## Supplementary file 1: Detailed search and selection strategy

**The search strategy was designed by Dr. K. A. Hayden. We searched five databases (MEDLINE,** Embase, CINAHL, Cochrane CRCT, SportDiscus) **for English-language articles. For MEDLINE, the following search strategy was used. This search strategy was then** translated for each database**.**

Database(s): Epub Ahead of Print, In-Process & Other Non-Indexed Citations, Ovid MEDLINE(R) Daily and Ovid MEDLINE(R)

1946 to Present

Search Strategy:

# Searches

1 exp Brain Concussion/

2 mild concussion\*.tw.

3 cerebral concussion\*.tw.

4 concussion\*.tw.

5 mild traumatic brain injur\*.tw.

6 mtbi.tw.

7 sport\* related concussion\*.tw.

8 commotio cerebri.tw.

9 or/1-8

10 biomechanic\*.tw.

11 clinical\*.tw.

12 objective\*.tw.

13 scientific\*.tw.

14 operational.tw.

15 physiologic\*.tw.

16 or/10-15

17 characteristic\*.tw.

18 criteria\*.tw.

19 symptom\*.tw.

20 component\*.tw.

21 evaluation\*.tw.

22 diagnos\*.tw.

23 definition\*.tw.

24 define.tw.

25 changes.tw.

26 exp Classification/

27 classification\*.tw.

28 "Concept Formation"/

29 or/17-28

30 exp Sports/

31 exp Snow Sports/ or exp Racquet Sports/

32 exp Athletes/

33 exp Hockey/ or exp Soccer/ or exp Football/

34 (Sport\* or athlete\* or athletic\* or player\* or team\* or competitor\* or jockey\* or varsity).tw.

35 (Soccer or football or rugby or baseball or basketball or boxing or hockey or volleyball or netball or diving or racquet\* or martial arts or equestrian or lacrosse or skating or skiing or snowboard\* or wrestling or softball).tw.

36 or/30-35

37 9 and 16 and 29 and 36

38 limit 37 to english language

39 limit 38 to (addresses or autobiography or bibliography or biography or directory or editorial or in vitro or interactive tutorial or interview or lectures or legal cases or legislation or letter or news or newspaper article or patient education handout or periodical index or personal narratives or portraits or video-audio media or webcasts)

40 38 not 39

**Our search was updated through September 14, 2016. We also performed a manual search of reference lists from eligible articles. Research abstracts from meeting proceedings or unpublished studies or non-English language studies were not considered. Where appropriate, we attempted to contact authors regarding study details.** There was no review protocol.

**All identified articles were subject to title and abstract screening by two independent reviewers (AAT, NFD). Articles were selected using pre-determined criteria. Reviewers *excluded* papers that were no full manuscripts (e.g. letters to the editor or correspondence on published studies), did not report on sports-associated head-injuries meeting the criteria for brain concussion or MTBI in athletes, did not focus on the diagnosis of concussion (but e.g. rather on its management) and acute effects of concussion (e.g. on concussion therapy, prognosis, return to play), did not contain data about a) the clinical criteria of a definition of concussion (for example only epidemiological data about concussion frequency) or b) about the biomechanics of concussion in humans, did not require the diagnosis of concussion being made by medical personal (e.g. physician, trained coach, physiotherapist) or reported on less than five cases. Note that studies reporting no original data (e.g. conference consensus statements) were eligible for the assessment of** clinical criteria of a definition of concussion as well**.**

**Full-text screening was applied to all abstracts considered eligible by at least one reviewer (i.e., labeled “yes” or “maybe” in the abstract review). The two independent reviewers (AAT, NFD) identified whether full-text manuscripts were eligible and provided a reason for exclusion. Discrepancies in selection status and reasons for exclusion were settled between the two reviewers by discussion** and adjunction of a third reviewer if needed.

Information abstracted from each article included study type and publication date, addressed sports, proposed clinical criteria for a definition of concussion and number of citations for aim 1. For aim 2 (biomechanical studies) abstracted information included the investigated sports, level of play, recording systems used and recorded linear/rotational accelerations in concussed players. Data were handled in EndNote X 7.5 (Thomson Reuters, NY) and Microsoft Excel 2011 (Redmond, WA).

**Search Results**

Our search identified 1601 unique citations, of which 1478 (92.3%) were excluded at the abstract level (see flow diagram in main manuscript for details in the search strategy). We did not require concordance on the reasons for abstract exclusion, but, of concordant codings (89.2%, n=1319), exclusions were for the following reasons: **37% were not about acute effects of concussion;** 28% **were not about clinical criteria of concussion or about biomechanics in sports-related concussions in humans; 9% were not about diagnosis of concussion; 7% were not about sports-related concussions; 5% were not about brain concussions and 1% each were no full papers or reported on less than five players.**

We sought to examine 123 full articles. After initial screening, there were 21 disagreements on study inclusion (Cohen’s kappa 0.64), and 11 disagreements on the reason for exclusion. These were settled by adjudication and discussion between the two reviewers. After final full-text review, 87 articles were excluded. The most common reason for exclusion **was not reporting on clinical criteria of concussion or about biomechanics in sports-related concussions in humans** (45%, n=39); other reasons for exclusion were as follows: paper **was not about diagnosis of concussion** (20%, n=17); was not about brain concussion (16%, n=14); was **not about acute effects of concussion** (9%, n=8); was not about sports-related concussions (6%, n=5); was no full paper (3%, n=3); or did not require concussion diagnosis being made by medical staff (1%, n=1). Eligible articles represented 2.2% of the total (n=1601) articles.