall or collision), one occurred suddenly (no obvious trauma), and three were attributed to gradual onset. In our cohort, we observed a greater prevalence of ankle and foot/toe injuries than described in classic rowing athletes. Athletes reported a total of four ankle injuries (6.79%), three foot/toe injuries (5.08%) and one lower leg injury (1.69%) at WRBSF. Conversely, Trease *et al* reported a total of seven ankle injuries (1.8%) and one foot injury (0.3%) over two Olympic cycles in international rowers and Smoljanovic *et al* reported 11 (3.1%) ankle injuries during a single season in masters rowers.[7 10] Given the running start and transition from land to water, the demands on lower extremities are different in beach sprints and likely contribute to the high prevalence of foot and ankle injuries. Thus, it may be beneficial to develop and assess beach sprint-specific injury prevention programmes. Future research should more closely investigate the sprinting and transition components of beach sprints rowers to determine the magnitude of impact it has across all lower extremity injuries.

In our Incidence Survey, 36 athletes opted-in to participate in the Incidence Survey but only 11 completed it. Athletes may have been directed to report to their team's medical staff. This could explain the low number of reported in-competition injuries and illnesses. Our low response rate, short time frame and low illness incidence make it difficult to determine how competition at WRSBF affects beach sprint rowers overall but underscores the importance of future research in this area. In elite Olympic-level classic rowers, illness was the most frequent aetiology, resulting in lost training time.[7] To better understand the burden of illness in beach sprints, it would be beneficial to study incidence outside of a competition environment. During the Incidence Survey, one athlete reported sustaining a hamstring strain during running accelerations and another athlete sustained a concussion during WRBSF. Concussions have not been an injury that has historically occurred in classic rowing populations. A recent study by Thornton *et al* found that in retired elite Canadian female rowers who competed between 1976–2019, only a single rowing athlete had a concussion during their career.[26] Beach sprints rowers may be more susceptible to this specific injury given the transitions in and out of the rowing shell. Future research should seek to determine if this type of injury is more prevalent in this rowing discipline.

Clinical implications

There are several practical implications based on the results of this study. First, future studies should establish if there are links to injuries that occur during sprinting and transitions into and out of the rowing shell. While only a single athlete reported a hamstring strain, sprinting and agility locomotion are completely absent in classic flat-water rowing. Beach sprints rowing requires a more diverse set of athletic skills than classic rowing and different foci within the training programme. This discipline of rowing requires athletes to sprint, have excellent agility in various terrain, and have the technical skill to navigate through unstable waves.[27] These are all skills that can be developed and trained, with appropriate warm-ups and drills incorporated into race preparation. The rough water conditions, along with heavier equipment, suggest increased risk for more trauma-based injuries than classic rowing. Thus, medical event coverage should include up-to-date concussion treatment protocols, and preparedness for a greater variety of musculoskeletal injuries than at classic rowing events.

Limitations

First, due to the survey-based nature of our study, there is the risk of recall bias, relying on athletes to accurately remember and describe their injury/illness. Our analysis was limited to anatomical sites of injury and lacked corroboration with medical records or imaging; future research involving medical staff to determine a precise injury diagnosis could better inform our understanding of beach sprints-related injuries. Additionally, we recruited elite athletes as they were preparing for a world championship event, and multiple studies occurred at the WRBSF, which may have deterred athletes from participating. The combination of these factors likely contributed to our very low response rate in the Incidence Survey. Finally, we only recruited athletes actively competing in the WRBSF. Thus, our cohort and injury prevalence reflect injuries in athletes who were still able to train/compete and may not capture the entire landscape of beach sprint-related injuries, particularly more severe injuries that require more time away from sport. Yet, we point to the strengths of the study, which include recruitment of an international cohort of elite beach sprints athletes and capturing injury prevalence for the first time while also identifying a trend towards different injuries compared to classic rowing. This is a reason to repeat this research again with an improved recruitment strategy and a focus on injury and illness that take place during WRBSF.

CONCLUSION

This study identifies common anatomical injury sites between classic and beach sprint rowing athletes, such as the lumbar spine. It also highlights that a beach sprint rower is performing acceleration, deceleration, agility

and transitions out of the boat that place different demands on athletes compared to those in classic rowing. Future research should examine specific occurrences of injury on-water or land to better understand causation.

X Joseph Michael DeLeo @JDeLeo, Kathryn Ackerman @DrKateAckerman, Evert Verhagen @evertverhagen and Fiona Wilson @fionawilsonf

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Contributors KA and FW conceived and designed the study. JMD performed data collection, data analysis and wrote the first draft. ACF and EV assisted with data analysis. All authors provided draft revisions and final approval of the manuscript. JMD is the guarantor of this study.

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ORCID iDs
Joseph Michael DeLeo http://orcid.org/0000-0002-5502-6131
Kathryn Ackerman http://orcid.org/0000-0003-2626-7785
Evert Verhagen http://orcid.org/0000-0001-9227-8234
Andrew C Fry http://orcid.org/0000-0001-8171-7684
Fiona Wilson http://orcid.org/0000-0002-0292-1087

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