

Introduction

Injuries are a common occurrence across collegiate sports and how to best prevent sports injuries remains an open question. In order to develop methods for injury prevention, it is first useful to understand how similar injuries occur across different types of sports. Here, we use methods from network theory to model relationships between different sports and types of injuries. We model sports and injuries as a bipartite network, and apply community detection to identify clusters of sports that share similar injuries and groups of injury types that are similar across sports. Our results can potentially influence future collaborations across sports to develop common methods to prevent future injuries.

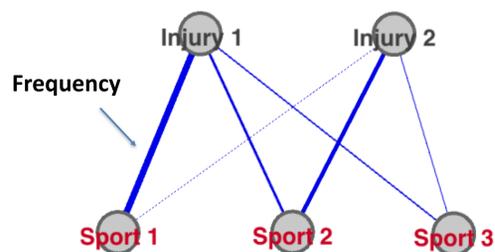
Methods

Data Collection:

In order to obtain a data set, we collected data from 15 different papers describing the frequency of injuries in 15 different collegiate sports (non-differentiating gender) during both practice and game times. After controlling for common injury types across all data, we were left with a final data set that included the frequency of 7 injuries across 12 different sports for both practice and game conditions.

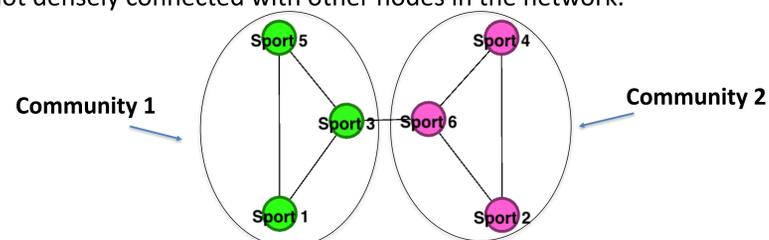
Network creation:

- Nodes = sports/injury types
- Edges = frequency of injury type in a sport



Community Detection:

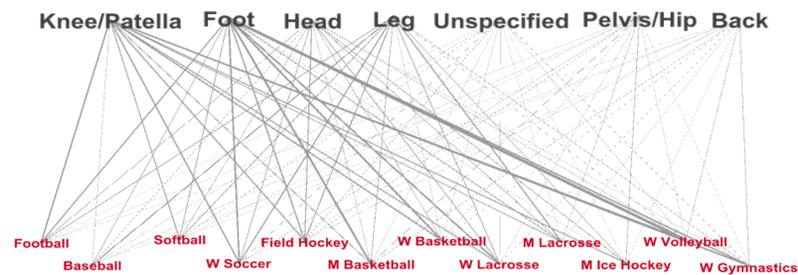
A community is a group of nodes in a network (sports or injuries) that are densely connected with other nodes in the community, but are not densely connected with other nodes in the network.



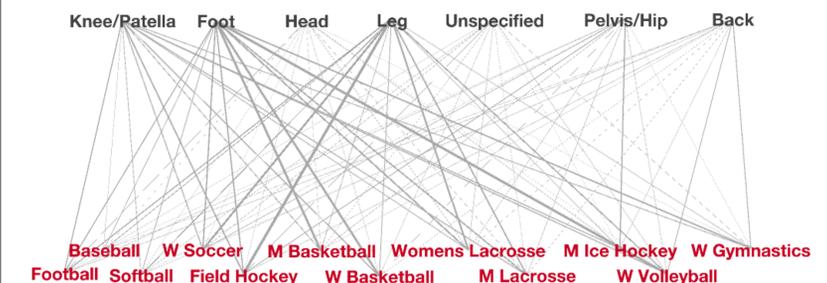
- 1) We first project the network onto a single node representation, where nodes are either sports or injuries.
- 2) We then apply a community detection algorithm [1] to identify communities in our networks.

Results

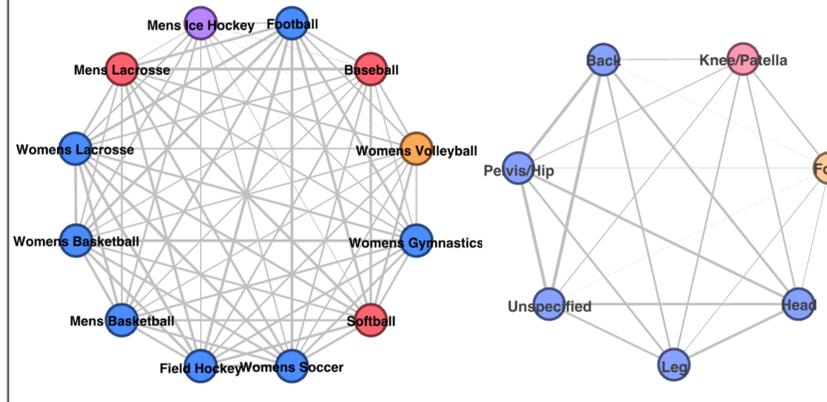
Sports Injury Bipartite Game Network



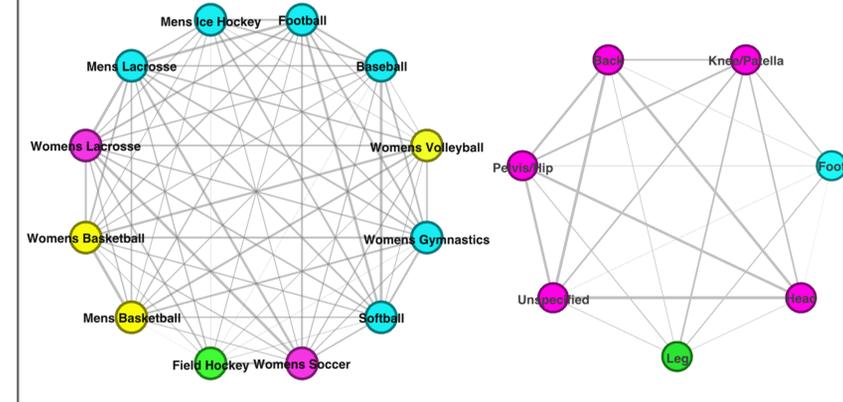
Sports Injury Bipartite Practice Network



Game Sports and Injuries Projection with Community Detection



Practice Sports and Injuries Projection with Community Detection



Discussion

Sports Networks:

- Sports are clustered if they use the same body parts
- Sports with 2 genders are generally in the same community
- 4 communities in both game and practice
- 1 large community and 3 smaller communities in both practice and game
- Sport outlier is different in game and practice

Injury Networks:

- Foot injuries are separate in both game and practice
- 3 communities in both game and practice
- 1 large community and 2 small communities in both practice and game
- Injuries are clustered if sports have similar degrees in contact
- Injuries are clustered if the environments of the sports are similar

Conclusion

Game vs. Practice Times:

The community structure comparing game and practice times differ with each other. This is potentially due to the general higher frequency of practice injuries than game injuries. We infer that this is a cause of how athletes do not necessarily prepare their bodies for a potential injury or potential contact with another player during a practice, but more likely during a game.

Future Investigations:

Having a better understanding of which sports share similar injuries, or which injuries are alike across different sports though methods of community detection can hopefully lead to a different approach to injury prevention in the future.

References

1. Bassett, D.S., Porter, M.A., Wymbs, N.F. et al (2013) Robust detection of dynamic community structure in networks. *Chaos*, 23: 013142.