

Sports-related mild traumatic brain injury (mTBI) recovery time in intercollegiate athletes

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Abstract

Sports related mTBIs has become an increasingly hot topic. Few studies report mean recovery times from mTBIs and even less for intercollegiate athletes. The primary aim of this study was to compare the recovery time in athletes from a large Division I University to published data for quality assessment and improvement. Secondary aims were to compare recovery times between genders, sport, and league. 53 athletes (26 male & 27 female) with an mTBI from 2010 – 2012 had a mean recovery time of 10.11 days (95% CI 8.58–11.65 d), statistically greater than reported times in the literature. No significant variation in recovery times between genders and NCAA vs. club league were seen. Subgroup statistics of 13 sports were inconclusive due to low power. However, the male football subgroup had a mean recovery time of 6.5 days (95% CI 4.86–8.14 d), statistically similar to published data. Multiple confounding variables were not controlled. However, this study did highlight areas for quality improvement. Further studies with higher power and confounding variable control are needed for a definitive baseline recovery time. This study is the first to report mean recovery time in a Division I program. Similar studies should be done at other institutions to ensure compliance with standard of care.

Introduction

Background

- Concussions are complex pathophysiological processes affecting the brain and:
 - Usually caused by trauma with an “impulsive” force transmitted to the head
 - Rapid onset and short duration of impaired neurological function with spontaneous resolution
 - Represent a functional disturbance rather than a structural injury (See Figure 1)
 - Typically do not involve loss of consciousness and resolve in a predictable sequential course
 - Have no abnormality on standard imaging
- 1.6 – 3.8 million sports concussions occur each year
- No evidence based concussion guideline exists, making clinical decisions on return to play difficult
- There are no effective evidence based medical interventions for concussions
- Physical and cognitive rest are the mainstays of concussion management
- Very few studies report the mean time to recovery from sports concussion



Fig. 1: A concussion is a violent jarring or shaking that results in disturbance of brain function rather than structural injury

Objectives

- **Primary:** Determine the mean time to recovery from mTBI at a large Division I NCAA institution and compare to times reported in the literature
- **Secondary:** Compare the time to recovery between gender, sport, and league (NCAA vs. non-NCAA)

Methods

Design: Retrospective chart review

Setting: Large Division I NCAA University

Patients: Concussed NCAA & non-NCAA athletes from Aug. 2010 – Nov. 2012

Measurements: Time to recovery, gender, sport, and league

Time to recovery: Time from concussion diagnosis to return to play

Return to play guidelines: Athletes are cleared to play when asymptomatic at rest, asymptomatic with exertion, and neurocognitive testing at or near baseline

Neurocognitive testing: Immediate post-concussion assessment and cognitive testing (ImPACT), a validated computerized neurocognitive test

Statistical Analysis: Descriptive statistics and nonparametric Wilcoxon rank-sum test

Exclusion Criteria: Non sports-mTBI injuries, athletes under alcoholic influence, no medical records, post-concussion syndrome, lack of dates, specialist referral, abnormal imaging, and medical treatment. 55 cases identified and 2 excluded.

Results & Discussion

Primary Objective Results: Table 1

- 53 cases showing a mean time to recovery of 10.11 days
- Statistically greater than NCAA study, but significance could not be determined due to lack of data from NCAA study
- Overlap of 95 % CI with time to recovery in Zurich Statement.

Secondary Objective Results: Recovery time by gender and sport league

- No statistically significant difference in recovery time between gender (Table 2)
- No statistically significant difference in recovery time between NCAA and non-NCAA athletes (Table 3)

Table 1: Comparison of time to recovery from sports-related mTBI

Source	Recovery Time (95 % CI) [days]	N
Current Study's Results	10.11 (8.58 - 11.65)	53
NCAA Concussion Study	7 ^a	79 ^b
Zurich Consensus Statement	7 - 10 ^c	N/A ^c

^aconfidence intervals for this study were not given; ^ball athletes in this study were male NCAA football players; ^ca relative range was given without a confidence interval or mention of sample size

Table 2: Mean time to recovery from sports-related mTBI delineated by gender

Sex	Recovery Time (95 % CI) [days]	N
Male	9.74 (7.38 - 12.1)	27
Female	10.5 (8.4 - 12.6)	26

Nonparametric Wilcoxon rank-sum test: Z = 0.72 (Z_{critical} = 1.96)

Table 3: Mean time to recovery from sports-related mTBI delineated by sport league

Sport Group	Recovery Time (95 % CI) [days]	N
NCAA	9.91 (8.27 - 11.55)	45
Non-NCAA (Club)	11.25 (5.87 - 16.63)	8

Nonparametric Wilcoxon rank-sum test: Z value = 0.52 (Z_{critical} = 1.96); NCAA - National Collegiate Athletic Association

Secondary Objective Results: Recovery time by sport

- Low power at sport subgroup level did not allow for much data interpretation
- Most represented sport, men's football, had mean recovery time similar to comparison studies and most closely matched the study group in the NCAA concussion study

Table 4: Mean time to recovery from sports-related mTBI delineated by sport

Sport	Recovery Time (95 % CI) [days]	N
Basketball	10.4 (3.57 - 17.23)	5
Basketball: Men	14 ^a	1
Basketball: Women	9.5 (0.09 - 18.91)	4
Cheerleading: Women	12 ^a	1
Football: Men	6.5 (4.86 - 8.14)	12
Gymnastics: Women	13 ^a	1
Lacrosse: Men	8 ^a	1
Rugby	12 (-1.12 - 25.12)	4
Rugby: Men	8.33 (-3.14 - 19.81)	3
Rugby: Women	23 ^a	1
Soccer: Women	10.38 (6.05 - 14.71)	8
Surfing: Women	5 ^a	1
Tennis: Women	17 ^a	1
Track & Field: Male	17 ^a	1
Volleyball: Women	7.5 (1.15 - 13.86)	2
Water Polo: Women	9.57 (5.48 - 13.67)	7
Wrestling: Men	13.44 (7.49 - 19.4)	9

^asports with a single case did not have confidence intervals

Conclusions

- Statistically longer recovery time at this study's institution, but not conclusive
- No significant difference when comparing matched sport subgroups
- No significant difference in recovery time between genders
- No significant difference in recovery time between NCAA and non-NCAA athletes

Study Limitations

- Low power
- Poor control of confounding variables

Future Directions

- Repeat studies with better control and higher power
- Similar studies at other institutions for more definitive mean time to recovery
- Determination of sound evidence based management guidelines
- Clinical trials investigating therapeutic interventions for concussion management