

# Disc Golf, a Growing Sport

## Description and Epidemiology of Injuries

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**Background:** Disc golf is a sport played much like traditional golf, but rather than using a ball and club, players throw flying discs with various throwing motions. It has been played by an estimated 8 to 12 million people in the United States. Like all sports, injuries sustained while playing disc golf are not uncommon. Although formalized in the 1970s, it has grown at a rapid pace; however, disc golf-related injuries have yet to be described in the medical literature.

**Purpose:** To describe the most common injuries incurred by disc golf players while comparing the different types of throwing styles.

**Study Design:** Descriptive epidemiology study.

**Methods:** The data in this study were collected from 883 disc golf players who responded to an online survey collected over a 1-month period. Respondents answered 49 questions related to demographics, experience, style of play, and injury details. Using a chi-square analysis, common injuries sustained in players using backhand and forehand throwing styles were compared.

**Results:** More than 81% of respondents stated that they had sustained an injury playing disc golf, including injuries to the elbow (n = 325), shoulder (n = 305), back (n = 218), and knee (n = 199). The injuries were most commonly described as a muscle strain (n = 241), sprain (n = 162), and tendinitis (n = 145). The type of throw primarily used by players varied, with 86.2% using backhand, 12.7% using forehand, and 1.1% using an overhead throw. Players using a forehand throw were more likely to sustain an elbow injury ( $P = .014$ ). Many players (n = 115) stated they had undergone surgery due to a disc golf-related injury, with the most common surgeries including meniscal, shoulder, spine, and foot/ankle surgeries.

**Conclusion:** The majority of surveyed disc golfers sustained at least 1 injury while playing disc golf, with many requiring surgery. The types of injuries sustained by players varied by the types of throw primarily used. As the sport of disc golf continues to expand, health professionals should be aware of injuries sustained, with future studies focusing on injury prevention and education strategies.

**Keywords:** disc golf; Frisbee; general sports trauma; epidemiology

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Disc golf (also known as Frisbee golf, or frof) is an emerging sport that is played much like traditional golf, but rather than using a ball and club, players use flying discs.<sup>13</sup> The sport was formalized in the 1970s and has continued to

grow at a rapid pace. There is little information in the medical literature about disc golf. A search of PubMed using the key words *disc golf*, *Frisbee golf*, or *frof* yielded no results. While other disc-hurling sports, such as ultimate Frisbee, and their associated injuries have been described,<sup>17</sup> disc golf-related injuries have not.

The object of disc golf is to complete each hole by reaching a target in the fewest number of strokes, or as in disc golf, throws. As in ball golf, there is a designated area to tee off and a target that marks the end of the hole. Disc golf targets are most often in the form of an elevated metal basket with hanging chains to catch the disc. As a player throws progressively down the fairway, the natural environment provides challenging obstacles. An experienced disc golf player can typically drive (first throw of each hole) a disc 350 to 400 feet. The hole is completed when the player's disc lands in the basket. A typical course includes 18 holes, and

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One or more of the authors has declared the following potential conflict of interest or source of funding: The survey for this study was funded by Rosalind Franklin University of Medicine and Science.

the player who completes the course in the fewest number of throws is declared the winner.

The sport is growing rapidly. The number of disc golf courses built each year has increased by 6% to 14% annually, with nearly 3000 courses in the United States alone. Texas (n = 235), Minnesota (n = 203), Illinois (n = 183), and California (n = 182) are the states that currently have the largest number of disc golf courses; however, there are courses in every state throughout the country.<sup>15</sup> The Professional Disc Golf Association (PDGA) is the major sanctioning body of the sport and currently has more than 20,000 active members. More than 120,000 disc golf players have competed in PDGA-sanctioned events, which in 2013 alone, had a total purse that was greater than \$2.5 million.<sup>15</sup> Internationally, there are members of the PDGA from 38 countries that play on the 491 international courses.<sup>15</sup> It is estimated that 8 to 12 million persons have played disc golf, with roughly 500,000 regular players.<sup>14</sup> The game can be played by people of all physical capabilities, ages, and sexes, and aside from the cost of the discs (US\$5-\$25 each), playing disc golf is usually free. Just as golf utilizes a variety of clubs to accomplish specific tasks (such as drivers, wedges, putters, etc), disc golf uses various types of discs (drivers, midrange, putters, etc) that differ in form, size, type of plastic, and weight (usually between 150 and 180 g).

There are various throwing motions used in disc golf that a player may utilize that are dependent on a variety of different in-play situations, such as distance to the basket, curvature of an individual hole, and obstructions in the field of play. A “backhand” throw is more similar to a backhand shot in tennis, which utilizes motion of the shoulder and elbow while simultaneously shifting weight from the back to front leg and twisting of the trunk. A “forehand” throw uses a more traditional side-arm motion and relies on the motion of the hips, shoulder, and elbow for power. An “overhead” throw consists of putting your fingers or thumb onto the inside lip of the disc while throwing and releasing it overhead using a motion similar to pitching a baseball. As with other throwing sports,<sup>7,10,19</sup> it is not uncommon for players to be injured during play; however, injuries sustained in disc golf differ from those most commonly seen in ultimate Frisbee, which requires sprinting and cutting and risks players colliding with one another.<sup>17</sup>

The purpose of this study was to report on the most common types of injuries incurred while playing disc golf, the mechanism of those injuries, and the type of medical treatment utilized by patients.

## METHODS

An institutional review board protocol was submitted to University of Arizona describing the study design and what information was being obtained through the anonymous web-based survey system. The study was considered exempt from human subject research under 45 CFR 164.514(b) exemption from 45 CFR part 5 requirements.

A survey made up of 49 questions related to demographic information, frequency of play, experience level, style of play, health and exercise behavior, and injury details was

TABLE 1  
Demographic Information

Variable	%
Patient sex	
Male	92.90
Female	7.10
Age, y	
<25	12.20
25-44	63.80
45-64	23.00
≥65	1.10
Days played/wk	
<1	4
1	14
2-3	57
4-6	22
7	3
Months played/y	
<1	0.30
1-3	1.40
4-6	6.50
7-9	15.40
10-12	76.40
Experience, y	
<1	5.90
1-3	24.90
4-5	17.90
6-7	12.00
8+	39.30

used to collect data. A web-based survey was created on SurveyMonkey (www.surveymonkey.com), a third-party site, which allowed participants to respond to the survey over the Internet. The SurveyMonkey website is protected by many mechanisms that keep transmissions over the Internet confidential and has been used in many studies in medical literature.<sup>1,9</sup> Only the members of the research team had access to the SurveyMonkey data.

A link to the survey was placed on the PDGA website (www.PDGA.com) during the time of the disc golf World Championship tournament when the website has increased traffic. The survey remained open for a total of 31 days, from July 1, 2012 to August 1, 2012.

The survey approach is an efficient and commonly used method for collecting data.<sup>12</sup> With the help of electronic communication, surveys can be a means of collecting data from a high number of respondents over a large geographical area<sup>12</sup> while decreasing the overall costs of the survey.<sup>20</sup> Survey research has been used in sports and recreation to examine the type, frequency, and causes of injuries sustained during play of a given activity.<sup>2,3,5,6,8,11,18</sup>

Participants were made aware of the purpose of the survey, and their consent for participation in the research study was given by voluntarily completing the survey. The collected data from the survey were examined by entering them into a Microsoft Excel spreadsheet. The data were then analyzed for connections between the injury types, demographic characteristics of the subjects, throwing style, and health care behaviors.

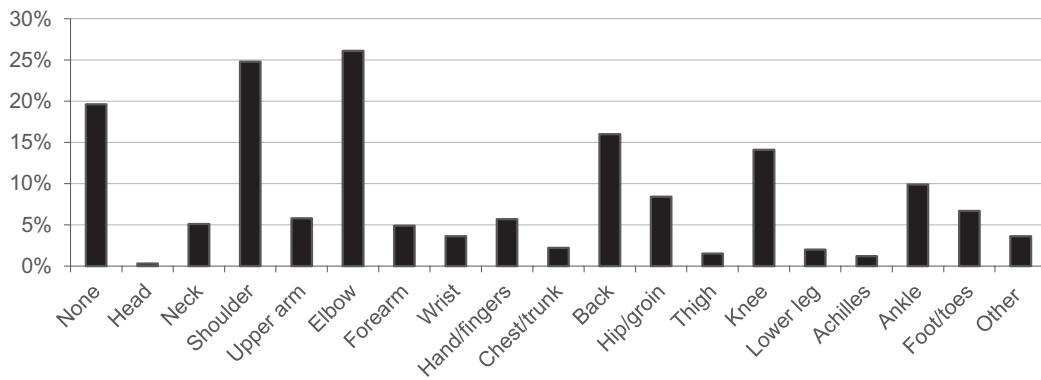


Figure 1. Disc golf injury occurrences categorized by body part.

RESULTS

Demographic Information

In total, information was obtained from 883 individuals, of whom 89.9% (n = 794) completed all questions contained in the survey. Of the respondents, 92.9% were male, with the majority (64%) being between the ages of 25 and 44 years (Table 1).

Respondents reported that, on average, they play 2 to 3 days per week year round. Experience level of respondents also varied as determined in number of years played, with 39.3% reporting 8+ years, 12.0% reporting 6 to 7 years, 17.9% reporting 4 to 5 years, 24.9% reporting 1 to 3 years, and 5.9% having played less than 1 year (Table 1).

Injuries

Of the 874 individuals responding to a question about injury, 715 (81.8%) reported that they had sustained an injury that was due to disc golf. Participants were asked to identify the bodily location of all injuries they had sustained due to disc golf play (Figure 1). Injured bodily locations were identified by using an adaptation to the Orchard Sports Injury Classification System.<sup>16</sup> The most commonly injured area was the elbow with 325 (46.0%), followed by the shoulder (43.1%), back (30.8%), knee (28.1%), and ankle (21.2%). To account for previous injuries that may have been aggravated by disc golf, participants were asked to report on bodily areas injured during disc golf that had also previously been injured by non-disc golf-related events. Although 35.2% reported that they did not have previous related injuries, 20.2% reported that they had a previous back injury, 19.9% reported previous knee injury, 19.7% reported previous shoulder injury, and 17.9% reported previous ankle injury. Despite the elbow being the most frequently reported disc golf injury, only 10.3% reported they had previously injured their elbow prior to their disc golf injury. The most common self-reported diagnoses by the respondents were those related to a strained/pulled muscle (36.5%), sprain/ligament tear (24.5%), and tendinitis (22.0%) (Table 2).

The primary or most common throw style utilized by a disc golf player is backhand (BH) (86%), followed by

TABLE 2  
Injury Types

Answer Options	Response, % (n)
Bruise/contusion	2.9 (19)
Concussion	0.3 (2)
Cut/laceration	0.9 (6)
Dehydration	0.3 (2)
Dislocation	3.5 (23)
Fracture/broken bone	2.9 (19)
Meniscus injury	5.3 (35)
Muscle cramp	2.4 (16)
Scratch/abrasion	0.3 (2)
Spinal disc/nerve injury	6.7 (44)
Sprain/ligament tear	24.5 (162)
Strain/pulled muscle	36.5 (241)
Stress fracture	1.5 (10)
Tendinitis	22.0 (145)
Unknown/other	23.2 (153)

forehand (FH) (13%), and overhead (OH) (1%). Bodily location of injury was found to vary with preferred throwing style. A chi-square test was used to analyze differences in body part injured between BH versus FH throws (Figure 2). In respondents utilizing an FH throw as their primary throw style, it was found that they were more likely to sustain an elbow injury than those utilizing a BH throw ( $P = .0142$ ). In those primarily utilizing a BH throw, there was no significant increase in any injury when compared with those using an FH throw. Because of the sample size of respondents that primarily utilized an OH throw being so low (n = 10), analysis comparing it with BH and FH throws was not performed, as the data would not be useful.

Participants were also asked about the mechanism of injuries that they deemed as “the most serious.” The 2 most common responses were that their injury occurred gradually over time due to repetitive stresses (57.4%) and that their injury occurred traumatically during a single throw step or movement (29.4%). Less common mechanisms for injury included a fall/slip/loss of balance (9.4%) and moving (12.1%). Prevalence of the bodily areas injured that were “the most serious” mirrored the injuries listed in Figure 1. When asked about how these serious injuries impacted their lives, 57.6% of the respondents stated that the injury

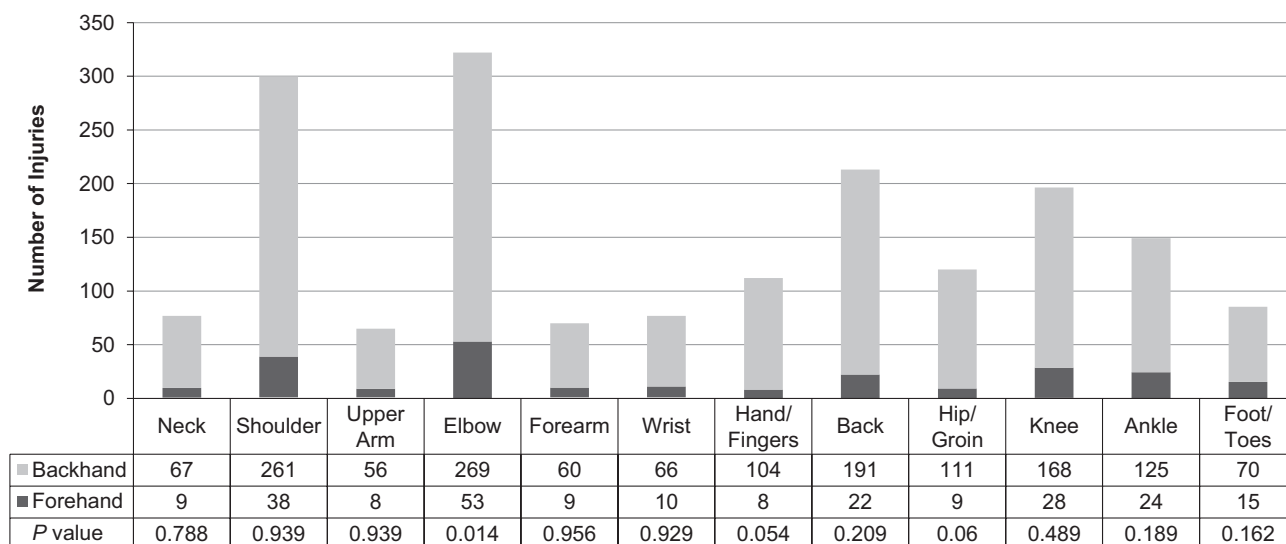


Figure 2. Injuries by location: backhand versus forehand.

TABLE 3  
Impact of Injury on Life Activities

Answer Options	Response, % (n)
Activities of daily living	57.6 (372)
School	2.6 (17)
Work	34.5 (223)
Other recreational/sporting activities	51.5 (333)
None	14.6 (94)

TABLE 4  
Treatments Received After Most Serious Disc Golf Injury

Answer Options	Response, % (n)
Athletic training	9.0 (57)
Chiropractic treatment	15.6 (99)
Doctor/hospital visit	29.0 (184)
First aid	6.3 (40)
Massage	20.5 (130)
Occupational therapy	1.3 (8)
Personal training	6.1 (39)
Physical therapy	28.8 (183)
None	32.0 (203)
Other (please list)	14.8 (94)

affected their activities of daily living (such as moving about the house, dressing, bathing, eating, doing housework/chores, and other self-care). Work duties were affected in 34.5% of respondents (Table 3).

Disc golf players most often reported receiving treatment for their injuries in the form of a doctor/hospital visit, physical therapy, and massage (Table 4). Despite high response rates for these interventions, 32% of respondents stated that they did not receive any treatment for their most serious injuries. When queried if any of their most serious injuries related to disc golf required surgery, 115 stated that

they had undergone surgery, with the most common surgeries performed including meniscal surgery (n = 13), rotator cuff repair or other shoulder surgery (n = 13), spine surgery (n = 7), foot/ankle surgery (n = 7), and knee scope (n = 5). Many others stated that they were currently in the process of being worked up for surgery or had surgery offered to them but declined.

DISCUSSION

The aim of the present study was to use preliminary data to educate physicians and medical professionals about the growing sport of disc golf as well as investigate the prevalence of disc golf injuries through the use of a survey. Survey research can play an important role in the surveillance and investigation of a proposed injury control process by a survey’s ability to document the existence of a problem, its prevalence in a population, and risk factors. The collected data can be further analyzed to help develop preventive interventions that can be implemented to decrease the frequency of injury.<sup>8</sup>

Disc golf is a relatively safe sport, but like any recreational activity, it has risks. The elbow was the most frequent bodily area of injury reported by all participants, regardless of the preferred throwing style; however, those primarily utilizing an FH throw were found to be more likely to sustain an elbow injury. This suggests that disc golf players who have an increased risk of elbow injury would possibly benefit from primarily utilizing a BH throw instead of an FH throw. Although not significant for either throw type, disc golf players should also know of the high prevalence of shoulder injuries and that they should take precaution to prevent such injuries.

There is a potential selection bias in this study because the survey was placed on a professional organization’s website (www.PDGA.com). This website is a primary resource used to inform disc golf players on various topics, such as

rules of play, as well as course location. It is frequented by disc golf players of all expertise levels. While similar types of data collection have been utilized to collect epidemiologic injury data,<sup>4</sup> the retrospective nature and collection method could result in increased reporting by athletes who sustained injuries compared with those who did not. This study is useful in obtaining preliminary data to aid in the design of a prospective study to evaluate disc golf players of varying levels and the injuries they sustain.

PDGA membership was not required for survey participation, which made participation more accessible to disc golf players of all levels. The main disadvantages of these types of web-based surveys are that participation is restricted to those that are computer and Internet literate, response rate is difficult to determine, and it would be impossible to carry out repeated assessments of the same individuals.<sup>20</sup>

As this is the first article published on disc golf, the future of disc golf-related research is vast. A prospective study that would enroll and follow disc golf players over a specific period of time and evaluate injury patterns would be useful. A biomechanical breakdown of throwing styles would also be useful. These types of data could be used to create awareness for injury prevention through displaying the areas of the body that are primarily at risk from disc golf play, the mechanism of injuries, the nature of those injuries, and the effect injuries have on the lives of disc golf players.

### Benefits of the Study

There were no direct benefits to the subjects responding to the survey. There was an indirect benefit to the participants because this study aimed to provide information to the PDGA and health care professionals on the occurrence of injuries in disc golf players.

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