HISTORY

In spring 2017 Roger Tobin of the Physics Department contacted the Athletics Committee to question why we are letting our students play football in light of all the dire information coming out about the dangers of concussions. Roger joined the committee for a conference call with Paul Berkner, the medical director at Colby College and a consultant to the NESCAC athletic conference. Dr. Berkner made two things clear: first, this is not just a question about football, since concussions occur in many other sports, and, in fact, are lower per capita in football because there are so many players on the team; second, at Colby College, half the concussions each year are due to athletics, the other half to nonathletic injuries. He also pointed out that most of the football injuries occur in practice, and schools that practice less have more concussions in games.

In fall 2017 Roger and other colleagues brought the issue up at a faculty meeting and in correspondence with the president. After the committee chair met with the president and was given the go-ahead, the Athletics Committee organized two subcommittees. Group 1 would look at what Tufts, NESCAC, other NESCAC schools, and the NCAA were doing to reduce the frequency and severity of concussion injuries. At Tufts we talked to Pres. Monaco, Provost Harris, and Associate Provost Dunn at the upper administrative level, Athletics Director John Morris and Director of Sports Medicine Nick Mitropoulos, University Counsel Dana Fleming, Health Services physician Peter Doyle, and Dowling Associate Advising Dean Carol Baffi-Dugan; at NESCAC to Executive Director Andrea Savage and again to conference medical consultant Paul Berkner; and to Jane Chaplin, head of the faculty Athletics Committee at Middlebury College. Appendix A shows the list of questions we asked the appropriate parties. Group 2 looked selectively at the scientific literature on concussions.

The two groups reported to the full committee late in spring 2018. Since there wasn't time then to report to the faculty, and because there are a number of new members on the committee this year, the current committee reviewed the previous year's work and prepared this report and recommendations for delivery to the AS&E faculty in spring 2019.

SUBCOMMITTEE 1

President Monaco advised us that he and the other NESCAC presidents are taking the risk of concussion to student athletes very seriously. In addition to the president's work on this issue, Athletic Director John Morris and Tufts Senior Associate Athletic Director Alexis Mastronardi attended a conference on concussion injuries organized by NESCAC.

Athletic Director Morris and Director of Sports Medicine Mitropoulos explained some of the changes that have been made in football. In the preseason practices are now limited
to one practice a day (instead of two, as formerly), and each practice lasts 1.5 - 2 hours. Also, in three out of four practices they do not tackle to the ground but rather employ "thudding," that is, hugging and picking up the opposing player. These two changes have been limiting the chances of injurious impact. Emphasis is put on training players to tackle properly and protect themselves. A well-developed concussion protocol is shared with athletes and coaches (see Appendix B for Tufts Concussion Protocol, which incorporates the NESCAC and NCAA protocols, and which gets improved every year with input from Health Services and NESCAC), and the athletes are shown an NCAA video on concussions. Sports Medicine performs baseline testing on all freshman and sophomore athletes to provide a benchmark in case an athlete suffers a concussion. A trainer from Sports Medicine is always present during practice and games. It is the trainer's decision whether to pull an athlete out for a suspected concussion, and the coaches have been clearly instructed by the athletic director not to put any pressure on the trainers. Consideration is also being given to rule changes, such as moving the kickoff line to prevent high-risk runbacks (a step already taken by the NFL, but proving to be less effective than expected because kickers purposely kick the ball short), and efforts are being made to improve helmet design. Similar procedures are in place for the other varsity sports. Men's lacrosse and ice hockey have fewer contact drills and less scrimmage time, and soccer is striving to limit head balls and dives. John and Nick felt that, while the severity of concussions appears to be the same, the rate of concussions has been reduced (see Appendix C, a NESCAC document comparing the incidence of athletic concussions at Tufts over the last four years with the other NESCAC schools—note that NESCAC only has figures for varsity sports—and Appendix D, showing Tufts Sports Medicine figures for Fall 2018). When John asked Nick whether there is anything more that we could do, Nick mentioned that there is some advanced equipment to better test athletes and the severity of their concussions – balance equipment and goggles to perform ocular testing.

Varsity athletes diagnosed with a concussion are treated by Sports Medicine. But a number of our respondents expressed concern about club sports. Because club sport coaches are part-time and paid less, they don't get the training in concussion protocols that the varsity coaches do, nor are trainers present at practices or games. There are quite high incidences of concussions in men's and women's rugby and ultimate frisbee (see Appendix E, with concussion figures for rugby and ultimate frisbee at Tufts over the previous four academic years). Normally club sports athletes are seen by Health Services. Given the incidence of concussions in rugby and ultimate frisbee, they have been brought under the wing of Sports Medicine, and the Athletics Department has mandated that no events can be held without a trainer available. Our committee recommends that greater resources be put into club sports, including better training of coaches and the presence of trainers at practices and games.

Everyone we asked about sub-concussive impacts and their consequences maintained that they are very hard to diagnose and we are not yet in a position to assess the consequences. However, all of the efforts made to reduce concussions should also reduce sub-concussive injuries.
University Counsel Dana Fleming told us there are hundreds of concussion lawsuits pending around the country. Many of these lawsuits are being consolidated, including one lawsuit against NESCAC filed by a former Williams College football player. The University is monitoring these cases carefully and identifying risk management strategies that are informed by these cases and emerging best practices for concussion prevention and treatment. At this point the University's overall strategy is for risk mitigation rather than getting rid of particular sports.

Dr. Peter Doyle is responsible for treating students with concussions in Tufts Health Services. He talked about new approaches to treatment of concussions that seem to speed healing and lessen the likelihood of depression. He is concerned that some athletes may deliberately undertest on the baseline testing, and some may be less than truthful about their symptoms if they are anxious to get back on the field.

Carol Baffi-Dugan, an advising dean in Dowling, reported the following:

“We have a database on reported concussions… We note who diagnosed a concussion, so that will typically tell us if it was athletic or not... Anecdotally, the vast majority of concussions resolve themselves pretty quickly and in the short term faculty are very supportive and flexible with students. Those with significant longer-term symptoms are referred to student accessibility services for short-term accommodations. In very rare circumstances a student takes a medical leave... From my perspective, since we put together our protocol, working between Dowling, health services and athletics, the trainers have been very clear and very consistent with athletes about returning to play. Returning to play and returning to 100% academic engagement usually go hand-in-hand.”

Information provided to us by Dean Baffi-Dugan and Dr. Doyle indicates that the vast majority of concussions at Tufts do not involve varsity athletes. Dowling keeps a record that probably comes closest to tabulating all concussions at Tufts, since they work to get the students back in the classroom. Last year, in which there were approximately 85 student concussions at Tufts, only 10 involved varsity athletes, 19 involved mens and womens rugby club teams, and the remaining 55 or so must be from other club sports and non-athletic concussions. Both Student Services and Health Services are taking steps to improve the diagnosis and handling of concussions.

We also talked with Andrea Savage, Executive Director of the NESCAC conference, and Dr. Paul Berkner, a medical consultant to the conference who also chairs a committee on Medical Aspects in Sport studying the concussion issue. Director Savage largely echoed what we’d heard at Tufts about the changes already in place or being contemplated to reduce the frequency and severity of athletic concussions. Dr. Berkner pointed out that his group is looking into a system of concussion prevention applicable to all sports. When asked whether a first concussion may make an athlete more vulnerable to future concussions and whether athletes who have suffered a previous
concussion should be treated differently, he responded that the research literature doesn't show worse short-term consequences, and he suspects that other factors, such as gender, migraines, and ADHD, may prolong the length of recovery. (Incidentally, a recent report in the newspaper suggested that certain people may be genetically more susceptible to concussions and long-range cognitive damage.) Dr. Berkner's general sense is that the presidents of the NESCAC institutions have made the issue of athletic concussions a high priority, that there is not enough data to indicate what changes to make (though NESCAC is looking into it), that the general approach is not to make changes without being sure of the results, and that NESCAC is ahead of the curve compared to many conferences. He noted that three studies of Division III sports do not show a relationship between concussive sports and long-term neurological outcomes. Finally, he pointed out that data from four institutions – Williams, Colby, Amherst, and Middlebury – show that less than half the concussions each year are athletic.

We also corresponded with the chair of the faculty athletic committee at Middlebury College, a committee that has also focused on concerns about concussions. In recent years one meeting has been devoted to statistical reports on concussions, and a report was made last year to the full faculty. Emphasizing that the majority of concussions at Middlebury are nonathletic, she notes that "the most frequent cause of concussions is students banging their heads on a piece of furniture when they bend over to pick up a phone in the dark because they don't want to switch on the light and disturb a sleeping roommate."

SUBCOMMITTEE 2

Report of the Subcommittee of the Athletics Committee Evaluating the Scientific Literature

April 13, 2018

In preparation for this meeting, we reviewed six published papers; full references are given at the end of this document. These six included the Consensus Statement on Concussion in Sport and five articles published in peer-reviewed journals. The five articles were not intended to be a random sample of the existing literature. Instead, they were chosen to give the members of the subcommittee a feel for the state of the literature on the effects of concussions and sub-concussive impacts.
In our view, the *Consensus Statement* does a nice job of summarizing the state of the literature in the “Residual effects and sequelae” subsection; “The literature on neurobehavioral sequelae and long-term consequences of exposure to recurrent head trauma is inconsistent. Clinicians need to be mindful of the potential for long-term problems such as cognitive impairment, depression, etc in the management of all athletes. However, there is much more to learn about the potential cause-and-effect relationships of repetitive head impact exposure and concussions” (p. 7).

Our read of the literature is that a combination of inherent limitations and critical research design problems make the validity and generalizability of many of the studies questionable. Among the common problems are:

1) Sample selection issues – many of the authors are up front about the fact that they are using convenience samples. But the conclusions that are drawn are probably too strong given the nature of the samples. And, in cases where convenience samples are not used, the authors frequently make sample retention choices that weaken their experimental group, their control group, or both.

2) Poorly designed control groups – few of the studies provide the basic statistical analysis needed to make the case that, save for experimental treatment, the control and experimental groups are statistically indistinguishable. Our expectation is that they would typically be able to reject that null that the two groups were indistinguishable, making it unclear if their findings are a result of real effects or poor experimental design.

3) Small sample sizes

While individual studies had other potential flaws, these issues were common across the papers we reviewed. As a result, we understand why the authors of the *Consensus Statement* concluded that our state of knowledge is too limited to make any definitive statements about long-term impact.
Nevertheless, we feel that, even given these flaws, there are several lessons that stand out from the papers we read. These are:

1) Athletes with a history of concussions are more likely to experience deficits later in life.
2) Concussions are hard to detect. As a result, it is not clear that any discovered effects of sub-concussive impacts are a result of those impacts or of undetected concussions. As a result, it may be worth pursuing in-season “procedures that lead to the identification of these at-risk individuals” (Talavage, et al, 2014, p. 337). Universal IMPACT testing might be an option, though other options should be discussed.
3) Singling out football makes no sense. While many of the studies focus on football players some of the starkest cases were athletes from other sports. Sub-concussive impacts might be more of an issue in football than in other sports, but concussions occur in all contact sports. Since the strongest evidence of long-term effects is for those athletes who have experienced a concussion, the focus should be on detecting concussions and on making sure that athletes do not return to play until any detectable evidence of concussion has resolved.

Papers reviewed


APPENDIX A – GROUP 1 QUESTIONS

What changes have been made in football to prevent or reduce the severity of concussions? To make sure that concussions are immediately detected and dealt with? Other sports?

Have these changes shown positive results in preventing or reducing the severity of concussions?

Is any attention being paid to preventing sub-concussive injuries?

How are coaches at Tufts trained to deal with concussions (all sports)? What are players told (all sports)? Should there be an independent evaluator involved in determining when concussed athletes can return to practice and competition?

What is the concussion protocol at Tufts? Is it state of the art? Is it applied in all sports? Club sports? What's the recovery program and who oversees it?

Given that first concussion may make athlete more vulnerable to future concussions, are athletes who have suffered previous concussions treated any differently?

From a Student Services perspective, how much do concussions affect students’ academic performance, short-term and long-term?

What further changes are contemplated in football to reduce risk of concussions? Other sports?

Where's the line? What would it take for us to drop a sport?

What would be the consequences of dropping football? Other sports?

What legal exposure does Tufts face?

Whose job is it to think about and oversee these concerns? Administration, Health Services, Faculty, Athletics Dept.?
What are other (NESCAC and other Division III schools) doing to increase student-athlete safety?
APPENDIX B

Tufts University Head Injury Protocol

Concussion is a brain injury and is defined as a complex pathophysiological process affecting the brain caused by either a direct or indirect blow to the head or caused by the head striking something else such as the ground. Concussion typically results in the rapid onset of short-lived impairment of neurologic function that resolves spontaneously. However in some cases, signs and symptoms may evolve over a number of minutes to days. Concussion may result in neuropathological changes, but the acute clinical symptoms largely reflect a functional disturbance rather than a structural injury. Concussion results in a graded set of clinical symptoms possibly including headache, nausea, vomiting, dizziness, balance problems, feeling “slowed down”, fatigue, trouble sleeping, drowsiness, sensitivity to light or noise, blurred vision, difficulty remembering or difficulty concentrating and may or may not involve loss of consciousness.

Second Impact Syndrome, a rare but life-threatening complication related to concussion, occurs when an individual sustains a second, often minor trauma to the head before the initial symptoms of the first head injury have resolved. The resulting loss of auto regulation of the brain’s blood supply could result in vascular engorgement and herniation of the lower brain, causing death. There are high morbidity and mortality rates associated with Second Impact Syndrome.

Brain injury and concussion history will be specified by the student athlete in Sportware and Impact baseline testing prior to participation. Pre-participation clearance regarding previous concussions will be determined by medical providers at Tufts University Sports Medicine after reviewing each student-athlete’s Health History Form and Sport Pre-Participation History and Physical Form. The Tufts University Athletic Training Staff will refer any student-athlete (SA) who has not completely recovered or is still having any problems from previous concussions to student health or directly to a neurologist for further examination. Referrals may be made by Health Services to concussion specialists in the community if additional consultation is necessary.

Educating our student-athletes, coaches, team physicians, athletic trainers and administrators is an important component of our concussion policy. In the preseason, each of these groups will receive a copy of the appropriate NCAA fact sheet on concussion. Each incoming student athlete will watch a video on concussion by the NCAA. Also, our athletic training staff will spend time in their preseason meetings with their student-athletes and coaches to discuss our protocol for concussion management.

All incoming Tufts University Student Athletes who participate in high risk sports will complete ImPACT baseline testing as part of their requirements to participate.

Recognition and diagnosis of concussion management plan:

• Medical personnel with training in the diagnosis, treatment and initial management of acute concussion are “present” at all varsity competitions in the following
contact/collision sports: basketball; field hockey; football; ice hockey; lacrosse; pole vault; soccer.

- Medical personnel with training in the diagnosis, treatment and initial management of acute concussion are “available” at all varsity practices in the following contact/collision sports: basketball; equestrian; field hockey; football; ice hockey; lacrosse; pole vault; rugby; skiing; soccer. To be available means that, at a minimum, medical personnel can be contacted at any time during the practice via telephone, messaging, email, beeper or other immediate communication means. Further, the case can be discussed through such communication, and immediate arrangements can be made for the athlete to be evaluated.

**Recognition, Diagnosis and Treatment of Concussion**

- The following concussion management protocol will be followed during practices and games after head injury when a student-athlete (SA) shows any signs, symptoms, or behaviors consistent with a concussion on Tufts Campus or Away:
  1. The student-athlete shall be withheld from the competition or practice and will not be allowed to return to activity for the remainder of the day if a concussion is confirmed.
  2. The Athletic Trainer (AT) or team physician with concussion experience will examine the SA. The mental status of the student will be regularly monitored for deterioration or post concussive symptoms.
  3. The AT will use a Graded Symptom Checklist (GSC) protocol for each subsequent follow-up assessment until all signs and symptoms related or attributed to their concussion have cleared at rest and during physical and cognitive exertion.
  4. The AT and Sports Medicine Team Physician will have unchallengeable authority to determine management and return to play of any ill or injured SA, as they deem appropriate. The AT’s decision is final.
  5. The SA must complete the attached return to play protocol before they return to full participation in sport.

**Follow-Up/Communication**

1. The SA will receive the attached letter for concussion education at the initial evaluation in the athletic training room. At this time their Academic Dean will be contacted via Email to notify them that the SA has sustained a concussion.

2. The SA has the ability to work with their Dean in order to request academic accommodations, they also may reach out to Student Accessibility Services for further assistance.

3. The Athletic Training Staff will monitor the student daily if possible until resolution of their symptoms. Athletic Training Staff will document the incident, evaluation, continued management, and clearance of the SA via the Sportware injury tracking program.

4. Medical clearance and final authority for return to play shall reside with the Team Physician.
ImPACT
1. Immediate Post-Concussion Assessment and Cognitive Testing (ImPACT http://www.impacttest.com/index.html) is a concussion management program to help evaluate recovery following concussion.
2. It is mandatory for all freshmen SA on all intercollegiate teams to have a baseline ImPACT test as part of their medical clearance process.

General Use of IMPACT for Return to Play Following a Head Injury
1. ImPACT is an adjunctive tool that can be used to evaluate the SA who has had a concussion.
2. ImPACT will be administered once the SA is free of symptoms (as defined by the Graded Symptom Checklist) with cognitive activity.
   a. ImPACT post-test #1 is taken by SA in the presence of an AT.

Return to Sports
• Student athletes on varsity teams are followed collaboratively by Athletic Trainers, Team Physicians and sports medicine specialists (if required) associated with Tufts Athletics, communicating via secure (encrypted) email or Sportware notes.
• In general, student athletes are evaluated and followed until asymptomatic, then progressed through ImPACT testing, a graduated exertion protocol under the guidance of Athletic Trainers and sports medicine specialists.
• Final clearance to return to sports is given by Team Physician.

Graduated Exertional Return to Play Protocol:
This guideline will serve as a basis for return to play after a concussion for a supervised in-season athlete, some cases may require more individualized treatment with MD approval and supervision. No athlete should return to play following a concussion in less than 7 days, and without completed a graded return to play outlined below.

For athletes who begin the symptomatic exercise protocol, they may begin the graded return to play on step 3 if they become asymptomatic in 4 or more days post-concussion. Athletes who begin the exercise protocol while symptomatic and have symptoms abate in less than 4 days must begin the RTP protocol on step 1.

Impact testing should be completed prior to step 6 but can be administered at any time during the progression before this, and should be performed when the athlete becomes asymptomatic. The athlete’s Impact score must be normal before progressing to contact (step 6).

Step 1 should be supervised, other steps can be supervised based upon your discretion. Each step should take at least 1 day. Athletes should be instructed not to complete other “exercise” during the progression.
If symptoms return at or after a certain step but resolve rapidly (within 1-2 hours), the athlete may resume the progression one step lower the next day. If the symptoms persist for longer or recur again at the lower step, the athlete should start again from step 0.

A. **RTP Protocol:**
   - **Step 0:** 10-15 minutes of low level exercise daily until feeling 100% back to normal.
   - **Step 1:** 15 minutes on an exercise bike at about 50% of maximum exertion.
   - **Step 2:** 20 minutes on an exercise bike at about 80% of maximum exertion.
   - **Step 3:** 30 minutes of running/simple drills
   - **Step 4:** Sports specific activity without contact or risk of hitting head for 45 minutes. This may include skating for ice hockey athletes.
   - **Step 5:** Sports specific activities and drills at maximum exertion without contact or risk of hitting head for 60 minutes (maximum exertion test). ImPACT must be back to normal before proceeding to Step 6.
   - **Step 6:** Full practice with contact (non-contact athletes may skip this step).
   - **Step 7:** Full clearance

B. **Symptomatic Exercise Protocol:**
   - May begin exercise protocol 48 hours post-concussion ONLY if symptoms are trending down.
   - Must complete an exercise tolerance test (ETT) prior to initiating any exercise.
   - **ETT:** 10 minutes on bike without resistance up to a maximum of HR of 90 BPM and rating of work 10 on RPE (linear non-impact non-jarring aerobic exercise) if symptoms are not exacerbated athlete passes. Symptom exacerbation fails test.
   - **Passing ETT:** athlete may bike later that day or once per day for 30 mins at a self-selected resistance with a maximum heart rate of 160 bpm or an RPE of 15 (this is the limit of the exercise, not the goal. Athlete should comfortably exert themselves within these limits). If symptoms are exacerbated the exercise is ended, and the athlete must pass the ETT test again before resuming exercise.
   - **Failing ETT:** Athlete may not participate in exercise and may repeat the ETT in 24 hours.

**Student Accessibility Office involvement in concussion recovery:**
- Once a SA sustains a concussion and reports it to Sports Medicine their academic Dean is contacted
- The Academic Dean will work to provide support and coordination with the student’s professors if assistance or accommodations are required
- At Concussion evaluation the SA is encouraged to get in contact with their Dean as academic action is non-retroactive
- If the SA has prolonged symptoms and feels they may require further support, they may contact the Student Accessibility Office
- The SAO provides classes to assist students recovering from injury/illness and may also coordinate greater potential accommodations if needed.
Athlete sustains concussion:
Immediate management (removal from play, red flag assessment, education, symptom assessment, dean notified)

MD assessment

Asymptomatic athlete:
Follows current protocol on step 0

Symptomatic Athlete:
-May begin exercise protocol 48 hours post-concussion ONLY if symptoms are trending down.
-Must complete an exercise tolerance test prior to initiating any exercise.
-ETT: 10 minutes on bike without resistance up to a maximum HR of 90 BPM and rating of work 10 on RPE (linear non-impact non-jarring aerobic exercise) if symptoms are not exacerbated athlete passes. Symptom exacerbation fails test.
-Passing ETT: athlete may bike later that day or once per day for 30 mins at a self-selected resistance with a maximum heart rate of 160 bpm and an RPE of 15 (this is the limit of the exercise, not the goal. Athlete should comfortably exert themselves within these limits) If symptoms are exacerbated the exercise is ended, and the athlete must pass the ETT test again before resuming exercise.

If the athlete becomes asymptomatic in 4 or more days they may begin RTP protocol on step 3

If athlete becomes asymptomatic in less than 4 days they begin RTP protocol on step 1
<table>
<thead>
<tr>
<th>Step</th>
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<tbody>
<tr>
<td><strong>ACADEMIC EXPECTATIONS</strong></td>
</tr>
<tr>
<td><strong>ATHLETIC EXPECTATIONS</strong></td>
</tr>
<tr>
<td>1 Complete physical &amp; cognitive rest necessary while acutely symptomatic. Complete cognitive rest: limit (or no) TV, computer and testing until Sx free at rest.</td>
</tr>
<tr>
<td>Complete physical rest. NO sports OR aerobic physical activity. Excuse from team meetings/functions/travel.</td>
</tr>
<tr>
<td>Progress to the next phase when able to tolerate up to 30 min of mental exertion without worsening symptoms.</td>
</tr>
<tr>
<td>2 Gradual return to class. May need partial days initially. Start with class observations, next add participation. Gradually increase to full days and assignments. No tests/quizzes/exams.</td>
</tr>
<tr>
<td>Continue physical rest. May watch home games if able to tolerate noise/stimulation. No attending practices. As mental &amp; physical stamina increases, activity w/o brain bounce (stationary bike, walking on TM). Student may be cleared for supervised light aerobic activity w/o brain bounce (stationary bike, walking on TM).</td>
</tr>
<tr>
<td>Progress to next Phase when tolerating full class schedule and/or working with SEAS. If the ORANGE phase persists &gt; 2 weeks, consider a Reduced Course load.</td>
</tr>
<tr>
<td>3 Tolerating class and able to do assignments. Testing may begin. Limit one exam per day. Student may need extended time and is working with SAO for this and other possible accommodations.</td>
</tr>
<tr>
<td>Once asymptomatic at rest, ImPACT testing performed, reviewed by Brown concussion specialists. Communication with Athletic Training staff. Initiate Return to Play Protocol if participating in full academic course load with minimal or no academic accommodations implemented for concussion recovery. (Some students may have accommodations in place for other academic reasons)</td>
</tr>
<tr>
<td>Progress to &quot;Green&quot; when tolerating full academic load with minimal OR no accommodation. If Yellow phase persists &gt; 6-8 weeks, consider Neuropsych Testing</td>
</tr>
<tr>
<td>4 Examinations okay. Time to begin &quot;Catch Up.&quot; SAO Office remains involved as long as accommodations are required.</td>
</tr>
<tr>
<td>Progress through Return To Play Protocol with careful supervision by ATC staff.</td>
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</tbody>
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This chart provides a general guide for how a re-entry to academics is managed by Sports Medicine Staff, if further assistance is required it is handled by their Academic Dean and the Student Accessibility Office.
APPENDIX C – NESCAC CONCUSSION DATA

The following report compares data collected in 2017-2018 from Tufts University to its 2014-2015, 2015-2016, and 2016-2017 data, as well as to other NESCAC schools that are also participating in this study. There are four main sections:

1. Summary Statistics
2. Time to Return to Athletics and Academics
3. Comparison of Exposure Rates
4. Comparison of Concussions Sustained in Practice and in Games
## Summary Statistics

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<tbody>
<tr>
<td></td>
<td>Concussions per 1000 Exposures</td>
<td>Total Concussions</td>
<td>Concussions per 1000 Exposures</td>
</tr>
<tr>
<td>Football</td>
<td>0.72</td>
<td>0.22</td>
<td>0.41</td>
</tr>
<tr>
<td>W Soccer</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>M Soccer</td>
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<td>0</td>
<td>0.48</td>
</tr>
<tr>
<td>Field Hockey</td>
<td>0.72</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>W Basketball</td>
<td>0.63</td>
<td>0</td>
<td>1.41</td>
</tr>
<tr>
<td>M Basketball</td>
<td>0</td>
<td>0</td>
<td>1.41</td>
</tr>
<tr>
<td>M Ice Hockey</td>
<td>0.85</td>
<td>2.44</td>
<td>1.11</td>
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<tr>
<td>W Lacrosse</td>
<td>1.42</td>
<td>0</td>
<td>0.20</td>
</tr>
<tr>
<td>M Lacrosse</td>
<td>0</td>
<td>0</td>
<td>0.52</td>
</tr>
</tbody>
</table>

- 2017-2018:
  - Football: 0.72, Total Concussions: 3
  - W Soccer: 0, Total Concussions: 0
  - M Soccer: 0, Total Concussions: 0
  - Field Hockey: 0.72, Total Concussions: 1
  - W Basketball: 0.63, Total Concussions: 1
  - M Basketball: 0, Total Concussions: 0
  - M Ice Hockey: 0.85, Total Concussions: 2
  - W Lacrosse: 1.42, Total Concussions: 3
  - M Lacrosse: 0, Total Concussions: 0

- 2016-2017:
  - Football: 0.22, Total Concussions: 1
  - W Soccer: 0, Total Concussions: 0
  - M Soccer: 0, Total Concussions: 0
  - Field Hockey: 0, Total Concussions: 0
  - W Basketball: 0, Total Concussions: 0
  - M Basketball: 0, Total Concussions: 0
  - M Ice Hockey: 2.44, Total Concussions: 6
  - W Lacrosse: 0, Total Concussions: 0
  - M Lacrosse: 1.43, Total Concussions: 6

- 2015-2016:
  - Football: 0.41, Total Concussions: 2
  - Field Hockey: 0, Total Concussions: 0
  - M Soccer: 0.48, Total Concussions: 1
  - W Soccer: 1.41, Total Concussions: 2
  - M Basketball: 0, Total Concussions: 0
  - W Basketball: 0, Total Concussions: 0
  - M Ice Hockey: 1.11, Total Concussions: 3
  - M Lacrosse: 0.20, Total Concussions: 1
  - W Lacrosse: 0.52, Total Concussions: 1
<table>
<thead>
<tr>
<th>2014-2015</th>
<th>Concussions per 1000 Exposures</th>
<th>Total Concussions</th>
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<tbody>
<tr>
<td>Football</td>
<td>1.88</td>
<td>9</td>
</tr>
<tr>
<td>W Soccer</td>
<td>0.94</td>
<td>1</td>
</tr>
<tr>
<td>M Soccer</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Field Hockey</td>
<td>0.70</td>
<td>1</td>
</tr>
<tr>
<td>W Basketball</td>
<td>1.20</td>
<td>2</td>
</tr>
<tr>
<td>M Basketball</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>M Ice Hockey</td>
<td>0.67</td>
<td>2</td>
</tr>
<tr>
<td>W Lacrosse</td>
<td>1.13</td>
<td>2</td>
</tr>
<tr>
<td>M Lacrosse</td>
<td>0.23</td>
<td>1</td>
</tr>
</tbody>
</table>

18
Return to Academics and Athletics

Exposure Rate
Per Sport:

School 17-18 Concussions per 1000 Exposures Compared to 4-Year Average and NESCAC 4-Year Average
Practices vs. Games

Overall (Including All Sports and All Genders):

Per Sport:

Men's Soccer Game vs Practice Concussion Percentages
Women's Soccer Game vs Practice Concussion Percentages

<table>
<thead>
<tr>
<th></th>
<th>Percent of Total Conussions</th>
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</thead>
<tbody>
<tr>
<td>Practice</td>
<td>40</td>
</tr>
<tr>
<td>Game</td>
<td>100</td>
</tr>
</tbody>
</table>

- 4-Year NESCAC Percentages
- 4-Year Tufts Percentages
- Tufts 17-18
Sailing - 3
Men's Rugby - 8
Women's Rugby - 5
Football - 2
Men's Soccer - 3
Women's Soccer - 4
Volleyball - 1
APPENDIX E – CONCUSSIONS IN CLUB SPORTS (REPORTED TO ATHLETICS)

<table>
<thead>
<tr>
<th>Year</th>
<th>Sport</th>
<th>Concussions (count)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-18</td>
<td>Rugby, men</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Rugby, women</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Ultimate Frisbee, men</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ultimate Frisbee, women</td>
<td>0</td>
</tr>
<tr>
<td>2016-17</td>
<td>Rugby, men</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Rugby, women</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Ultimate Frisbee, men</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Ultimate Frisbee, women</td>
<td>0</td>
</tr>
<tr>
<td>2015-16</td>
<td>Rugby, men</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Rugby, women</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Ultimate Frisbee, men</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Ultimate Frisbee, women</td>
<td>0</td>
</tr>
<tr>
<td>2014-15</td>
<td>Rugby, men</td>
<td>8</td>
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<tr>
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<td>Rugby, women</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Ultimate Frisbee, men</td>
<td>4</td>
</tr>
<tr>
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<td>Ultimate Frisbee, women</td>
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