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A REVIEW OF ADOLESCENT ATHLETE SPORT-RELATED CONCUSSION UNDER-REPORTING

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Background

- Sport-related concussions (SRC) are recognized as a functional brain injury manifesting with a wide range of physical, cognitive and clinical symptoms[1].
- Adolescent athletes in particular may have an increased risk of sustaining SRC[2], protracted concussion recovery[1,3], and prolonged cognitive issues, including memory dysfunction[4] compared with adults.
- In order to properly manage and treat concussed adolescent athletes, it is critical that symptoms are quickly recognized and athletes are removed from play for clinical assessment.
- Despite these risks, research indicates adolescent athletes are failing to properly disclose SRC symptoms[5–8].
- There is a need for a comprehensive, rigorous review of the literature addressing SRC symptom under-reporting by adolescent athletes.

Objective

To assess and synthesize the current literature on sport-related concussion under-reporting in adolescent athletes.

Methodology

- The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) Guidelines[9] are used as a framework .
- The systematic review protocol is registered with PROSPERO, an international registry for health-focused systematic reviews. The full methodology can be accessed at www.crd.york.ac.uk/PROSPERO. Registration ID: CRD42018076471

Search Strategy

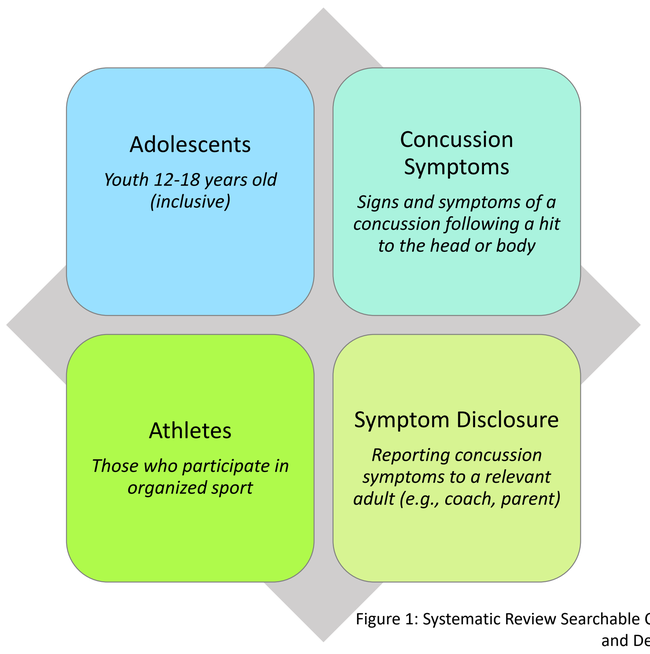

Figure 1: Systematic Review Searchable Concepts and Definitions

#	Searches	Results
1	Adolescent/	1953729
2	Young Adult/	676249
3	Schools/	33258
4	(adolescen* or minors or high school* or highschool* or young adult* or teen*).tw,kf.	364644
5	Athletes/	8689
6	exp Sports/	170550
7	((youth or male* or female* or girl* or boy* or wom$n* or m$n*) adj3 (player* or athlete*)).tw,kf.	11340
8	Brain Concussion/	6557
9	Athletic Injury/	26565
10	((head or brain) adj3 (impact* or injur* or blow* or hit*)).tw,kf.	89405
11	(concuss* or mtbi or (mild adj3 traumatic brain injury)).tw,kf.	9738
12	(dizz* or headache* or stars or blur* or dinged or bell ringer*).tw,kf.	108423
13	Self Report/	22229
14	Truth Disclosure/	13391
15	Disclosure/ or Parental Notification/	13375
16	(disclos* or report* or underreport* or hide* or hiding or notif*).tw,kf.	3570785
17	1 or 2 or 3 or 4	2393347
18	5 or 6 or 7	177109
19	8 or 9 or 10 or 11 or 12	224828
20	13 or 14 or 15 or 16	3592343
21	**17 and 18 and 19 and 20**	**2012**

Table 1: Ovid MEDLINE Search String

Acknowledgements

The authors wish to thank Erica Lenton and Rebecca Burt for their assistance with this project.

Data Extraction and Assessment

- Searches were conducted on eight databases and de-duplicated using the Bramer Method[10].
- Two reviewers independently screened all articles at the title/abstract level and again at the full-text level.
- Supplementary search techniques included grey literature searching, hand-searching top h-indexed journals in the field, and reference tracking.
- Data extraction captured the following information: study purpose, population demographics (including gender, sport, level of play, sample size), control groups, findings, and main measures .
- Risk of bias was assessed using the Mixed Methods Appraisal Tool[11].
- Data was analyzed using a narrative synthesis approach[12] , which seeks to summarize and assess the current knowledge and explore relationships between studies.

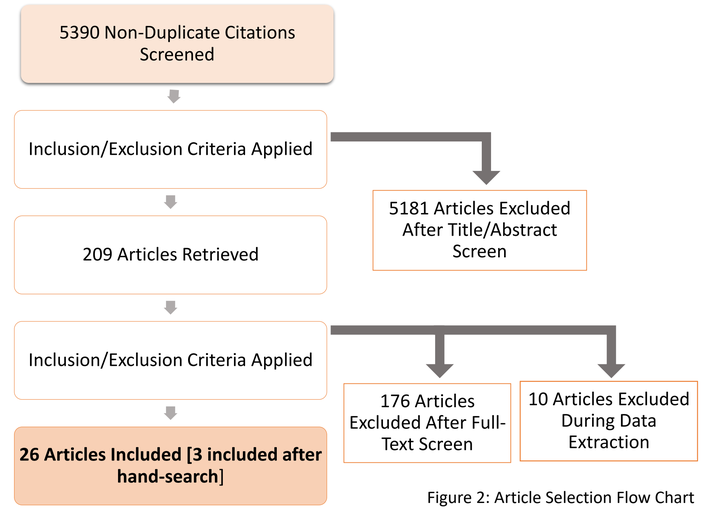

Figure 2: Article Selection Flow Chart

Results

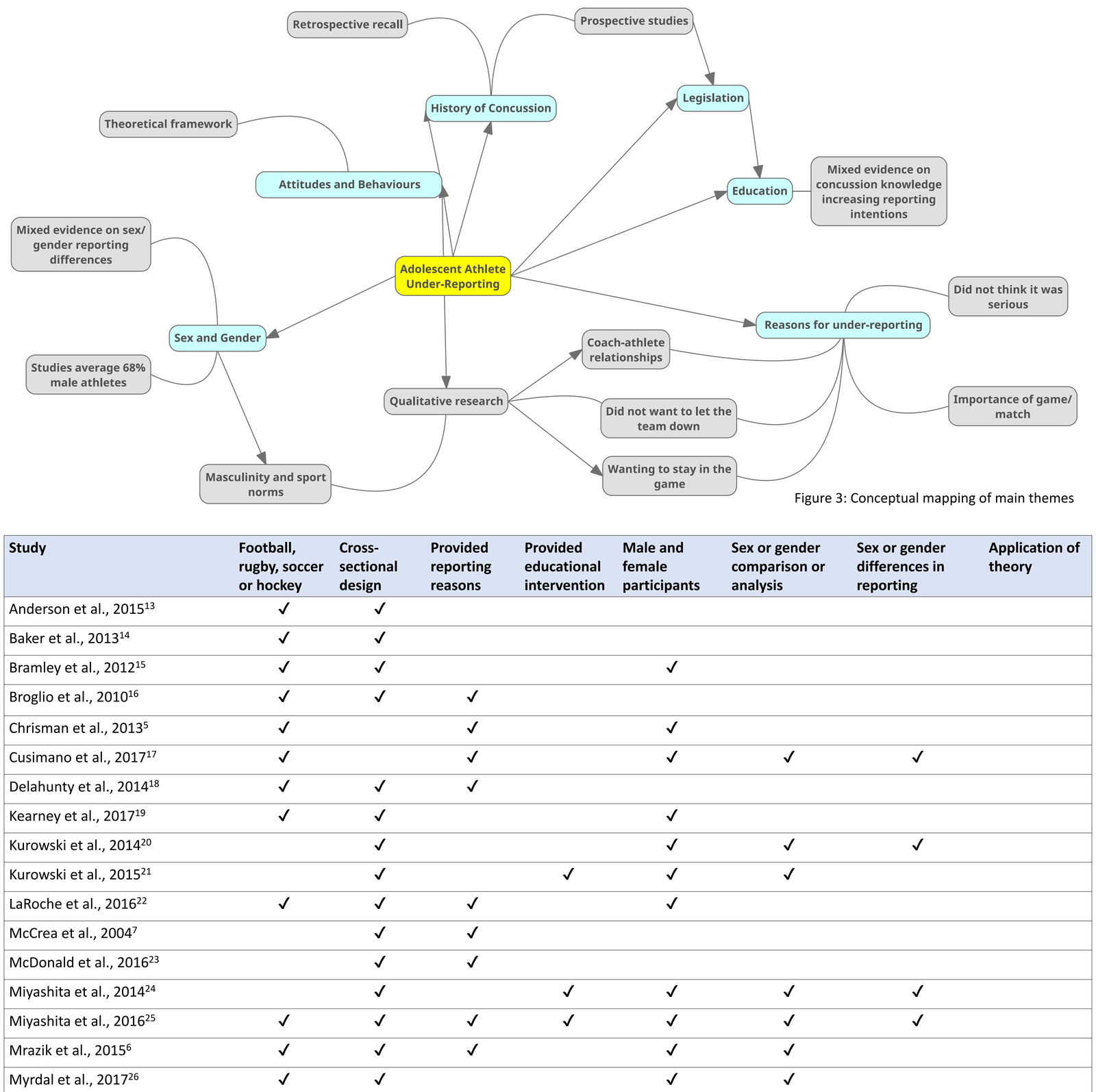

Figure 3: Conceptual mapping of main themes

Study	Football, rugby, soccer or hockey	Cross-sectional design	Provided reporting reasons	Provided educational intervention	Male and female participants	Sex or gender comparison or analysis	Sex or gender differences in reporting	Application of theory
Anderson et al., 2015[13]	✓	✓						
Baker et al., 2013[14]	✓	✓						
Bramley et al., 2012[15]	✓	✓			✓			
Broglio et al., 2010[16]	✓	✓	✓					
Chrisman et al., 2013[5]	✓		✓		✓			
Cusimano et al., 2017[17]	✓		✓		✓	✓	✓	
Delahunty et al., 2014[18]	✓	✓	✓					
Kearney et al., 2017[19]	✓	✓			✓			
Kurowski et al., 2014[20]		✓			✓	✓	✓	
Kurowski et al., 2015[21]		✓		✓	✓	✓		
LaRoche et al., 2016[22]	✓	✓	✓		✓			
McCrea et al., 2004[7]		✓	✓					
McDonald et al., 2016[23]		✓	✓					
Miyashita et al., 2014[24]		✓		✓	✓	✓	✓	
Miyashita et al., 2016[25]	✓	✓	✓	✓	✓	✓	✓	
Mrazik et al., 2015[6]	✓	✓	✓		✓	✓		
Myrdal et al., 2017[26]	✓	✓			✓	✓		
O'Kane et al., 2017[27]								
Register-Mihalik et al., 2013a[28]		✓			✓			
Register-Mihalik et al., 2013b[29]		✓			✓	✓		✓
Register-Mihalik et al., 2017[30]	✓	✓			✓			
Rivara et al., 2014[31]					✓			
Wallace et al., 2017a[32]		✓	✓		✓	✓	✓	
Wallace et al., 2017b[33]		✓	✓		✓			
Wallace et al., 2017c[34]	✓	✓	✓		✓			
Williamson et al., 2016[8]		✓			✓			

Table 2: Study Characteristics

Results (continued)

- There is mixed evidence concerning previous concussion education improving reporting behaviours or intentions.
- Although attitudes and behaviours were common outcome measures, they were often poorly defined and used inconsistently across studies.
- Legislation did not prove effective for increasing reporting behaviours.
- Qualitative findings provided a unique perspective on athletes' rationale for failing to disclose symptoms.
- A history of concussion was not indicative of improved reporting behaviours; retrospective designs and a lack of clarity concerning concussion definitions increased unreliability of concussion symptom recall.

Implications of Findings

- Prior concussion knowledge and education do not sufficiently predict reporting behaviours.
- There is a need for consistent and validated measurement tools and more robust study designs.
- It is important to consider how an athlete arrives at the decision to report symptoms; further qualitative research may prove useful in this regard.
- Although both male and female athletes appear to under-report, the motivations are not well understood.

Full Reference List Available Upon Request