General

Injury Types and Training Habits among Soccer (Football) Athletes

Jai Patel, Rohan Mangal, Thor Stead, Andrew Barbera, Latha Ganti

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Background

For soccer athletes, injuries are frequent and pose a considerable health and financial burden for individuals and families. While studies have previously assessed the incidence of soccer injuries and preventive strategies male athletes use to reduce these occurrences, few have included women and players of varying skill levels.

Objective

To report the frequency of injuries in a cohort of male and female soccer athletes and describe the training habits that have helped prevent injury.

Methods

Two hundred (n=200) United States participants completed a questionnaire on soccer practicing frequency, habits, injuries, and treatments. A screening question ensured all respondents had played soccer for at least one year and determined eligibility for the study. Participant information related to age, sex, education, income, and race was also collected. JMP statistical software was used to analyze collected data and build multivariate regressions, mosaic plots, and histograms.

Results

The mean number of practice sessions per week was 3.60 +/- 1.64, and the median experience playing soccer was 2-4 years. Older participants were more likely to practice once (p = 0.0001) or twice (p= 0.0008) per week. Women were less likely to include warmups before playing soccer (p = 0.022). This was problematic as participants who did not include a proper warmup routine were more likely to have been absent from play for longer amounts of time following injury (p = 0.032). The four most common injury sites were knees (n = 35, 17.5%), ankles (n = 31, 15.5%), shoulders (n = 25, 12.5%), and head/neck (n = 24, 12%). 140 (47.62%) patients used pain medication as their main remedy, 128 (43.54%) went to physical therapy, and 26 (10.78%) underwent surgery.

Conclusion

In any sample of soccer athletes involving variations in sex, race, and competitive play, injuries are highly common. Few studies before this one have included female athletes, and our findings highlight an important discrepancy in training habits between sexes. Women are less likely to follow a warmup regimen and are thus injured for longer. Incorporating dynamic stretching and plyometrics are particularly helpful to stay healthy.

INTRODUCTION

In at least 200 countries, over 270 million people and 110,000 professional athletes play soccer.[1] On average, soccer has become faster and is played with greater intensity than before when comparing professional performance over the decades.[1] For youth and adult athletes there is growing concern about how the pressure of the sport is linked to increased incidence of physical injury. Age, exercise load, level of competitive play, and discrepancies in training regimen have previously been associated with more frequent injuries.[2,3] In particular, 17 to 18 year old soccer players and older adults have been linked to injuries at the highest rates.[4] Professionally, in a team of 25 players, approximately 50 injuries are encountered throughout a season—equivalent to roughly 2 injuries per player per season.[2]

The most common injuries are related to trauma, with joint and bone overuse accounting for 9% - 34% of all cases. Approximately 12% - 28% of all soccer injuries can be as-

What is known about this subject

Previous studies involving soccer players have found that injuries are highly common and have reported on aspects of their training habits. Some studies have administered specific training protocols in cohorts and compared injury outcomes to a control group to demonstrate the efficacy of a particular training routine. However, few studies have examined training habits and injury types among both female and male athletes as well as athletes of varying skill levels.

What this study adds to the existing knowledge

Our study includes the training habits of soccer athletes who compete at various skill levels as well as female and male players. In addition to simply reporting participants' responses, our study examines the differences in training habits between genders, how these differences correlate to increased frequency of injury, and how these affect the time removed from play due to injury. As soccer is played by both men and women in near equal proportion, this study is particularly important in representing the diversity of athletes who play the sport.

cribed to contact made with another athlete, and incidents that are unrelated to contact are mostly found in training or preparation for competitive play.[5] Nearly a quarter of all injuries soccer players encounter are caused by repeat damage to a previously distressed area.[6]

In the early 1990s, an injury prevention program included shin guards, training shoes, ankle taping for players with a demonstrated history of torsional issues, and supervision by healthcare professionals. A 6-month follow-up period showed that the intervention group consisting of six out of twelve randomly assigned teams had 75% fewer injuries than the control group.[7]

While most epidemiologic studies have examined male soccer players, in general, an elite soccer player will suffer at least one performance-reducing injury per year.[7] Our study aims to note the prevalence of soccer injuries in a cohort of males and females and elucidate which aspects of training protocols may help prevent severe injuries.

METHODS

RECRUITMENT AND DATA COLLECTION

Two hundred United States (US) residents were polled on their experience playing soccer and training habits. One screening question was administered to exclude any participants who did not play soccer, and this determined eligibility for the study. Information pertaining to age, gender, education, income, and race was collected alongside participants' responses to the survey questions. Barring the screening criteria, there were ten total questions in the survey; nine were multiple choice and one allowed for a free-response answer. The first three questions asked participants about their background with the sport—the number of years they played, practices per week, and whether the sport was played competitively. Two questions also asked for details of a specific physical training program for soccer and if a warmup routine was included before playing. The remaining five questions asked if participants encountered injury, where these were located, how long the athlete was removed from play, and what type of treatment was required to heal. This survey study did not involve a power analysis or planning (ad hoc) for a specific minimum sample size.

STATISTICAL ANALYSIS

All data collected from the survey was analyzed using JMP. The significance threshold was alpha = 0.05 and all confidence intervals were 95%.

ETHICAL CONSIDERATIONS

HCA Healthcare Centralized Algorithms for Research Rules on IRB Exemptions (CARRIE)/ IRB manager issued study exemption number 2022-912.

RESULTS

DEMOGRAPHIC CHARACTERISTICS OF COHORT

A total of 200 individuals participated in this study, of which 116 are male (58%) and 84 are female (42%). The median age of participants is 36 with an interquartile range of 27 – 43, minimum of 17, and maximum of 76 years of age. In terms of background, 148 individuals identify as white (74%), 28 as black (14%), 7 as Asian (3.5%), and 7 as Hispanic/Latino (3.5%). Income levels varied in our cohort with 47 (23.5%) reporting earnings of under $25,000, 34 (17%) earning between $25,000 - $49,999, 24 (12%) between $50,000 - $74,999, 20 (10%) between $75,000 -$99,999, 23 (11.5%) between $100,000 - $124,999, 15 (7.5%) between $125,000 – $149,999, and 24 (12%) earning above $150,000. In terms of employment, 103 (51.5%) participants are employed by a company, 27 (13.5%) are self-employed, 15 (7.5%) are students, 15 (7.5%) are unemployed but looking, and 12 (6%) are unable to work.

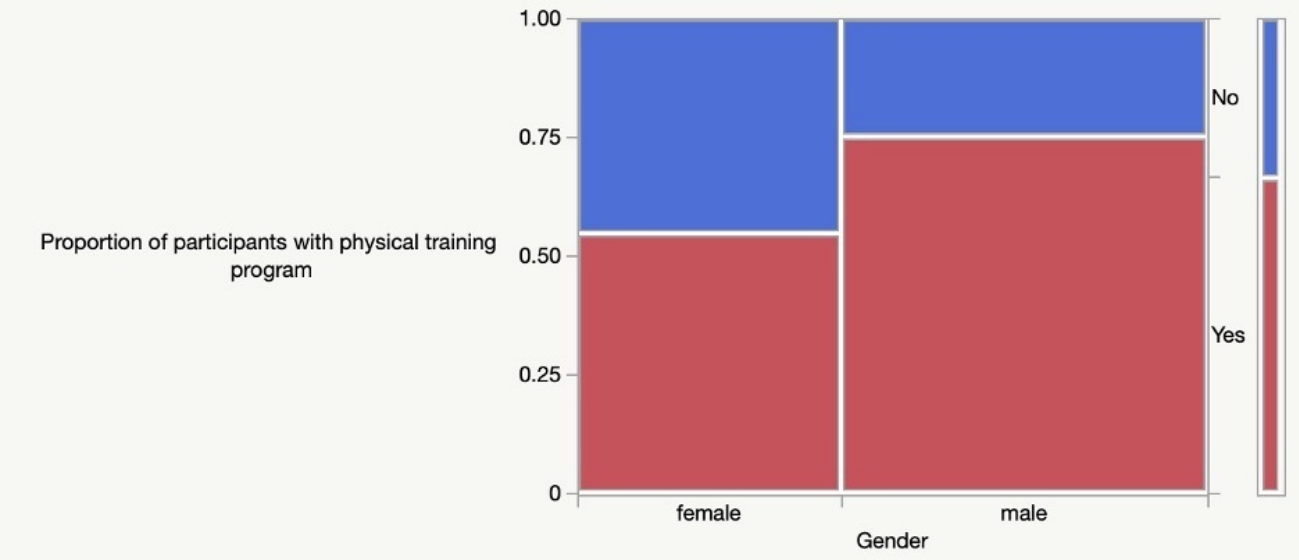


Figure 1. Physical training programs for soccer by gender

SPORTS AND SOCCER PRACTICE HABITS

The mean number of practice sessions per week was 3.60 +/- 1.64, and the median amount of play time for the cohort is 2-4 years. When comparing males and females, there were no significant differences found in the number of practices per week (p = 0.288), and neither gender was more likely to play soccer competitively (p = 0.065). While age was not a predictive factor for practicing more than three times per week, older participants were more likely to practice at most once (p = 0.0001) or twice (0.0008) per week. Warming up was highly common in our cohort before playing – 175 (87.5%) participants reported including a routine before engaging in soccer whereas 25 (12.5%) did not. While age was not a significant factor in having a pre-workout routine, women were less likely to include warmups before playing soccer (p = 0.022).

Most participants engaged in physical training specific for soccer (n = 133, 66.5%). Both age and gender were factors in whether respondents incorporated a training program, with female status (p = 0.0031) and increased age (p = 0.0015) decreasing the likelihood of having a soccer-specific training regimen. Race was not a determining factor for soccer specific training or playing the sport competitively. Participation in a training program for soccer is shown below by gender (Figure 1).

SOCCER INJURIES

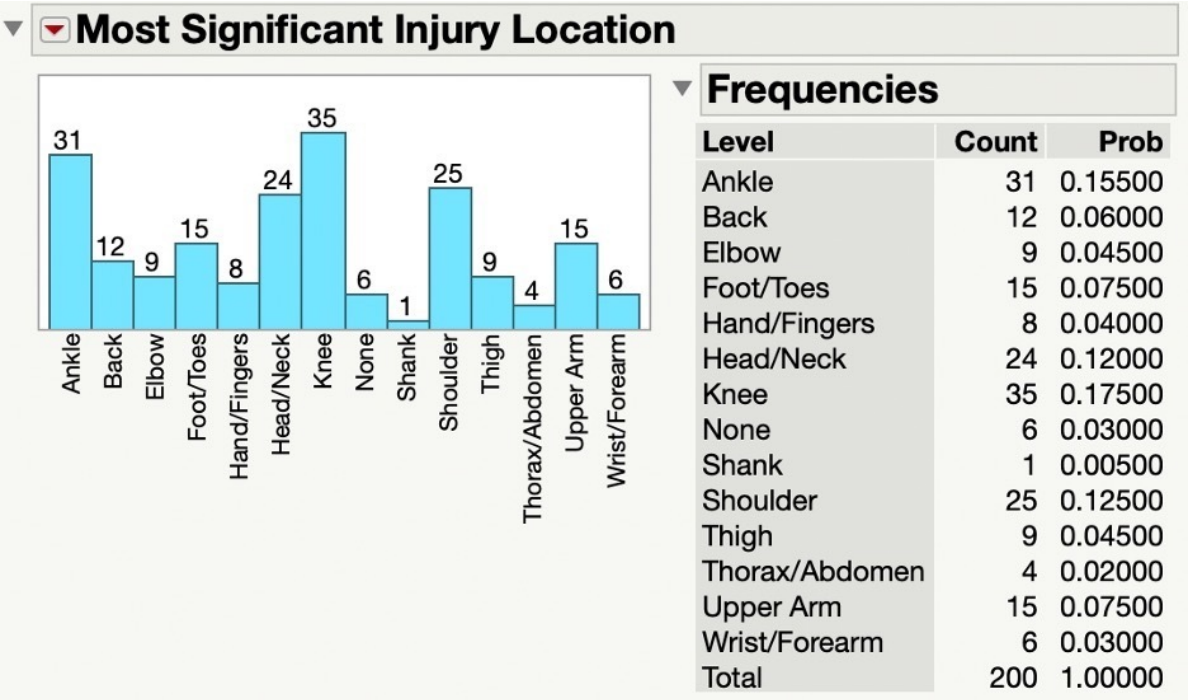
Of the 200 participants included in the study, 194 (97%) reported injuries at some point that were attributable to soccer. The three most common injuries were sprains (n = 46, 23%), bone fractures (n = 42, 21%), and ligament injuries (n = 23, 11.5%). Of note, one individual marked "other" and specified a brain injury while playing soccer. The four most common locations for injuries were respondents' knees (n = 35, 17.5%), ankles (n = 31, 15.5%), shoulders (n = 25, 12.5%), and head/neck (n = 24, 12%). Collectively, these constituted 57.5% of all injuries encountered. There was no significant relationship between playing soccer competitively and the types of injury or their locations. Figure 2 shows the location of participants' most significant injuries.

Respondents varied in their time out from playing soccer. 60 (30.9%) participants reported 1-7 days, 84 (43.3%) reported 8-21 days, and 50 (25.8%) reported 21+ days removed from soccer as a result of injuries. When accounting for race (p = 0.307), sex (p = 0.123), and income (p = 0.0549), no statistically significant factors were found to correlate with time out from playing following an injury. However, participants who reported not warming up properly before engaging in soccer were statistically more likely to have been absent from play for longer amounts of time following injury (p = 0.0320). A mosaic plot was constructed to visualize this relationship—from this a likelihood ratio and chi-squared test supported that regular warmups are associated with faster recovery time post-injury (p = 0.0078) (Figure 3).

In terms of treatments pursued by injured respondents, 140 (47.62%) patients used pain medication as their main remedy, 128 (43.54%) went to physical therapy, and 26 (10.78%) reported surgery. Age (p= 0.8720), sex (p=0.7919), competitive play (p=0.1120) , frequency of playing (p=0.3865), and warmup routines (p=0.9229) were not statistically significant in predicting whether surgical intervention was needed for an injury related to playing soccer.

DISCUSSION

The aim of this study is to describe soccer players' practice and performance habits, frequency/severity of injury, and their corresponding treatments. Related studies have postulated that age, frequency of training, and level of competitive play are risk factors for injury—this information was collected and assessed for in this cohort. In addition, our study also examines warmup routines, recovery time after injury, and differences between genders. Most studies, including literature reviews, of injuries in soccer have involved male athletes but seldom female players as well.[8]



Level	Count	Prob
Ankle	31	0.15500
Back	12	0.06000
Elbow	9	0.04500
Foot/Toes	15	0.07500
Hand/Fingers	8	0.04000
Head/Neck	24	0.12000
Knee	35	0.17500
None	6	0.03000
Shank	1	0.00500
Shoulder	25	0.12500
Thigh	9	0.04500
Thorax/Abdomen	4	0.02000
Upper Arm	15	0.07500
Wrist/Forearm	6	0.03000
Total	200	1.00000

Figure 2. Soccer players' site of most significant injury with count labeled

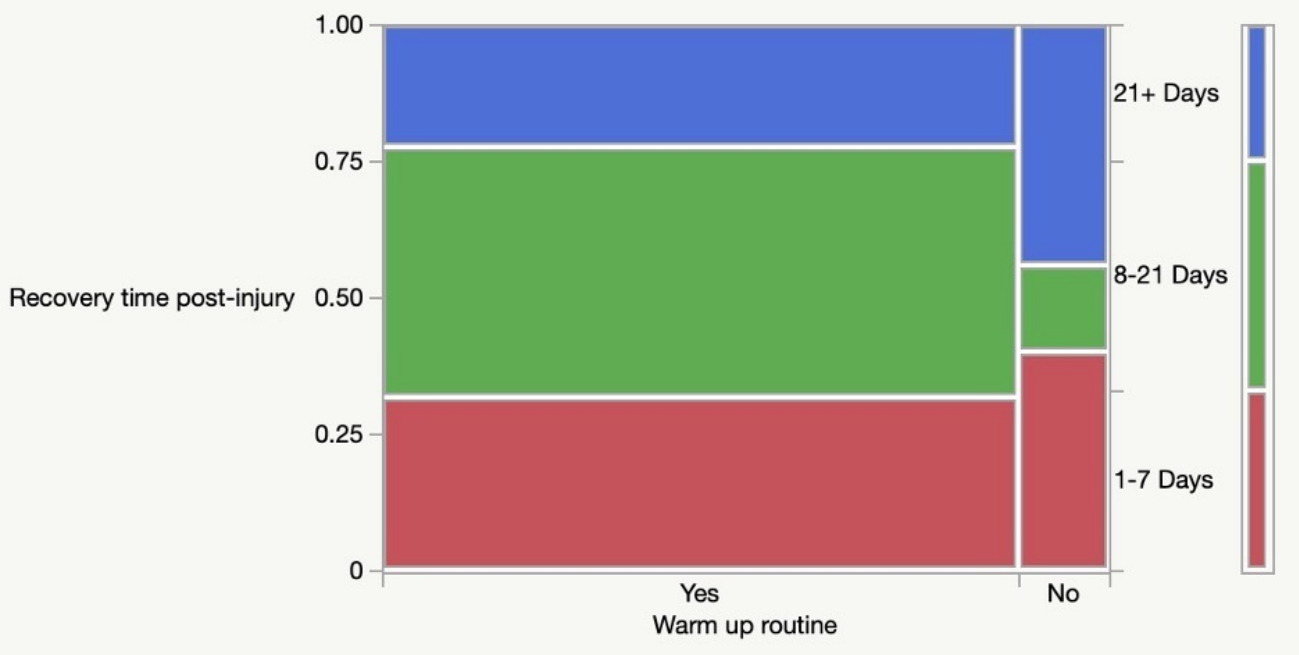


Figure 3. Recovery time post-injury for participants stratified by having a warmup routine

As soccer is played in near equal proportions by males and females, studies involving female athletes can help illuminate how injuries in soccer can be prevented for all. In our study, women were less likely to include a warmup routine, which was found to have a pivotal role in reducing the incidence and severity of injury.

Of all factors assessed for which athletes are injured for longer periods of time, a warmup routine was found to have the greatest impact on recovery time. Fewer participants with this regimen were injured for over 21+ days and required surgical intervention. Junge et al. implemented a prevention program for seven teams including warmups, ankle taping for athletes known to have unstable ankles, and knee joint exercises and compared outcomes in injury to seven teams without a specific protocol in place. Per 1000 hours of training/playing, the incidence of injuries was 6.7 for the intervention group, as compared to 8.5 in the control group.[5,9] Teams that competed in lower-level leagues were found to benefit more from the prevention program than higher skilled teams. For knee injuries, a literature

review of 13 studies concluded that a consistent regimen that focused on neuromuscular and proprioceptive training helped prevent short and long-term injury in athletes.[10]

The current FIFA recommendations for injury prevention can be broken into three components.[11] These include slow-paced running and dynamic stretches, exercises targeting the trunk and legs with progressive overload, and running drills involving different types of movement. These 15 total exercises are recommended at least three times per week for soccer athletes. Another study has suggested implementing a protocol with core strength, balance, and plyometrics.[9] A study assessing outcomes in teams with different warmup/training protocols may help identify which groups of exercises help prevent injury.

LIMITATIONS

A sample size of 200 participants does not highlight the diversity of people who play soccer. The sport is played internationally in countries where it is even more popular than in the United States. However, our cohort includes only individuals in the US and thus does not capture all soccer athletes. Survey research is also susceptible to response bias wherein participants may not submit answers entirely accurately or truthfully. By using a third-party survey tool, there is also a sampling bias as respondents participated for an incentive by the provider. Despite these limitations, this study provides valuable information about soccer practice habits and their relationship to injury for both male and female athletes that range in competitive level.

CONCLUSION

Studies relating to soccer often do not capture the heterogeneity of athletes who play it. Injuries are highly common, particularly of the knee, ankle, and shoulder. The level of competitive play and frequency of playing throughout the week did not influence the incidence or severity of injury. Race, income, and age were not determining factors of who is more likely to encounter injury during training or competition.

A warmup routine was found to improve recovery times following injury. Athletes who did not warmup were more likely to be injured for 21+ days and require more severe treatment to heal. Women were found to be less likely to include warmups in their routine before playing soccer. Based on findings from this study and others, a training routine consisting of dynamic stretching, complex movements, and plyometrics may help reduce injury in soccer athletes of all levels and forms of identity.

DISCLAIMER

This research was supported (in whole or in part) by HCA Healthcare and/or an HCA Healthcare affiliated entity. The views expressed in this publication represent those of the author(s) and do not necessarily represent the official views of HCA Healthcare or any of its affiliated entities.

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