

**Playing Surfaces and Knee Injuries in UWRF Athletes**

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## **Introduction**

Knee injuries are one of the most common injuries occurring to athletes. Within the past two decades, great strides have been made in cause and prevention measures for severe knee injuries. Today, with the help of modern technology and advancements in sport science, athletes can participate in competitive sports with lower risks of severe knee injury (knee injury requiring surgery). Typical causes of knee injuries can be attributed to a variety of factors which include: equipment (shoes, cleats, etc...), playing surfaces, biomechanical and gait issues, overtraining, lack of musculature (not enough sport specific training), and blunt trauma (contact during activity). University of Wisconsin River Falls (UWRF) athletes, and athletes in general, participating in sports that involve cutting/change of direction movements and physical contact are at the highest risk of severe injuries to the knee.

The purpose of this research was to explore the effect of playing surfaces on the amount of severe knee injuries in UWRF athletes. This topic is of great importance as athletes playing in particular sports need to be aware of the possibility of injury to the knee. The knee is one of the most important joint structures in the body and is vital for lower body mobility. This research will ultimately provide valuable information to UWRF parents and athletes about the potential risks and likelihood of serious knee injuries involved with playing surfaces, gender, and sport. Our research question that we explored was “How do playing surfaces affect the amount of knee injuries requiring surgery in UWRF athletes.” In addition to playing surfaces, we explored the relationships of gender and sport in reference to severe knee injuries in UWRF athletes. The variables of playing surface, gender, and sport are some of the most important aspects involved in the relationship to severe knee injuries.

## **Review of Literature**

The NCAA has conducted numerous studies analyzing the causes and mechanisms of knee injury. This article looked specifically at male and female collegiate athletes participating in soccer and basketball. They looked at data over a 5 year period and found that females reported higher frequencies of knee injuries and ACL incidences in both these sports when compared to their male counterparts. The study yielded that non contact mechanisms were to blame for the majority of the cases. This means that most of the injuries were due to body movement, muscular strength, gender differences in anatomy and structure, equipment, and playing surface (Dick). These results are very conclusive to the results we found from our study at UWRF. We found that females in general had a higher frequency for injury and that women's basketball and women's soccer had the highest frequency for injury out of all the sports in the study.

Another study published by Kentucky Sports Medicine called "*Knee Injuries in Female Athletes*," found that female athletes have an increased risk for knee injuries and have higher frequency for injury than males. This higher frequency could be due to a number of reasons. But the major cause is due to gender differences in anatomy and structure. Females have a different lower level extremity alignment than males and in most cases aren't as developed in the strength and conditioning mechanisms. In sports that have quick stopping and starting movements, females have an increased risk for ACL injury (Hutchinson). Although our research was on a smaller scale, our results are very similar to the study above and yielded very similar conclusions.

The third article was found in the British Journal of Sports Medicine and it was researching risk factors of the lower extremity due to intrinsic and extrinsic factors. The focus of this study was on the ankle, knee, and foot injuries. It also was using athletes and military recruits for their

sample. While looking at this study, the extrinsic factor of playing surface concluded that artificial turf was implicated as an injury risk factor in two prior studies. An NFL study was done in the early to mid 1980's and showed that artificial turf increased the frequency of knee and foot/ankle injuries compared to grass and gravel surfaces. Though more studies have been done on playing surfaces and injuries, other factors must be taken into consideration to support this evidence.

This study relates to ours because it compares some of the same sports we looked at here at UWRF as well as looks at one of the same variables that cause serious knee injuries which was playing surface. However, this study found that artificial turf increased the frequency of injuries where as our results showed the opposite. Again, we must reiterate that the majority of UWRF athletes do not play on artificial turf very often which may be why our results are lower than this study's.

### **References: Literature Review**

Beynon, B D, Connolly, D A J, & Murphy D F. (2003). Risk factors for lower extremity injury: a review of the literature. *British Journal of Sports Medicine*. 37, 13-29.

Dick, R. Knee Injury Patterns Among Men and Women in Collegiate Basketball and Soccer. *NCAA Data and Review of Literature*, 23(6).

Hutchinson, L. J. (1995). Knee injuries in female athletes. *Sports Med: Kentucky Sports Medicine*

Research like these studies and our studies are needed to boost the awareness of the causes and mechanisms of knee injuries. Also, more is needed to provide athletes with the potential risks and likelihood of knee injuries when it comes to playing surfaces, sport, and gender. The more

evidence and support we can provide on these sport issues, the more prevention measures can be used to lower the frequency of severe knee injuries.

## **Method**

To continue with our study we made sure to meet all the required protocols of the IRB and to get approved before any information was collected. The risk of the subjects involved in this study was very minimal. The only risk for this study would be data exposure. If this were to happen the negative effects on the subjects would be minimal at worst. Also, the subjects experienced no deception involved with this research. To keep the data anonymous and confidential, it was reviewed in private confines by only those involved with the study. The participants involved with this research were limited to male and female UWRF collegiate athletes. The normal age range of UWRF athletes usually falls between 18 to 25 years old.

To gather our data for the number of severe knee injuries at UWRF, we contacted UWRF Head Athletic Trainers Crystal Lanning and Gary Eloranta. With the use of the NCAA Injury Surveillance System and Datalys Injury Surveillance Tool, the trainers were able to record each injury that occurred over the last five years (2004-Winter 2010). We were able to use this secondary data to look specifically at each knee injury that occurred; what surface the athlete was playing on, which sport they were participating in, as well as whether or not they required surgery. Secondary data allowed us to keep all the athletes anonymous. We looked at both male and female collegiate athletes at UWRF participating in football, women's soccer, men's hockey, women's hockey, men's basketball, women's basketball, and women's softball. Aside from the NCAA Injury Surveillance System and Datalys Injury Surveillance Tool, no other tools or instruments were used in this study.

## **Results**

To organize our data, we entered all relevant information into Excel. We then were able to formulate bar graphs to aid in our comparison and analysis of playing surface, gender, and sport to the frequency of severe knee injuries in each. Information entered included: playing surface, gender, sport, total number of athletes in each sport over the last 5 years (2004- Winter 2010), total number of severe knee injuries for each playing surface, sport, and gender. We were then able to find a frequency of severe knee injuries for each playing surface, sport, and gender. To do this we divided the total number of athletes in each category of playing surface, sport, and gender by the total number of severe knee injuries occurring in each category and multiplied the answer by 100 to give us a percent frequency. (See Appendix A)

By using a percent frequency we were able to account for most variables. However, there is one variable that we were not able to account for which was the specific cause of injury. It is important to recognize that other factors which include: equipment, biomechanical/gait issues, overtraining, lack of musculature (sport specific training), and blunt trauma (direct contact to the knee) could have accounted for some injuries.

In the comparison of playing surfaces to the percent frequency of severe knee injuries (Fig. 1), from 2004-2010, hardwood courts accounted for the highest frequency of knee injuries at about 2.7%. This was followed by ice with a frequency of 2.1%, grass with a frequency of 1.4%, and artificial turf with a frequency of 0.4%. (See Appendix B)

In the comparison of sport to percent frequency of severe knee injuries (Fig. 2), from 2004-2010, women's basketball had the highest frequency of knee injuries at about 4.9%. Following women's basketball, women's soccer had a frequency of 3.1%, men's basketball had a frequency of 2.7%, men's hockey had a frequency of 2.4%, football and women's hockey both had

frequencies of about 1.7%, women's softball had a frequency of about 1%, and women's volleyball was last with a frequency of about 0.8%. (See Appendix B)

In the comparison of gender to the percent frequency of severe knee injuries (Fig. 3), females represented the highest at a frequency of 2.3%, and males had a frequency of 1.9%. While female athletes had the highest frequency, male athletes accounted for 60% of the total athlete's in the sports compared above. (See Appendix C)

### **Discussion**

These results show that hardwood courts, women's basketball, and female athletes in general accounted for the majority of severe knee injuries at UWRF. These results are significant for UWRF current and prospective parents and athletes to consider the possible risks and likelihood of serious knee injuries occurring when it comes to playing surfaces, gender, and sport. They can use these results to take any preventative or precautionary measures necessary while participating in the collegiate sports used in this study at UWRF.

When considering the significance of these results to other collegiate athletic populations, it is important to recognize the limitations of this research. First, the secondary data gathered was only from the past five years (2004 –winter 2010) which gave us a limited amount of data to analyze. More data over longer periods of time would provide more significant results. Second, when we analyzed playing surface to the frequency of knee injuries, we must recognize that other collegiate universities have different playing surfaces which would yield different results. For example, the UWRF campus has the only grass football stadium in our conference. This means that they play and practice on grass instead of artificial turf the majority of the time which may be why grass has a higher frequency than artificial turf at UWRF. This result may be

different for universities that have artificial turf stadiums and play and practice on it the majority of the time.

The results of our research conducted at UWRF had very similar findings compared with other studies done on these topics. Our study found that female athletes at UWRF had higher frequencies of knee injuries and also had higher incidences of ACL injuries. This result is conclusive with two other studies discussed in the literature review that found the same result. Also, in our study we found that women's basketball and women's soccer had the highest frequency for knee injury out of all the sports included in our research. This result is conclusive with two studies discussed in the literature review that had the same results. Lastly, our study found that artificial turf had a very low impact and frequency for knee injury in UWRF athletes. This result was opposite from one study discussed in the literature review. However, the UWRF athletics and campus has no artificial turf surfaces. The few injuries that did occur on artificial turf happened at other universities or away competitions. This means that UWRF athletes do not spend much time on artificial turf which could be why our numbers are so low. In the study that had opposite results on turf than ours, the athletes played on turf much more frequently than UWRF athletes.

Overall, our results are significant for current and potential UWRF athletes and parents. We were able to use accurate data to accumulate significant analyses of playing surface, gender, and sport in reference to the frequency of severe knee injuries occurring in each. Current and prospective UWRF parents and athletes can use these results to weigh the possible risks and likelihood of severe knee injuries occurring when it comes to playing surface, gender, and sport.

## Appendix A

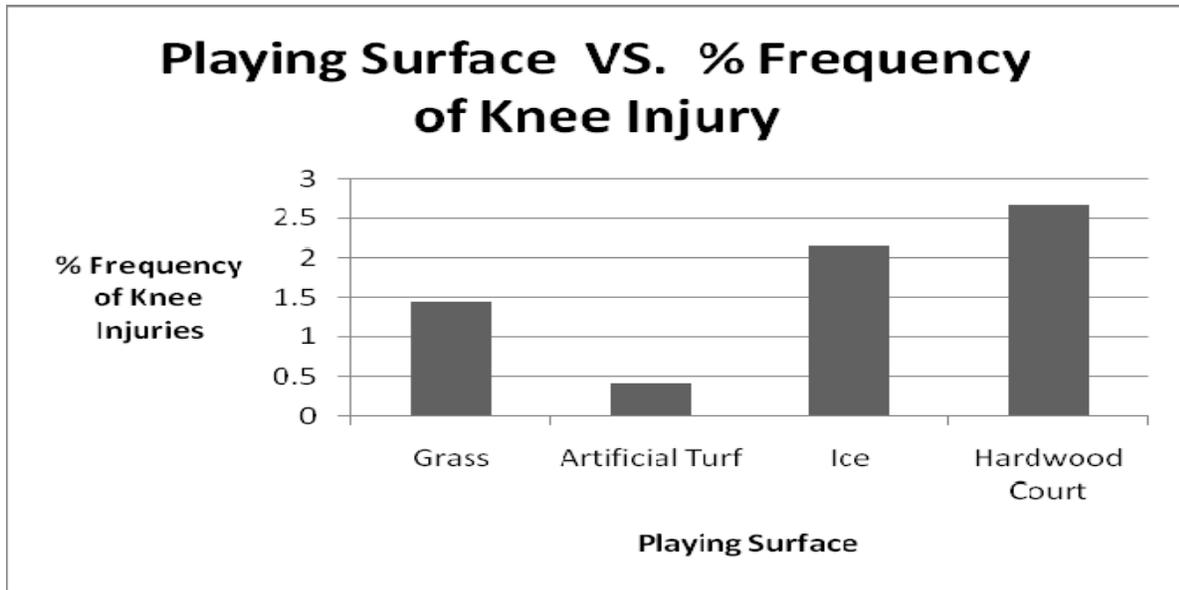
<b>Number of Knee Injuries</b>		<b>Total Number of Athletes (approx)</b>	<b>% of knee injuries/sport</b>
Football	10	600	1.67
W. Volleyball	1	124	0.81
W. Softball	1	104	0.96
M. Basketball	3	112	2.68
W. Basketball	5	103	4.85
M. Hockey	4	165	2.42
W. Hockey	2	116	1.72
W. Soccer	4	130	3.08

(Playing Surface)

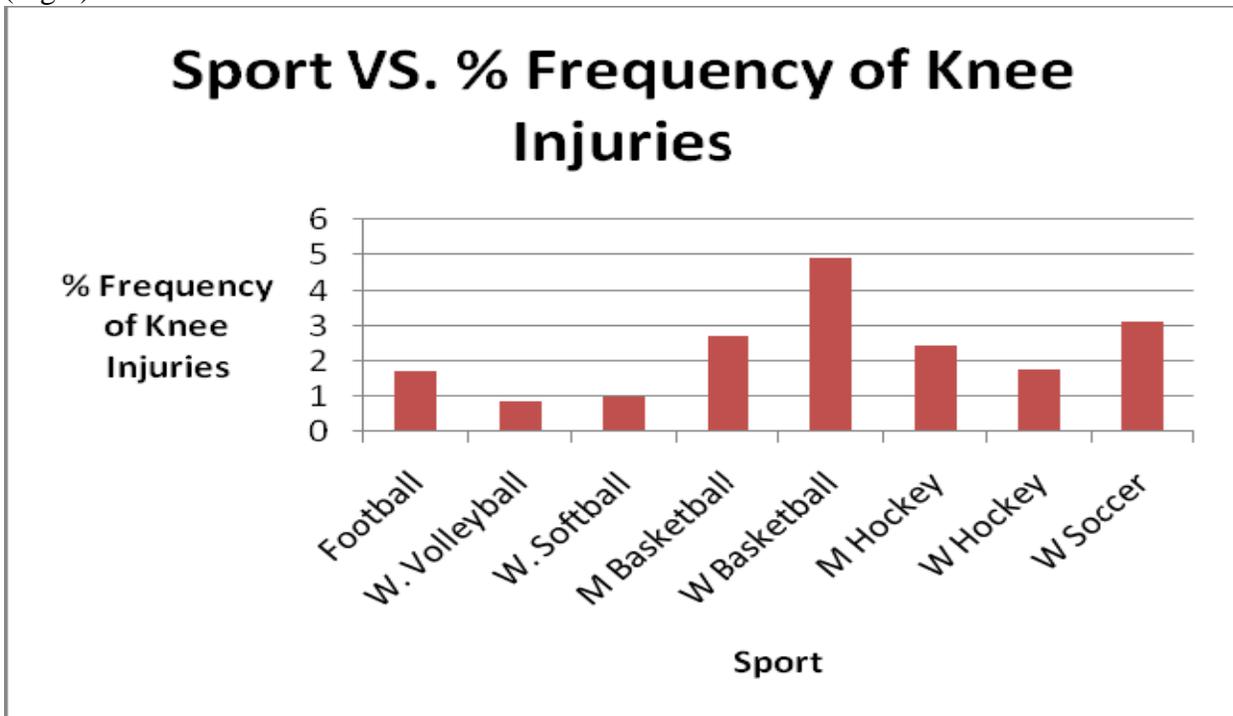
<b>Number of Knee Injuries</b>		<b>Total Number of Athletes</b>	<b>% of Knee Injuries</b>
grass	12	834	1.44
Turf	3	730	0.41
Ice	6	281	2.14
Hardwood Court	9	339	2.65

<b>Number of Knee Injuries</b>		<b>Total Number of Athletes</b>	<b>% of knee injuries</b>
Male	17	877	1.9
Female	13	577	2.3

## Appendix B (Fig. 1)



(Fig 2)



(Fig 3)

