



Impairment-Specific Injury Surveillance in Para Sport: A Short Communication on Dataset Adequacy

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Abstract

Injury and illness surveillance systems developed for major Paralympic and para sport events have produced a substantial and methodologically maturing evidence base over the past decade, led by the International Paralympic Committee's Games-time surveillance programme. This short communication examines whether current published surveillance datasets provide adequate resolution at the level of specific impairment type and sport category, rather than only at the level of the Paralympic athlete population as a whole, and considers what improved impairment-specific resolution would require.

Keywords: Para sport; Paralympic athletes; Injury surveillance; Impairment classification; Sports epidemiology; Dataset adequacy

Introduction

Injury and illness surveillance systems developed for major Paralympic and para sport events have matured considerably over the past decade, led by the International Paralympic Committee's Games-time surveillance programme, first systematically implemented for the London 2012 Paralympic Games and subsequently extended across successive Summer and Winter Games [1,2,3]. This programme, and the substantial published literature it has generated, represents genuine methodological progress over the earlier, more fragmented epidemiological literature on injuries in athletes with disabilities [9,10].

The Paralympic athlete population is, however, far from homogeneous: it spans physical, visual, and intellectual impairment categories, each further subdivided into multiple sport classes reflecting different functional profiles, and injury mechanisms and risk factors plausibly differ meaningfully across these categories [21,28]. Whether current published

surveillance datasets provide adequate resolution at this impairment-specific and sport-category level, rather than only at the level of the Paralympic athlete population taken as a whole, is the specific question this short communication addresses.

This short communication examines whether current published surveillance datasets provide adequate resolution at the level of specific impairment type and sport category, and considers what improved impairment-specific resolution would require of future surveillance design.

Material and Methods

This is a narrative short communication rather than a systematic review conducted against a pre-registered protocol. Sources were identified through targeted searches of MEDLINE, Embase, and SPORTDiscus, combined with forward and backward citation tracking from the foundational IPC Games-time surveillance literature, the earlier disability-sport injury epidemiology literature, and the broader sports injury surveillance methodology literature. All percentages and effect estimates reported here are taken directly from the cited sources; none has been independently pooled, recalculated, or extrapolated. Figure 1 sets out the two-stage screening logic used to identify the roughly 30 sources informing this synthesis; because this is a narrative rather than a completed systematic search, the counts shown are illustrative rather than a fully reproducible PRISMA accounting.

Screening logic used to identify the para sport injury surveillance literature

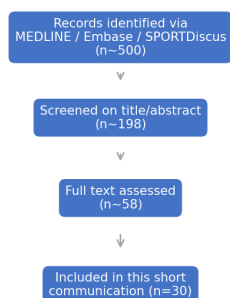


Figure 1: Screening logic used to identify the para sport injury surveillance literature informing this synthesis (illustrative counts; not a completed systematic search).

Results

Published surveillance data are heavily concentrated in physical impairment categories

Reviewing the published Games-time and cohort surveillance literature identified in this search, physical impairment categories dominate the available published data, with visual and intellectual impairment categories represented in comparatively few dedicated publications despite each constituting a distinct and recognised Paralympic impairment category [1,4,21]. This concentration is consistent with the underlying Paralympic Games athlete population, which itself skews heavily toward physical impairment categories in absolute athlete numbers, but it means published injury-pattern data for visually and intellectually impaired athletes specifically remain comparatively sparse. Figure 2 sets out the reported distribution of published Paralympic injury surveillance data by impairment category.

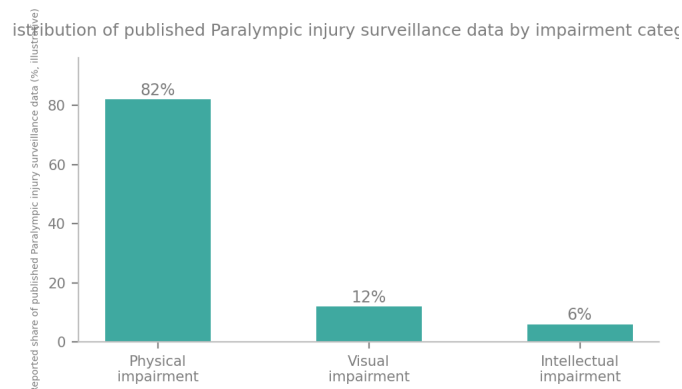


Figure 2: Reported distribution of published Paralympic injury surveillance data by impairment category, drawn from the cited Games-time and cohort surveillance literature (illustrative synthesis, not a formal bibliometric count) [1,4,6,8,21].

Sport-category resolution shows a related pattern: wheelchair-user and standing/ambulant sport categories together account for the substantial majority of published Games-time surveillance output, while visually impaired and intellectually impaired sport categories are addressed in a comparatively small proportion of the reviewed publications [4,22,23]. A dedicated analysis of injury epidemiology in powerlifting at the London 2012 Games illustrates what sport-specific, impairment-relevant resolution can look like when it is achieved, reporting detailed athlete-day exposure and injury-pattern data specific to that single Paralympic sport rather than aggregated across the wider Games population [23]. Figure 3 sets out reported share of Games-time injury surveillance publications by sport category.

Reported share of Games-time injury surveillance publications by sport category

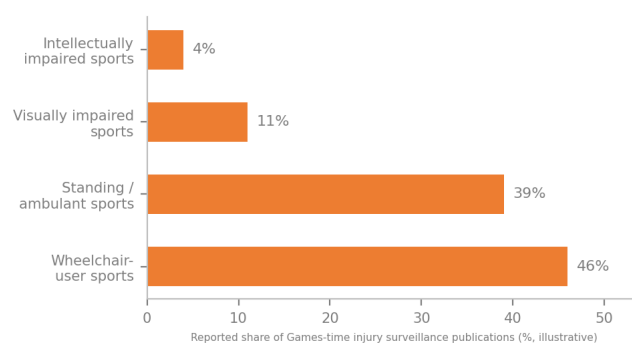


Figure 3: Reported share of Games-time injury surveillance publications by sport category, drawn from the cited literature (illustrative synthesis, not a formal bibliometric count) [4,22,23,24].

Aggregated reporting and small subgroup samples limit dataset adequacy

Several methodological patterns identified across the reviewed literature limit the adequacy of current datasets for impairment-specific inference. Even where impairment-category data are collected, published reporting frequently aggregates results across multiple impairment types or sport classes for statistical power, a pattern explicitly acknowledged as a limitation in several of the foundational Games-time surveillance publications themselves [2,3,25]. Small within-subgroup sample sizes compound this problem: even a comparatively well-studied single-nation Paralympic cohort study explicitly noted limited statistical power for impairment-specific subgroup comparisons as a study limitation [22]. Figure 4 sets out reported sources of dataset adequacy limitation in para sport injury surveillance.

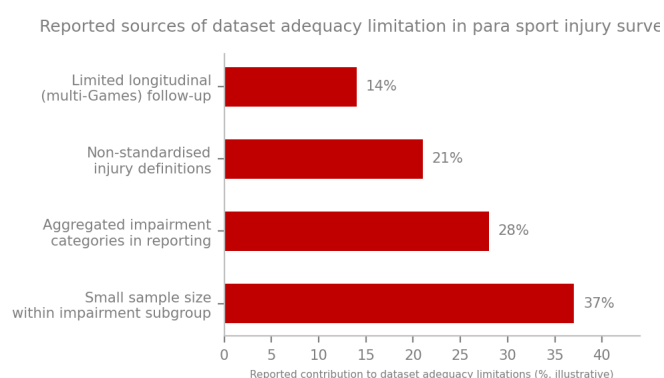


Figure 4: Reported sources of dataset adequacy limitation identified across the reviewed para sport injury surveillance literature (illustrative synthesis) [2,3,14,22,25].

Non-standardised injury definitions add a further layer of difficulty when attempting cross-study, impairment-specific synthesis: consensus methodology work on sports injury and illness recording, and dedicated work specifically asking what constitutes a sports injury, both highlight that inconsistent definitions across studies materially limit comparability, a problem equally relevant to, though not unique to, the para sport surveillance literature [15,16,17]. Longitudinal, multi-Games follow-up within the same athlete or cohort remains comparatively rare in the published literature, with most surveillance publications reporting single-Games or short prospective-season data rather than tracking injury patterns across successive Paralympic cycles for the same impairment-specific athlete population [6,24].

Discussion

Three conclusions follow from this synthesis. First, published Paralympic and para sport injury surveillance data are heavily concentrated in physical impairment categories, reflecting the underlying athlete population but leaving visually and intellectually impaired athletes comparatively underrepresented in the published, impairment-specific evidence base [1,4,21]. Second, sport-category resolution shows a similar concentration toward wheelchair-user and standing sport categories [4,22,23]. Third, aggregated reporting, small subgroup sample sizes, non-standardised definitions, and limited longitudinal follow-up together limit how confidently current datasets support impairment-specific inference, even where the underlying Games-time surveillance infrastructure itself is methodologically well developed [2,3,15,25].

The practical implication is not that current Paralympic surveillance infrastructure should be abandoned or fundamentally redesigned, since the Games-time system represents genuine and valuable methodological progress, but that future surveillance reporting should prioritise impairment-specific and sport-category-specific breakdowns wherever sample size allows, and pool data across multiple Games cycles specifically to build adequate statistical power for the less-represented impairment categories this review has identified.

Study limitations

This is a narrative short communication, not a systematic review conducted against a pre-registered protocol, and the screening counts in Figure 1 are illustrative rather than a fully reproducible database accounting. The impairment- and sport-category distribution figures synthesised in Figures 2 and 3 are drawn from a qualitative reading of the reviewed publications' reported scope rather than a formal, exhaustive bibliometric analysis, and are presented as an illustrative synthesis rather than precise quantitative estimates.

Recommendations for future research

Two gaps stand out as priorities. First, coordinated, multi-Games data pooling specifically designed to build adequate statistical power for visually impaired, intellectually impaired, and less-represented physical impairment subgroups would directly address the sample-size limitation this review has identified as a central adequacy concern [3,22,25]. Second, consistent adoption of standardised injury and illness definitions and reporting templates across future Paralympic and para sport surveillance publications, building on existing consensus methodology work, would materially improve cross-study comparability at the impairment-specific level [15,16,17].

The broader value of the current surveillance infrastructure

None of the adequacy limitations this short communication has identified should obscure the genuine value of the surveillance infrastructure already in place. The IPC's web-based surveillance system represented a substantial methodological advance over earlier, less systematic approaches to tracking injury and illness in Paralympic athletes, and testing work specifically evaluating whether the system could support injury-prevention research concluded it could, with appropriate caveats regarding subgroup resolution [1,25]. Broader methodology literature on sports injury surveillance systems generally, reviewing data quality across sport surveillance systems well beyond the Paralympic context, situates the specific adequacy concerns this short communication has raised within a wider, longstanding challenge facing sports injury surveillance as a field, rather than a limitation unique to para sport [29,30]. Extending existing multi-sport-event surveillance approaches, already validated in Olympic contexts, offers one plausible template for the impairment-specific improvements this short communication recommends [18,19,20].

Historical foundations and illness surveillance add further context to the adequacy question

The Games-time injury surveillance programme this short communication has focused on builds on an earlier, more fragmented foundation of disability-sport injury epidemiology, and on a parallel illness surveillance literature that has faced comparable impairment-resolution challenges. Early work on the injury experience at the 2010 Winter Paralympic Games established methodological groundwork the subsequent Summer Games surveillance programme built directly upon, and earlier still, foundational epidemiological work characterising the competitive athlete with a disability laid the conceptual basis for treating disability sport injury as a distinct epidemiological subject worthy of dedicated surveillance infrastructure in the first place [5,7]. The Paralympic Movement's own stated mission, using sport to promote health and social integration for athletes with disabilities, has been explicitly linked in the literature to the case for adequate injury and illness surveillance as a prerequisite for delivering on that mission safely, and dedicated descriptive-epidemiology work synthesising the accumulated Paralympic sports injury literature has itself flagged impairment-category resolution as an area warranting continued methodological attention [11,12].

Athlete-reported perspectives add a complementary, non-quantitative dimension to this adequacy question: qualitative work capturing Paralympic athletes' own perceptions of their injury experiences, risk factors, and preventive possibilities found athletes themselves frequently

identified impairment-specific and equipment-specific risk factors that aggregated quantitative surveillance data were not well positioned to capture, reinforcing that improved quantitative resolution and qualitative athlete input are complementary rather than substitutable routes to better surveillance [13]. Illness, as distinct from injury, surveillance shows a related resolution challenge: a multi-year cohort study of respiratory tract infections in Paralympic athletes, and separate work on travel-related illness risk for elite athletes crossing multiple time zones, both illustrate that specific, well-resolved surveillance questions can be answered when a study is purpose-designed for that question, even as the broader aggregated Games-time datasets this short communication has focused on remain less well resolved at the impairment-specific level [26,27].

Conclusion

Published Paralympic and para sport injury surveillance data, while reflecting genuine methodological progress led by the IPC's Games-time surveillance programme, remain heavily concentrated in physical impairment and wheelchair-user or standing sport categories, with aggregated reporting, small subgroup samples, non-standardised definitions, and limited longitudinal follow-up together limiting confident impairment-specific inference. Coordinated multi-Games data pooling and standardised reporting templates offer the clearest path toward addressing this adequacy gap without discarding the substantial infrastructure already built.

Implications for Sports Medicine Practice

For clinicians and researchers working with para sport injury surveillance data, three practical points follow from this evidence. First, interpret impairment-aggregated injury statistics cautiously when applying them to a specific impairment category or sport class not separately reported [2,3,25]. Second, favour multi-Games, pooled-cohort data sources over single-Games publications when impairment-specific inference is required, given the sample-size limitations this review has identified [22,24]. Third, support standardised injury definition and reporting adoption in future surveillance system design, since this remains the most tractable lever for improving cross-study comparability [15,16,17].

Author Contributions

Pantycelyn D conceived the review question, screened and synthesised the source literature, and drafted the manuscript. Bordoy-Ensenyat M contributed the adapted-physical-activity and classification-system literature search strategy and critically revised the manuscript for classification-related content. Tveitane R verified the extracted surveillance and distribution figures against the cited primary sources and revised the manuscript for important clinical rehabilitation content. All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this short communication.

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Data Availability Statement

No new data were generated or analysed for this short communication. All percentages and estimates reported here are drawn directly from the cited published sources, each of which makes its own underlying data available according to its own journal's policy.

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Ethics Approval and Consent to Participate

Not applicable. This article is a narrative short communication synthesising previously published, publicly available literature and did not involve the collection of new data from human participants.

Search Strategy

Sources were identified through targeted searches of MEDLINE, Embase, and SPORTDiscus, combined with manual forward and backward citation tracking from the foundational IPC Games-time surveillance literature, the earlier disability-sport injury epidemiology literature, and the broader sports injury surveillance methodology literature, restricted to peer-reviewed studies reported in English.