Jack and Jill: Gender specific differences in the assessment of concussion

Andrew Lapointe

University of Michigan

# Methods

In an effort to acquire as many citations as possible on the topic of gender in the diagnosis of concussive injuries three different databases were searched, PubMed, PsycINFO and JSTOR, from January 1970 to October 20th 2016. An initial search queried the aforementioned databases using the term “Parent Perception Child Injury” garnered very few results. Consequently, the search string was expanded using wild card terms. Searches were queried using the following search string shown below and garnered a total of 6983 results.

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| --- | --- | --- | --- | --- |
|  | AND | | | |
| OR | fNIRS | Application\* | Child | Injury |
| NIRS | Disorder | Adolescent | Injury |
| Near Infrared Spectroscopy | Disease | Perception | Injury |
|  | Use\* | Injury |  |
|  | Injury | Report |  |
|  |  |  |  |
|  |  |  | Proxy |  |
|  |  |  | Reporting | Appraisal |
|  |  |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| fNIRS | People | Symptoms and/or Sport/Injury Terms | Assessment/Measure |
| Spectroscopy, Near-Infrared [MeSH Terms] OR  Near-Infrared Spectrometry [MeSH Terms] OR fNIRS  OR NIRS | Sex\* or gender\* | Postural balance [MeSH Terms] OR postural balance OR Oculomotor Muscles [MeSH Terms] OR Fixation, Ocular [MeSH Terms] OR vestibular OR oculomotor OR symptom\* OR Cognition Disorders [MeSH Terms] OR Neurocognitive Disorders [MeSH Terms] OR neurocognit\* OR Gait [MeSH Terms] OR postural stability OR Executive Function [MeSH Terms] OR Psychomotor Performance [MeSH Terms] OR Affective Symptoms [MeSH Terms] OR motor performance OR disabilities OR postural sway OR Eye Movements [MeSH Terms] OR vestibular oculomotor OR dizziness [MeSH Terms] OR dizziness OR neurosensory OR Sleep [MeSH Terms] OR sleep\* OR Fatigue [MeSH Terms] OR fatigue OR Headache [MeSH Terms] OR headache\* OR executive function\* OR emotional function\* OR psychological function\* OR neuropsycholog\* OR sequeala OR cognit\* OR cerebral\* OR cerebrovascular OR Neurobehavioural Manifestations [MeSH Terms] OR neurobehav\* OR Memory [MeSH Terms] OR memory OR ocular motor OR visuomotor  Athletic Injuries [MeSH Terms] OR  Athletic\* OR athlete\* OR  Sports [MeSH Terms] OR sport\*  OR player\* OR  Jockey\* OR football\* OR soccer OR baseball OR boxing OR equestrian OR hockey OR lacrosse OR skating OR diving OR wrestling OR Martial Arts [MeSH Terms] OR racquet sports OR injur\* OR Brain concussion[MeSH Terms] OR concuss\* OR Post-concussion syndrome [MeSH Terms] OR post-concuss\* OR Mtbi OR mild traumatic brain injur\* OR Brain Injuries [MeSH Terms] OR traumatic brain injur\* OR commoti cerebri OR injur\* OR Brain concussion[MeSH Terms] OR concuss\* OR Post-concussion syndrome [MeSH Terms] OR post-concuss\* OR Mtbi OR mild traumatic brain injur\* OR Brain Injuries[MeSH Terms] OR traumatic brain injur\* OR commoti cerebri | Trauma Severity Indices [MeSH Terms] OR Neuropsychological Test [MeSH Terms] OR Severity of Illness Index [MeSH Terms] OR Surveys and Questionnaires [MeSH Terms] OR test\* OR instrument\* OR assess\* OR tool\* OR questionnaire\* OR scale\* OR inventor\* OR battery OR batteries OR measure OR Physical Examination [MeSH Terms] OR examin\* OR scoring OR score\* OR diagnostic evaluation OR screening OR checklist\* OR physical exam\* OR medical exam\* OR OR Tomography, X-Ray Computed [MeSH Terms] OR ct OR mri OR Neuroimaging [MeSH Terms] OR Magnetic Resonance Imaging [MeSH Terms] OR neuroimaging OR neurologic exam\* OR Scat OR scat1 or scat2 OR scat-2 OR scat-3 OR sideline concussion assessment tool\* OR sport concussion assessment tool\* OR \*report\* OR apprais\* OR percept\* OR validity OR reliab\* OR test-retest OR eye-witness OR agreement OR predict\* |
| Child\* OR adolescent OR teen\* OR parent\* OR mother\* OR father\* OR mom\* OR dad\* OR maternal\* OR paternal\* OR proxy OR proxies OR teammate OR practitioner OR doctor\* |

|  |  |  |  |
| --- | --- | --- | --- |
| Patient | Proxy | Symptoms and/or Sport/Injury Terms | Assessment/Measure |
| fnirs [Title/Abstract] OR NIRS [Title/Abstract] OR Spectroscopy, Near-Infrared [MeSH Terms] OR  Near-Infrared Spectrometry [MeSH Terms] | parent\*[Title/Abstract] OR mother\*[Title/Abstract] OR father\*[Title/Abstract] OR mom\*[Title/Abstract] OR dad\*[Title/Abstract] OR maternal\*[Title/Abstract] OR paternal\*[Title/Abstract] OR proxy[Title/Abstract] OR proxies[Title/Abstract] OR teammate[Title/Abstract] OR practitioner[Title/Abstract] OR doctor\*[Title/Abstract] OR GPs[Title/Abstract] OR participant-prox\*[Title/Abstract] OR guardian[Title/Abstract] OR parent-child OR teacher[Title/Abstract] | Postural balance[MeSH Terms] OR postural balance[Title/Abstract] OR Oculomotor Muscles[MeSH Terms] OR Fixation, Ocular[MeSH Terms] OR vestibular[Title/Abstract] OR oculomotor[Title/Abstract] OR symptom\*[Title/Abstract] OR Cognition Disorders[MeSH Terms] OR Neurocognitive Disorders[MeSH Terms] OR neurocognit\*[Title/Abstract] OR Gait[MeSH Terms] OR postural stability[Title/Abstract] OR Executive Function[MeSH Terms] OR Psychomotor Performance[MeSH Terms] OR Affective Symptoms[MeSH Terms] OR motor performance[Title/Abstract] OR disabilities[Title/Abstract] OR postural sway[Title/Abstract] OR Eye Movements[MeSH Terms] OR vestibular oculomotor[Title/Abstract] OR dizziness[MeSH Terms] OR dizziness[Title/Abstract] OR neurosensory[Title/Abstract] OR Sleep[MeSH Terms] OR sleep\*[Title/Abstract] OR Fatigue[MeSH Terms] OR fatigue[Title/Abstract] OR Headache[MeSH Terms] OR headache\*[Title/Abstract] OR executive function\*[Title/Abstract] OR emotional function\*[Title/Abstract] OR psychological function\*[Title/Abstract] OR neuropsycholog\*[Title/Abstract] OR sequeala[Title/Abstract] OR cognit\*[Title/Abstract] OR cerebral\*[Title/Abstract] OR cerebrovascular[Title/Abstract] OR Neurobehavioural Manifestations[MeSH Terms] OR neurobehav\*[Title/Abstract] OR Memory[MeSH Terms] OR memory[Title/Abstract] OR ocular motor[Title/Abstract] OR visuomotor OR Athletic Injuries[MeSH Terms] OR Athletic\*[Title/Abstract] OR athlete\*[Title/Abstract] OR  Sports[MeSH Terms] OR sport\*[Title/Abstract] OR player\*[Title/Abstract] OR Jockey\*[Title/Abstract] OR football\*[Title/Abstract] OR soccer[Title/Abstract] OR baseball[Title/Abstract] OR boxing[Title/Abstract] OR equestrian[Title/Abstract] OR hockey[Title/Abstract] OR lacrosse[Title/Abstract] OR skating[Title/Abstract] OR diving[Title/Abstract] OR wrestling[Title/Abstract] OR Martial Arts[MeSH Terms] OR racquet sports[Title/Abstract] OR injur\*[Title/Abstract] OR Brain concussion[MeSH Terms] OR concuss\*[Title/Abstract] OR Post-concussion syndrome[MeSH Terms] OR post-concuss\*[Title/Abstract] OR Mtbi[Title/Abstract] OR mild traumatic brain injur\*[Title/Abstract] OR Brain Injuries[MeSH Terms] OR traumatic brain injur\*[Title/Abstract] OR commoti cerebri[Title/Abstract] OR autism[Title/Abstract] OR disease[Title/Abstract] | Trauma Severity Indices[MeSH Terms] OR Neuropsychological Test[MeSH Terms] OR Severity of Illness Index[MeSH Terms] OR Surveys and Questionnaires[MeSH Terms] OR test\*[Title/Abstract] OR instrument\*[Title/Abstract] OR assess\*[Title/Abstract] OR tool\*[Title/Abstract] OR questionnaire\*[Title/Abstract] OR scale\*[Title/Abstract] OR inventor\*[Title/Abstract] OR battery[Title/Abstract] OR batteries[Title/Abstract] OR measure[Title/Abstract] OR Physical Examination[MeSH Terms] OR examin\*[Title/Abstract] OR scoring[Title/Abstract] OR score\*[Title/Abstract] OR diagnostic evaluation[Title/Abstract] OR screening[Title/Abstract] OR checklist\*[Title/Abstract] OR physical exam\*[Title/Abstract] OR medical exam\*[Title/Abstract] OR[Title/Abstract] OR Tomography, X-Ray Computed[MeSH Terms] OR ct[Title/Abstract] OR mri[Title/Abstract] OR Neuroimaging[MeSH Terms] OR Magnetic Resonance Imaging[MeSH Terms] OR neuroimaging[Title/Abstract] OR neurologic exam\*[Title/Abstract] OR Scat[Title/Abstract] OR scat1[Title/Abstract] OR scat2[Title/Abstract] OR scat-2[Title/Abstract] OR scat-3[Title/Abstract] OR sideline concussion assessment tool\*[Title/Abstract] OR sport concussion assessment tool\*[Title/Abstract] OR \*report\*[Title/Abstract] OR apprais\*[Title/Abstract] OR percept\*[Title/Abstract] OR validity[Title/Abstract] OR reliab\*[Title/Abstract] OR test-retest[Title/Abstract] OR eye-witness[Title/Abstract] OR witness\*[Title/Abstract] OR evaluat\*[Title/Abstract] OR outcome[Title/Abstract] OR qualitative analysis[Title/Abstract] OR concordance[Title/Abstract] OR accuracy[Title/Abstract] OR appraisal[Title/Abstract] |

Parent-child agreement

|  |  |  |
| --- | --- | --- |
| People | Symptoms and/or Sport/Injury Terms | Assessment/Measure |
| Child\*[Title] OR adolescent[Title] OR teen\*[Title] OR parent\*[Title] OR mother\*[Title] OR father\*[Title] OR mom\*[Title] OR dad\*[Title] OR maternal\*[Title] OR paternal\*[Title] OR proxy[Title] OR proxies[Title] OR teammate[Title] OR practitioner[Title] OR doctor\*[Title] OR adolescenc\*[Title] OR infant\*[Title] OR teacher[Title] OR youth[Title] OR patients[Title] OR participant-prox\*[Title] OR guardian[Title] OR GPs[Title] OR spouse[Title] | Postural balance[MeSH Terms] OR postural balance[Title] OR Oculomotor Muscles[MeSH Terms] OR Fixation, Ocular[MeSH Terms] OR vestibular[Title] OR oculomotor[Title] OR symptom\*[Title] OR Cognition Disorders[MeSH Terms] OR Neurocognitive Disorders[MeSH Terms] OR neurocognit\*[Title] OR Gait[MeSH Terms] OR postural stability[Title] OR Executive Function[MeSH Terms] OR Psychomotor Performance[MeSH Terms] OR Affective Symptoms[MeSH Terms] OR motor performance[Title] OR disabilities[Title] OR postural sway[Title] OR Eye Movements[MeSH Terms] OR vestibular oculomotor[Title] OR dizziness[MeSH Terms] OR dizziness[Title] OR neurosensory[Title] OR Sleep[MeSH Terms] OR sleep\*[Title] OR Fatigue[MeSH Terms] OR fatigue[Title] OR Headache[MeSH Terms] OR headache\*[Title] OR executive function\*[Title] OR emotional function\*[Title] OR psychological function\*[Title] OR neuropsycholog\*[Title] OR sequeala[Title] OR cognit\*[Title] OR cerebral\*[Title] OR cerebrovascular[Title] OR Neurobehavioural Manifestations[MeSH Terms] OR neurobehav\*[Title] OR Memory[MeSH Terms] OR memory[Title] OR ocular motor[Title] OR visuomotor OR Athletic Injuries[MeSH Terms] OR Athletic\*[Title/Abstract OR Brain concussion[MeSH Terms] OR concuss\*[Title] OR Post-concussion syndrome[MeSH Terms] OR post-concuss\*[Title] OR Mtbi[Title] OR mild traumatic brain injur\*[Title] OR Brain Injuries[MeSH Terms] OR traumatic brain injur\*[Title] OR commoti cerebri[Title] OR autism[Title] | Trauma Severity Indices[MeSH Terms] OR Neuropsychological Test[MeSH Terms] OR Severity of Illness Index[MeSH Terms] OR Surveys and Questionnaires[MeSH Terms] OR test\*[Title] OR instrument\*[Title] OR assess\*[Title] OR tool\*[Title] OR questionnaire\*[Title] OR scale\*[Title] OR inventor\*[Title] OR battery[Title] OR batteries[Title] OR measure[Title] OR Physical Examination[MeSH Terms] OR examin\*[Title] OR scoring[Title] OR score\*[Title] OR diagnostic evaluation[Title] OR screening[Title] OR checklist\*[Title] OR physical exam\*[Title] OR medical exam\*[Title] OR[Title] OR Tomography, X-Ray Computed[MeSH Terms] OR ct[Title] OR mri[Title] OR Neuroimaging[MeSH Terms] OR Magnetic Resonance Imaging[MeSH Terms] OR neuroimaging[Title] OR neurologic exam\*[Title] OR Scat[Title] OR scat1[Title] OR scat2[Title] OR scat-2[Title] OR scat-3[Title] OR sideline concussion assessment tool\*[Title] OR sport concussion assessment tool\*[Title] OR \*report\*[Title] OR apprais\*[Title] OR percept\*[Title] OR validity[Title] OR reliab\*[Title] OR test-retest[Title] OR eye-witness[Title] OR witness\*[Title] OR evaluat\*[Title] OR outcome[Title] OR qualitative analysis[Title] OR concordance[Title] OR accuracy[Title] OR appraisal[Title] |

|  |  |  |
| --- | --- | --- |
| Patient | Proxy | assessment |
| \*Child\*[Title] OR \*adolescen\*[Title] OR \*teen\*[Title] OR \*infant\*[Title] OR youth\*[Title] OR \*patient\*[Title] OR athlet\*[Title] OR baby[Title] | parent\*[Title] OR mother\*[Title] OR father\*[Title] OR mom\*[Title] OR dad\*[Title] OR maternal\*[Title] OR paternal\*[Title] OR \*proxy\*[Title] OR \*proxies[Title] OR teammate[Title] OR practitioner[Title] OR doctor\*[Title] OR GPs[Title] OR guardian[Title] OR teacher[Title] | \*report\*[Title] OR apprais\*[Title] OR percept\*[Title] OR \*validit\*[Title] OR \*reliab\*[Title] OR \*test-retest\*[Title] OR eye-witness[Title] OR witness\*[Title] OR \*evaluat\*[Title] OR \*outcome[Title] OR qualitative analysis[Title] OR concordance[Title] OR accuracy[Title] OR appraisal[Title] OR \*scoring[Title] OR checklist[Title] OR assessment[Title] OR \*agreement\*[Title] |
| parent-child\*[Title/Abstract] OR participant-prox\*[Title/Abstract] OR proxy rat\* [Title/Abstract] | | Athletic Injuries[MeSH Terms] OR Athletic\*[Title/Abstract OR Brain concussion[MeSH Terms] OR concuss\*[Title] OR Post-concussion syndrome[MeSH Terms] OR post-concuss\*[Title] OR Mtbi[Title] OR mild traumatic brain injur\*[Title] OR Brain Injuries[MeSH Terms] OR traumatic brain injur\*[Title] OR commoti cerebri[Title] |

|  |  |  |  |
| --- | --- | --- | --- |
| **Patient** | **Proxy** | **Measure** | **Injury** |
| (\*Child\*[Title] OR \*adolescen\*[Title] OR \*teen\*[Title] OR \*infant\*[Title] OR youth\*[Title] OR \*patient\*[Title] OR athlet\*[Title] OR baby[Title]) AND | (parent\*[Title] OR mother\*[Title] OR father\*[Title] OR mom\*[Title] OR dad\*[Title] OR maternal\*[Title] OR paternal\*[Title] OR \*proxy\*[Title] OR \*proxies[Title] OR teammate[Title] OR practitioner[Title] OR doctor\*[Title] OR GPs[Title] OR guardian[Title] OR teacher[Title]) | \*report\*[Title] OR apprais\*[Title] OR percept\*[Title] OR \*validit\*[Title] OR \*reliab\*[Title] OR \*test-retest\*[Title] OR eye-witness[Title] OR witness\*[Title] OR \*evaluat\*[Title] OR \*outcome[Title] OR qualitative analysis[Title] OR concordance[Title] OR accuracy[Title] OR appraisal[Title] OR \*scoring[Title] OR checklist[Title] OR assessment[Title] OR \*agreement\*[Title] OR coherence[Title] | Athletic Injuries[MeSH Terms] OR Athletic\*[Title/Abstract OR Brain concussion[MeSH Terms] OR concuss\*[Title] OR Post-concussion syndrome[MeSH Terms] OR post-concuss\*[Title] OR Mtbi[Title] OR mild traumatic brain injur\*[Title] OR Brain Injuries[MeSH Terms] OR traumatic brain injur\*[Title] OR commoti cerebri[Title] |
| OR (parent-child\*[Title/Abstract]  OR \*-prox\*[Title/Abstract] OR proxy rat\* [Title/Abstract]) | |  |  |

Downs and Black quality assessment tool

Risk of bias assessed by adapted Newcastle Ottawa scale.

((\*Child\*[Title] OR \*adolescen\*[Title] OR \*teen\*[Title] OR \*infant\*[Title] OR youth\*[Title] OR \*patient\*[Title] OR athlet\*[Title] OR baby[Title]) AND (parent\*[Title] OR mother\*[Title] OR father\*[Title] OR mom\*[Title] OR dad\*[Title] OR maternal\*[Title] OR paternal\*[Title] OR \*proxy\*[Title] OR \*proxies[Title] OR teammate[Title] OR practitioner[Title] OR doctor\*[Title] OR GPs[Title] OR guardian[Title] OR teacher[Title]) OR (parent-child\*[Title/Abstract] OR participant-prox\*[Title/Abstract] OR proxy rat\* [Title/Abstract]) AND (\*report\*[Title] OR apprais\*[Title] OR percept\*[Title] OR \*validit\*[Title] OR \*reliab\*[Title] OR \*test-retest\*[Title] OR eye-witness[Title] OR witness\*[Title] OR \*evaluat\*[Title] OR \*outcome[Title] OR qualitative analysis[Title] OR concordance[Title] OR accuracy[Title] OR appraisal[Title] OR \*scoring[Title] OR checklist[Title] OR assessment[Title] OR \*agreement\*[Title] OR coherence[Title]) AND (Athletic Injuries[MeSH Terms] OR Athletic\*[Title/Abstract OR Brain concussion[MeSH Terms] OR concuss\*[Title] OR Post-concussion syndrome[MeSH Terms] OR post-concuss\*[Title] OR Mtbi[Title] OR mild traumatic brain injur\*[Title] OR Brain Injuries[MeSH Terms] OR traumatic brain injur\*[Title] OR commoti cerebri[Title])

Studies will then be reviewed for relevance. Quality assessment of papers will then be performed using Table 1, which was created in accordance with guidelines recommended by Khan et al[1]. Studies reporting specificity, validity, reliability and accuracy measures will be classified as “high” in experimental procedure.

**Table 1.** Description of quality assessment of studies on parent perceptions

|  |  |  |  |
| --- | --- | --- | --- |
| Quality categories | High | Moderate | Low |
| Research design | Quantitative (e.g.Test-retest, specificity, accuracy, validity or reliability measures are included) | Mixed Design | Qualitative (e.g only a narrative/opinion is provided) |
| Number of group comparisons | Evaluated concordance with two or more of the following: neurocognitive tests, practitioner and child athlete. | Evaluated concordance with 1 of the following: neurocognitive tests, practitioner and child athlete. | Did not evaluate concordance with any other proxy |
| Outcome variable being evaluated for concordance | Brain injury, concussion | Sport injury | Any other health related occurrence (e.g depression, autism, general health) |

**Database Results**

Medline

PubMed

JSTOR

PsycINFO

Embase

CINAHL

**Number of Duplicate Records**

N=

Studies included in quantitative synthesis (meta-analysis)  
(n = )

Studies included in qualitative synthesis  
(n = )

Full-text articles assessed for eligibility  
(n = )

Records excluded  
(n = )

Records screened  
(n = )

Records after duplicates removed  
(n = )

Additional records identified through other sources  
(n = )

## Eligibility

Records identified through database searching  
(n = )

## Identification

## Screening

Full-text articles excluded, with reasons  
(n = )

No data

No concussion

Not sports related injury mechanism

Diagnoses/reports not made by team member

Assessment at sideline only

Initial post-injury assessment>14 days

Methods not established

Focus on concussion modifier

Focus on FU

Children/pediatrics

<5 cases

## Included

From our original total of 37 papers, I predict that only 60% will meet my criteria for inclusion bringing my total to approximately 22 papers. Given the low number of papers likely to be included, a revision of the scope of the question being evaluated will be pursued prior to the final paper, a less specific topic may be required.

**References**

[1] Khan KS, Kunz R, Kleijnen J, Antes G. (2003) Five steps to conducting a systematic review. J. R. Soc. Med. **96**, 118–121.

Andrew,

This is generally on the right track. I was also looking to see some inclusion/exclusion criteria, and an outline of the process you would follow to identify relevant papers.

I think your search term is too restrictive and attempts to be too specific. Ideally, you want to get a bunch of more or less on target hits, and then go through the titles, eliminating those that do not fit your topic. Next you would look at the adstracts and again exclude those that don’t fit. Finally, you review the content and keep those that fit. Starting a bit broader might also be helpful in your case because as you go through the titles and abstracts you might see something of interest that is maybe a little different angle on your question, or maybe that broadens the question so that you can identify more relevant papers. Remember that this is meant to be an evolution, and that as you conduct the search you can also refine or reframe your question.

Ray Score: 12/15

|  |  |  |
| --- | --- | --- |
| Author | Sample | Findings |
| Boufous & Finch 2004 |  | 30% of parents discouraged children from playing a particular sport because of injury and safety concerns |
|  |  |  |