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The impact of injury definition on injury surveillance in novice runners

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ABSTRACT

Objectives: Despite several consensus statements, different injury definitions are used in the literature. This study aimed to identify the impact of different injury definitions on the nature and incidence of complaints captured during a short-term running program for novice runners.
Design: Prospective cohort study.
Methods: 1696 participants completed weekly diaries on running exposure and musculoskeletal complaints during a 6-week running program. These data were used to compare six different injury definitions (presence of running-related pain, training-reduction, time-loss of one day or one week). Injuries were registered under these different definitions. Consequently incidence and the nature of complaints were compared between definitions.
Results: The different injury definitions resulted in incidences that varied between 7.5% and 58.0%, or 18.7 and 239.6 injuries per 1000 h of running. The median duration of injury complaints was 4–7 days for injuries registered under a 'day definition', while complaints registered under a 'week definition' lasted 20–22 days. For running-related pain injuries the median of the maximum amount of pain was 3.0. In training-reduction and time-loss injuries these median values were scored between 5.0 and 7.0. No significant differences in anatomical locations between injuries that were registered under a 'day definition' or a 'week definition' were found. Injuries registered under a time-loss definition were located relatively more often at the knee, while complaints at the pelvis/sacrum/buttock were captured more often under a running-related pain definition.
Conclusions: Injury definitions largely impact injury incidence. Location of injury is also affected by choice of injury definition. This stressed the need for standardized injury registration methods.

1. Introduction

Much research has been done on running-related injuries. Many incidence reports are thus available, with incidence proportions varying greatly from 1.4% to 94.4%.[1] Study design, follow-up time, running population, method of injury registration (injury assessment) and employed injury definition are all argued to form the basis for the large variety in reported incidence proportions.[2] And yet, in studies in which most of these factors were identical (i.e. study design, running population and injury assessment), incidence proportions still varied between 10.9% and 84.9%.[3,4]

Differences in injury definition logically impact these differences in reported injury incidences. Injury definitions can be generally categorized into 'all complaints', 'medical attention incidents' and 'time-loss injuries'.[5] Incidences will be highest when all complaints experienced during sports are registered, regardless of the consequences and origin of these complaints.[6] Including 'all complaints' as injury definition, however, is used less frequently in the literature and appears predominantly in research conducted during running events.[7,8] It is, however, the definition of an injury as proposed by the recent consensus statement for epidemiological studies in athletics.[9] A medical attention definition is also

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used often to assess injury occurrence during events.[7,10,11] A disadvantage of the latter registration method is that differences in accessibility to medical support largely influence the accuracy of the collected data.[12]

In research among runners, time-loss definitions are the most-often applied.[13] The large variety in application of time-loss definitions, however, might directly result in the range of incidence proportions found in literature.[14] Firstly, the duration of time loss to be considered an injury varies between studies. In some studies one training day missed due to running-related pain was considered a time-loss injury,[2,15] in others three consecutive training sessions or a complete week had to be interrupted in order to define an event as an injury.[3,16,17] Secondly, differences in the degree of time loss exist. Time loss can, for instance, be interpreted as being unable to do running practice[18,19] or only as a reduction in training (lower intensity, shorter distance or duration) as a result of running-related pain.[20–22]

To date, the influence of different injury definitions on injury incidence and nature of injury complaints among runners is unknown. Hence the primary aim of this study is to identify the impact of different injury definitions on the reported incidence in novice runners by applying different definitions in one large data set. The secondary aim is to compare characteristics of injuries that were registered under different injury definitions.

Table 1
Different injury definitions that were compared in the present study.

Day definitions	
Running-related pain injury, one day (RRP-day)	Running-related pain experienced during ≥1 (planned) running session, regardless of the consequences for that running session.
Training reduction injury, one day (TR-day)	Running-related pain experienced during ≥1 (planned) running session, influencing that session (reduction in speed, distance or intensity).
Time-loss injury, one day (TL-day)	Presence of running-related pain, resulting in the absence from ≥1 planned running session.
Week definitions	
Running-related pain injury, one week (RRP-week)	Running-related pain experienced during all (planned) running sessions for one week or more, regardless of the consequences for the running sessions.
Training reduction injury, one week (TR-week)	Running-related pain experienced during all (planned) running sessions for one week or more, influencing all running sessions for one week (reduction in speed, distance or intensity).
Time-loss injury, one week (TL-week)	Presence of running-related pain, resulting in absence from all planned running sessions for one week or more.

2. Methods

Data from the NLstart2run study were used for the stated study purpose. The NLstart2run study is a multi-center prospective cohort study among novice runners participating in a "Start to Run" program that prepared participants in 6 weeks (with 2–3 training sessions per week) for a 20-minute run.[23] The study design, procedures and informed consent process were approved by the Medical Ethics Committee (no. 2012/350) of the University Medical Center Groningen (UMCG), the Netherlands. The study is registered in the Netherlands Trial Registry (NTR3676).

Registrants of the 2013 'Start to Run' program ($N = 7660$), organized by the Dutch Athletics Federation, were asked to participate in the study. Participants aged between 18 and 65 who agreed to participate and completed a baseline questionnaire with personal characteristics were included in the study ($N = 1772$). Participants who reported data on running exposure via an online running log during the 6-week running program were included in the analysis ($N = 1696$).

A weekly digital running log had to be completed during the running program. This log asked for the number of planned training sessions as well as information on running activity (yes/no), running exposure (minutes of running) and pain experienced during running. Participants were asked not to report muscle soreness or blisters during the pain registration.

When pain was the reason for not starting a training session or was present during or immediately after the session, additional information was requested. Participants were asked to score the maximum amount of pain perceived during the day on an 11-point numerical rating scale (NRS) ranging from 0 (no pain) to 10 (worst pain imaginable). A body chart was used to obtain the locations of the complaints. Participants were also asked whether or not the pain was caused by running (running-related pain). Participants also reported the outcome of that training session (i.e. was it possible to finish the planned training session despite the pain). This information was used to register the injuries according to the different injury definitions.

Injury definitions were categorized into running-related pain (regardless of the consequences for training), training-reduction (reduction in intensity, speed, distance or duration) and time-loss (i.e. complete absence from training). These definitions were also separated into 'day' and 'week' based on the minimal duration of complaints. This categorisation resulted in six different injury definitions: one-day running-related pain injuries (RRP-day), one-day training-reduction injuries (TR-day), one-day time-loss injuries (TL-day), one-week running-related pain injuries (RRP-week), one-week training-reduction injuries (TR-week) and one-week time-loss injuries (TL-week) (Table 1). Injury incidences during the running program were calculated based on these six injury definitions from the training data that were collected using the digital running log.

Only the first registered injury was taken into account in the analyses. A comparison was made between the characteristics of all injured participants that were identified under the different injury definitions. Given the population of novice runners, it was assumed that participants had not previously suffered from running-related injury complaints. Incidence proportions (as percentage) and densities (number of injuries per 1000 h of running exposure) with corresponding 95% confidence intervals (CI) were therefore calculated for injuries that were registered under each of the six definitions. Hours of running exposure were measured from the start of the program until an RRI occurred or until the end of the running program. For each injury, the week of occurrence was determined as well as the maximum amount of pain perceived during the injury period. Duration of injury complaints was calculated as the number of days until the participant completed a training session without injury complaints or until the end of the running program. These data were reported as medians with inter-quartile ranges (IQR). The affected body parts were determined for each injury and were categorized into complaints affecting the Achilles tendon, foot, ankle, calf, shin, knee, dorsal thigh (hamstrings), ventral thigh (quadriceps), groin, hip or pelvis/sacrum/buttock. Multiple body locations could be affected in a single injury.

Injury characteristics of complaints that were 'missed' under one definition (stricter definition) but registered under another (broader definition) (e.g. TR-day vs. TL-day injuries) were compared. These comparisons were made for TR-day and TL-day, TR-week and TL-week and TL-day and TL-week injuries. These