Internet-based survey of the nature and perceived causes of injury to dogs participating in agility training and competition events

Kimberley L. Cullen, MSc; James P. Dickey, PhD; Leah R. Bent, PhD;
Jeffrey J. Thomason, PhD; Noel M. M. Moëns, MSc, DVM, DACVS

Objective—To characterize injuries (on the basis of type and severity of injury and affected region of the body) among dogs participating in agility training and competition events and examine associations between injury characteristics and perceived causes of injury.

Design—Internet-based, retrospective, cross-sectional survey.

Animals—3,801 privately owned dogs participating in agility training or trials.

Procedures—A retrospective electronic survey was developed to investigate demographic factors for dogs and handlers, frequency of participation in agility training and competition, and perceived causes and characteristics of injuries acquired by dogs during agility-related activities. Respondents were handlers recruited through member lists of large canine agility associations in Canada and the United Kingdom and through promotion on an agility blog site. Associations between cause and anatomic site or type of injury and between injury severity (mild vs severe) and setting (competition vs practice) were investigated.

Results—Surveys were received from 1,669 handlers of 3,801 agility dogs internationally. Handler-reported data indicated 1,209 of 3,801 (32%) dogs had ≥ 1 injury; of 1,523 analyzed injuries, the shoulder (349 injuries), back (282), and neck (189) regions and phalanges (202) were predominantly affected. Soft tissue injuries (eg, strain [muscle or tendon injury; 807], sprain [ligament injury; 312], and contusion [200]) were common. Injuries were most commonly incurred during interactions with bar jumps, A-frames, and dog walk obstacles (260, 235, and 177 of 1,602 injuries, respectively). Anatomic site and type of injury were significantly associated with perceived cause of injury.

Conclusions and Clinical Relevance—These findings provided a basis for further experimental studies to identify specific mechanisms of various types of injury in dogs that participate in agility activities. (*J Am Vet Med Assoc* 2013;243:1010–1018)

During agility competitions, dogs and their handlers work as a team to navigate a sequence of obstacles at speed, similar to show jumping in horse shows. A typical course can include 18 to 23 obstacles that involve jumping (ie, bar, panel, broad, spread, and tire jumps), weaving between upright poles, turning in tunnels (open and closed), climbing ramps (eg, A-frame) and seesaws, and movement on and off of, or across, other elevated surfaces (eg, dog walk and pause table); the type, number, and sequence of obstacles vary substantially among competitions. Specifications for these obstacles can vary among different sponsoring organizations.[1–3]

Agility competition is rapidly becoming the most popular canine performance sport in the world.[4] In North America, data indicate that the number of entries in American Kennel Club–sanctioned events in 2010 was close to 950,000, with a growth rate of nearly 10% annually between 2003 and 2010.[5] The number of dogs newly registered to participate in Canada's largest agility organization, the Agility Association of Canada, also increased by approximately 10% per year from 2000 to 2010, with > 1,300 new registrations in 2010.[a]

To date, only limited information is available regarding injuries among dogs that participate in agility events. In 2009, Levy et al[6] conducted a survey of American agility dog handlers, with responses received for 1,627 dogs. They found that 33% of these dogs had been injured, with 58% of injuries occurring during agility competition. The most commonly injured regions were the shoulder and back, and Border Collies

From the Biophysics Interdepartmental Group (Cullen, Dickey), the Department of Human Health and Nutritional Sciences, College of Biological Sciences (Bent), and the Departments of Biomedical Sciences (Thomason) and Clinical Studies (Moëns), Ontario Veterinary College, University of Guelph, Guelph, ON N1G 2W1, Canada; the Institute for Work and Health, 481 University Ave, Toronto, ON M5G 2E9, Canada (Cullen); and the School of Kinesiology, Faculty of Health Sciences, University of Western Ontario, London, ON N6A 5B9, Canada (Dickey).

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Address correspondence to Ms. Cullen (kcullen@iwh.on.ca).

appeared to incur a greater percentage of injuries than did all other breeds. Contact with an obstacle was reported as the perceived cause of injury, with A-frame, dog walk, and bar jump obstacles most commonly reported. Results of a preliminary survey given to handlers attending the 2003 Ontario Regional Championships (Cullen K; unpublished data) were consistent with previously published[6] findings. Results gathered for 102 agility dogs attending this event indicated that 35 (34%) had received an injury from participation in the sport; the shoulder and back regions were the most common sites of injury, and interaction with an A-frame was the most common perceived cause of injury. As the popularity of canine agility competitions continues to increase, companion animal veterinarians may expect to see more patients that are injured while participating in this activity; thus, understanding the etiology of such injuries is of critical importance.

In recent years, the caliber of top-ranked dogs in the sport has risen dramatically, with very small differences in scoring determining the winners at prestigious world championship events; for instance, in an international agility competition held in 2011 in Louisville, Ky, course performance times among the top 20 dogs in the qualifying round of the steeplechase event (which determined eligibility into the $10,000 final steeplechase round) differed by < 1 second.[7] In response to the high degree of athletic ability of such dogs, judges are designing more technically challenging courses, which increase the physical demands placed on canine athletes and may potentially increase the risk of injury. Although little is known about the implications that course design modifications may have on this risk in dogs, there is a substantial body of evidence in the equine literature to suggest that course design has a role in the risk of injury. In steeplechase and cross-country events, jump position (ie, angle and distance between jumps), track surface, race distance, and speed are important factors associated with serious injuries.[8–12] Given the similarities among these sports, despite the differences in species, it stands to reason that these factors may also be associated with injury in dogs participating in agility training or competition.

Clearly, there is a need to expand on the knowledge base for better assessment of the risk factors for injury among agility dogs. The objectives of the study reported here were to characterize injuries (on the basis of type and severity of injury and affected region of the body) incurred by dogs during agility training or competition and to examine the associations between injury characteristics and perceived causes of injury.

Materials and Methods

Sample—Survey participants were handlers of agility dogs who had Internet access and were willing and able to complete an electronic survey in English. Respondents from any geographic location were eligible to complete the survey.

Survey instrument and procedures—A retrospective survey design was used to examine demographic information for handlers and dogs, frequency of participation in agility training and competitions, characteristics of any agility training- or competition-related injury, and factors perceived to cause or contribute to the injury. The survey instrument was based on a survey developed in a preliminary study, in which a group of handlers for 102 agility dogs attending the Ontario Agility Association of Canada Regional Championship in 2003 answered questions regarding agility training– and competition-related injuries in their dogs (unpublished data). The final 27-item electronic survey[b] was pretested with a small convenience sample of 10 agility dog handlers to ensure it was user-friendly and comprehensive before beginning participant recruitment for the present study. The survey instrument and research protocol were reviewed and approved by the University of Guelph Research Ethics Board.

The survey was initiated, and responses provided between March 16 and September 30, 2009, were collected and analyzed. Participants were recruited through member lists of large canine agility associa-

Table 1—Selected characteristics of 1,669 agility dog handlers that participated in a 2009 survey to identify patterns of injuries (ie, type and severity of injury and affected region of the body) among dogs participating in agility training and competition events and examine associations between these patterns and perceived causes of injury.

Characteristic	No. (%) of respondents
Sex	
Male	124 (7.5)
Female	1,530 (92.5)
Age (y)	
≤ 19	45 (2.7)
20–29	164 (9.9)
30–39	318 (19.2)
40–49	449 (27.1)
50–59	490 (29.6)
≥ 60	191 (11.5)
Canine agility experience (y)	
< 5	465 (28.1)
5–10	807 (48.8)
> 10	381 (23.0)
Trials entered in past year (No. of events/mo)	
0	109 (6.6)
< 1	385 (23.3)
1	486 (29.4)
> 1	672 (40.7)
Frequency of canine agility practice in past year (No. of times/wk)	
0	7 (0.4)
< 1	72 (4.4)
1	383 (23.3)
2–3	756 (46.0)
4–5	318 (19.3)
> 5	109 (6.6)
Participation in other canine sports	
Yes	741 (44.7)
No	915 (55.3)
Region	
North America	1,390 (84.3)*
Canada	419 (25.4)
United States	966 (58.6)
Europe	207 (12.6)
Australia and New Zealand	28 (1.7)
South America	19 (1.2)
Africa	2 (0.1)
Asia	2 (0.1)

Percentages were based on the total number of responses for each category: sex (n = 1,654), age (1,657), agility experience (1,653), trials entered in the past year (1,652), frequency of agility practice (1,645), participation in other canine sports (1,656), and region (1,648).
*Total includes 5 participants from Mexico and Bermuda.

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tions in Canada (Agility Association of Canada) and in the United Kingdom (UK Agility) and through promotion on an agility blog site.[13] The electronic survey was promoted by these parties to their members once (via 1 contact/email address) on their websites as well as on their Internet discussion lists and at local competitions.

Respondent participation was initiated by clicking on a website link that directly accessed the survey. Collection restrictions were placed on the survey (on the basis of internet protocol address) to ensure that only 1 survey/respondent could be completed. Respondents were not blinded to the purpose of the study. There was an opportunity for respondents with multiple dogs to provide answers for each dog separately. Additionally, if a dog had incurred multiple injuries, respondents were instructed to fill out separate forms for each injury (up to 5 injuries/dog).

Demographic information collected included geographic location and the handler's gender and age. The number of dogs that the handler had entered in agility competitions during his or her career, number of years of experience in agility training, number of trials participated in during the past year, and frequency of agility practice for the handler were solicited as well as any preventative measures intended to keep dogs fit for agility activities and whether the handler and dogs participated in other canine sports. Information collected for dogs included breed, height at the withers (ie, highest point of the shoulders), weight, date of birth, number of years of participation in agility activities, agility associations for which the dog was registered, and whether any agility training– or competition-related injuries had been incurred. Results of analysis of risk factors for injury among these same dogs were reported elsewhere.[14]

If applicable, handlers were asked to provide their best estimate regarding the type of injury, anatomic region affected, and perceived cause of injury. Confirmation of reported injuries by a veterinarian was not a requirement for participation in this study.

A labeled diagram was provided to aid in consistent reporting of affected body regions. Regions were labeled (without demarcation of specific anatomic boundaries) as follows: head, mouth or teeth, eye, neck, back (shown as the dorsum extending approx from the highest point of the shoulders to the lumbar spine), chest (rib cage), flank (lateral aspect of the abdomen caudal to the rib cage), loin (dorsal region between the back and the croup), croup (dorsal aspect of the hindquarters), shoulder (scapular region), upper arm (brachium), forearm (antebrachium), elbow joint, carpal joint, upper and lower thigh (regions of the hind limb proximal to the stifle joint and between the stifle and tarsal joints, respectively), stifle joint, patella, tarsal joint, metacarpus, metatarsus, phalanges of the forelimbs or hind limbs, footpads, tail, or other.

For type and cause of injury, several response options were presented and handlers could choose all that applied. Injury types were categorized as sprain (defined as ligament injury), strain (defined as muscle or tendon injury), fracture, laceration, contusion, abrasion, puncture, or other. Selections for cause of injury included collision with an obstacle, handler, or judge; environmental conditions such as wet grass; no known specific cause; or other. Agility course obstacles listed included bar, spread, broad, panel, and tire jumps; dog walk; A-frame; seesaw; table; weave poles; and open and closed tunnels. For environmental conditions, an open-ended text field was available for respondents to provide additional information. Handlers could select multiple categories that contributed to the injury. A response of "other" to applicable questions also included an open-ended text field, which could be used if none of the provided response options were applicable.

If applicable, handlers could select multiple response options for the variables of anatomic site, type, and perceived cause of injury to describe a single injury incident. Additional questions regarding injured dogs included whether the specified injury was thought to have occurred during agility practice, competition, or in other settings; date of injury; amount of time re-

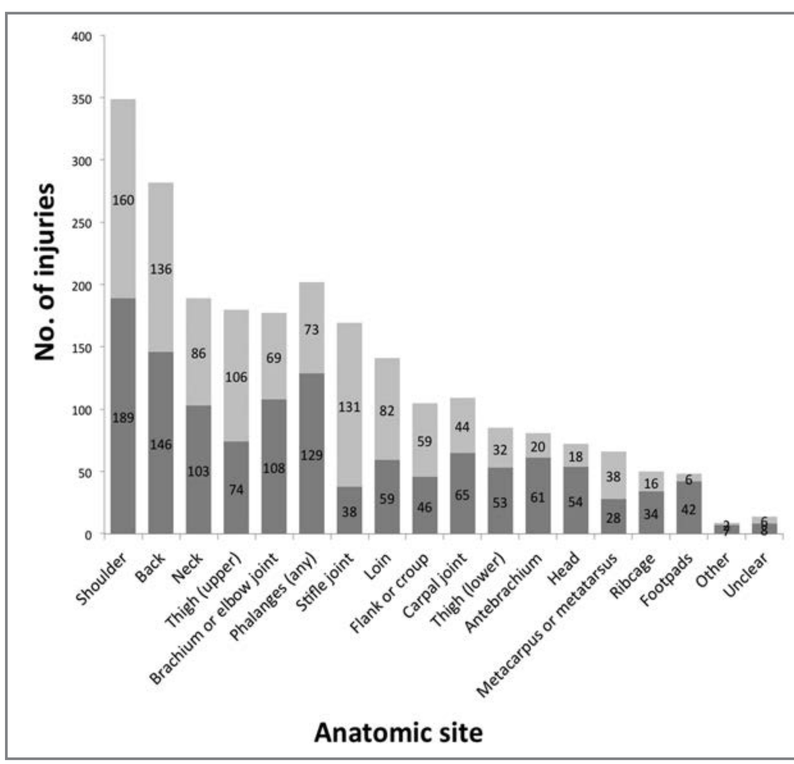

Figure 1—Common anatomic sites of mild (dark gray) and severe (light gray) injuries incurred by dogs during agility-related activities as reported by handlers in a 2009 Internet-based international survey. Responses were received from 1,669 handlers regarding 3,801 dogs; 1,602 injuries were described for 1,209 dogs. A labeled diagram was provided to enable consistent reporting of affected body regions. Handlers could select multiple anatomic sites if applicable for each injury incident. Mild injuries were defined as those that resolved in < 1 month, and severe injuries were defined as those that required ≥ 2 months to resolve (according to the handlers' responses). Confirmation of reported injuries by a veterinarian was not required. Seventy-nine of 1,602 injuries involving 127 anatomic sites were excluded from analysis because recovery was not complete or recovery time was not clear. Regions classified as other included the tail.

quired for recovery; whether medical intervention or other treatment was sought; and whether the same dog incurred multiple injuries.

Statistical analysis—For purposes of analysis, injuries were classified as mild or severe on the basis of the amount of time that respondents indicated was required for their dogs to recover. Injuries that resolved in < 1 month were classified as mild, and those that required ≥ 2 months for recovery were classified as severe. Injuries from which a dog had not fully recovered or for which recovery status was unclear were excluded from these categories and from analyses comparing variables on the basis of severity category.

Descriptive statistics for each variable were calculated and included a description of central tendency (mean), spread (SD and range), and distribution (frequency table and histogram). Associations of the handler-reported cause of injury with anatomic site and type of injury were examined by means of contingency tables and Pearson χ^2 goodness-of-fit analyses. To avoid violating the assumption that each observation was independent, only the first-reported injury was included in these analyses. Additionally, an independent χ^2 analysis was conducted for each of 18 anatomic sites and 12 injury types across handler-reported cause of injury. The expected frequencies were taken to be equal across each handler-reported cause of injury. The *P*-values were adjusted using false discovery rate to account for multiple comparisons.

Pearson χ^2 tests of independence were also used to examine whether associations existed between the severity of first-reported injuries (mild vs severe) and activity settings where these occurred (competition vs practice). The Yates correction for continuity was used where appropriate for these analyses.[15] Statistical analyses were performed with statistical software.[16,c] Values of $P < 0.05$ were accepted as significant.

Results

Characteristics of handlers and dogs—Completed surveys were received from 1,669 handlers and included data for 3,801 dogs that participated in canine agility activities. Not all respondents answered every question. Characteristics of handlers were summarized **(Table 1)**. The typical survey respondent (ie, handler) was female, > 40 years old, and from North America. Most handlers (1,188/1,653 [71.9%]) had ≥ 5 years of experience in the sport, had practiced at least once weekly during the previous year (1,566/1,645 [95.2%]), and had entered canine agility competitions with their dogs at least once per month during this time (1,158/1,652 [70.1%]).

Dogs had a mean ± SD weight of 17.8 ± 9.1 kg (39.2 ± 20.0 lb; range, 1.8 to 75 kg [4.0 to 165 lb]) and height of 47.8 ± 11.9 cm (18.8 ± 4.7 inches; range, 15.9 to 83.8 cm [6.25 to 33.0 inches]). Dogs had participated in agility activities for a mean ± SD of 4.5 ± 2.7 years (range, 0.5 to 14.0 years). The 6 breeds most commonly represented were Border Collie (639/3,801 [16.8%]), mixed (431 [11.3%]), Shetland Sheepdog (360 [9.5%]), Australian Shepherd Dog (252 [6.6%]), Labrador Retriever (133 [3.5%]), and Golden Retriever (131 [3.4%]). The population of dogs comprised 162 breeds in total.

Of 1,656 respondents that answered the question, 741 (44.7%) reported that in addition to agility activities, they and their dogs had participated in ≥ 1 other canine sport or activity. The most common of these were obedience (520/741 [70.2%]), rally-obedience (417 [56.3%]), conformation competition (219 [29.6%]), herding (217 [29.3%]), tracking (204 [27.5%]), and flyball (133 [17.9%]) activities.

Injury characteristics—In total, 1,209 of 3,801 (31.8%) dogs had an agility-related injury, and 334 of 1,209 (27.6%) dogs incurred > 1 injury. Mild injuries (809/1,602 [50.5%]) were more common than severe injuries (714 [44.6%]); the remainder (79 [4.9%]) were unclassifiable. Nine hundred and sixty nine of 1,602 (60.5%) injuries were evaluated by a veterinarian, and no medical attention was sought for 270 (16.9%); 71 (4.4%) injuries were treated by means of orthopedic surgery. Other treatments sought for injuries included chiropractic care (691/1,602 [43.1%)], physiotherapy (412 [25.7%]), acupuncture (290 [18.1%]), and massage (97 [6.1%]).

Perceived causes were not identified for 430 of 1,602 (26.8%) reported injuries (classified as nonspe-

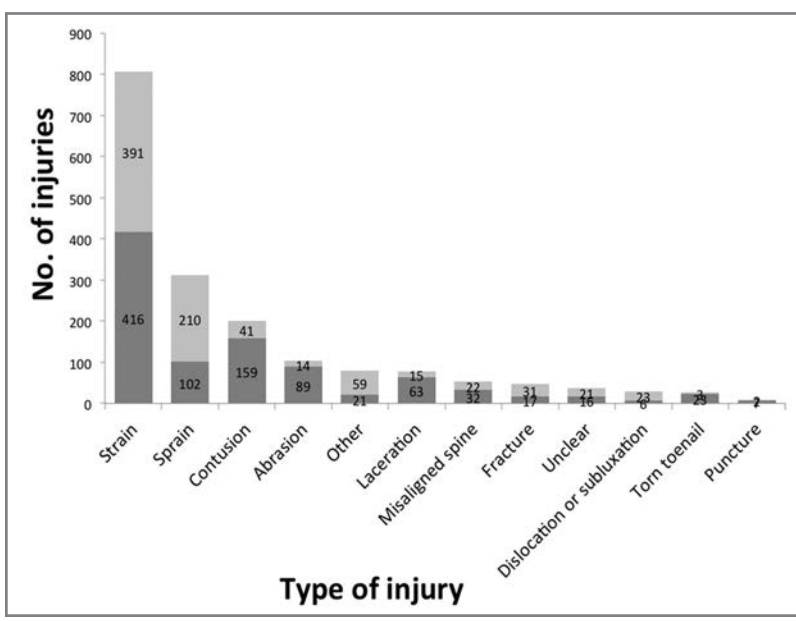

Figure 2—Common types of mild and severe injuries incurred by the same dogs as in Figure 1. Sprains were defined as ligament injuries, and strains were defined as muscle or tendon injury. Injuries classified as other were reported by handlers in their own words in open-ended text fields and included herniated disk (n = 24), arthritis (12), jammed toes (8) or joints (4), nerve injury (8), bone spur (4), dental injury (3), concussion (3), unspecified hernia (3), lumbosacral stenosis (2), joint capsule injury (2), and 1 each of unspecified brain injury, sesamoiditis, bee sting, cauda equina injury, cold tail or limber tail syndrome, fibrocartilaginous embolism, and spondylosis. Handlers could select multiple types of injury for a given injury incident. Seventy-nine of 1,602 injuries involving 103 types of injury were excluded from analysis because recovery was not complete or recovery time was not clear. *See* Figure 1 for remainder of key.

cific injuries). Commonly reported causes of injury included direct contact with a bar jump (260/1,602 [16.2%]) and contact with or fall from an A-frame (235 [14.7%]) or dog walk (177 [11.0%]). In 318/1,602 (19.9%) reported injuries, handlers identified > 1 perceived cause for injury. Environmental factors were implicated in 202/1,602 (12.6%) injuries. These included slippery conditions on wet grass (n = 42), loose footing on dirt surfaces (17), hard dirt or dry grass surfaces (21), slippery indoor mat surfaces (15), slick wet contact surfaces on obstacles (15), uneven ground or debris on field (10), carpet or artificial turf surfaces (5), and glare from the sun (1). Further details were not provided for the remaining 76 environmental factor–related injuries.

Distributions of injuries were summarized by anatomic site, severity, and type **(Figures 1 and 2)**. Anatomic regions most commonly affected were the shoulder (349/1,523 [22.9%] injuries), back (282 [18.5%]), phalanges (forelimb or hind limb; 202 [13.3%]), and neck (189 [12.4%]). Injuries typically involved soft tissues (strain, 807/1,523 [53.0%]; sprain, 312 [20.5%]; or contusion, 200 [13.1%]). Seventy-nine of 1,602 injuries involving 127 anatomic sites and 103 injury types were excluded from this analysis because they could not be classified as either mild or severe.

First-reported injuries attributed to the 3 most common perceived causes during the study (ie, those attributed to interactions with a bar jump, A-frame, or dog walk) were summarized by anatomic site and type **(Figures 3 and 4)**. Several anatomic sites ($P < 0.05$ for shoulder, antebrachium and head; $P < 0.01$ for phalanges, stifle joint, carpal joint, and ribcage) and types of injury were significantly ($P < 0.05$ for strain; $P < 0.01$ for abrasion) associated with cause. Results of χ^2 analyses and visual comparison of graphs revealed differences in the distribution of first-reported injuries attributed to each of the 3 most common causes, compared with the distribution when cause of injury was not taken into consideration (Figures 1 and 3).

Contact with a bar jump was the reported cause of a higher than expected number of shoulder (n = 41), stifle joint (36), carpal joint (23), and antebrachium (22) injuries, whereas a higher than expected number of shoulder (48) and phalangeal (42) injuries were attributed to contact with or fall from an A-frame. Contact with or fall from a dog walk was associated with a higher than expected number of ribcage (n = 14) and head (11) injuries, although neither of these injuries were frequently reported within the sample. Neck and back injuries were frequently reported but more equally distributed across all 3 perceived causes. Results of χ^2 analyses and visual inspection of graphs indicated that contact with or a fall from a dog walk was associated with a lower than expected number of strains (n = 57) and a higher than expected number of abrasions (22), compared with contact with

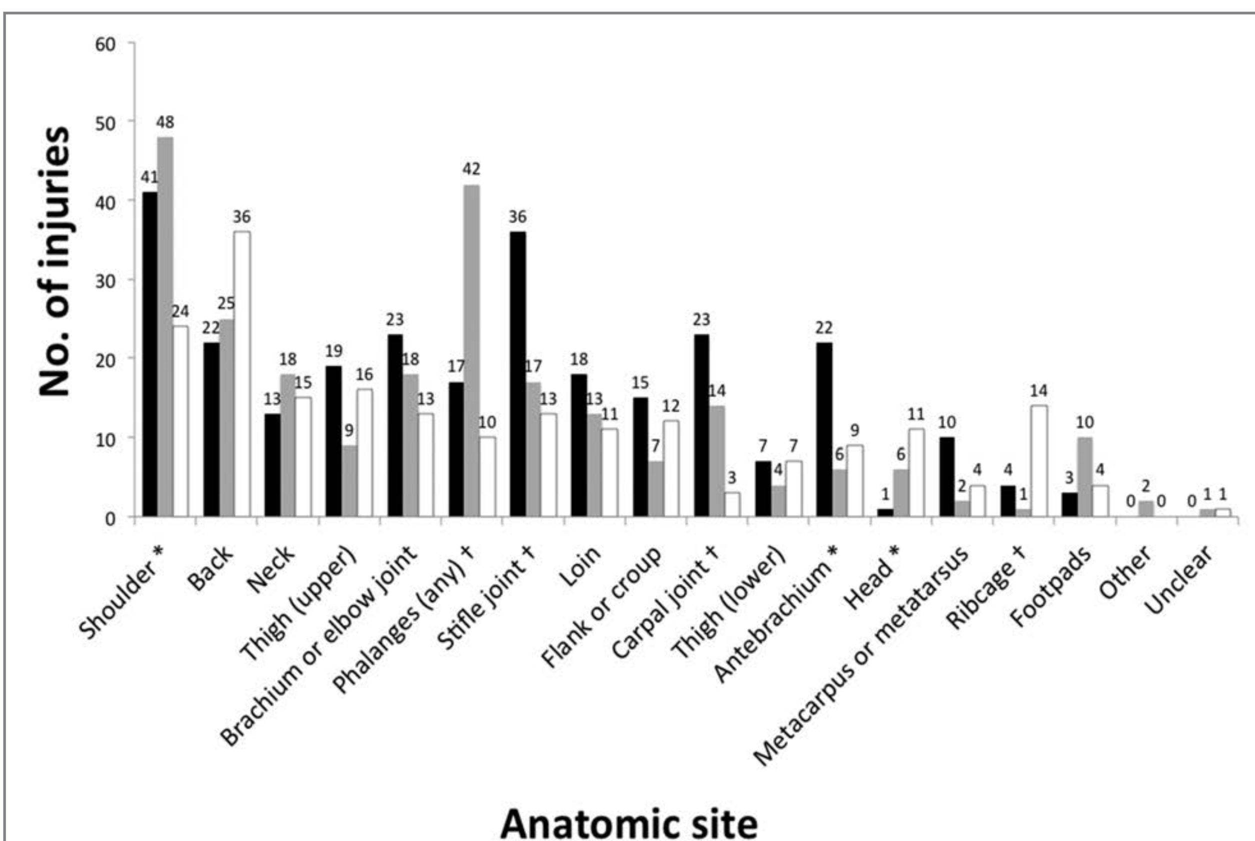

Figure 3—Common anatomic sites for first-reported injuries attributed to the 3 most common causes of agility-related injury (ie, those resulting from interactions with a bar jump [black bars], A-frame [light gray bars], or dog walk [white bars]) for the same dogs as in Figure 1. Results of Pearson χ^2 goodness-of-fit analyses indicated significant differences from expected equal injury distribution for several anatomic sites across the 3 most common causes of agility-related injury. *$P < 0.05$; †$P < 0.01$.

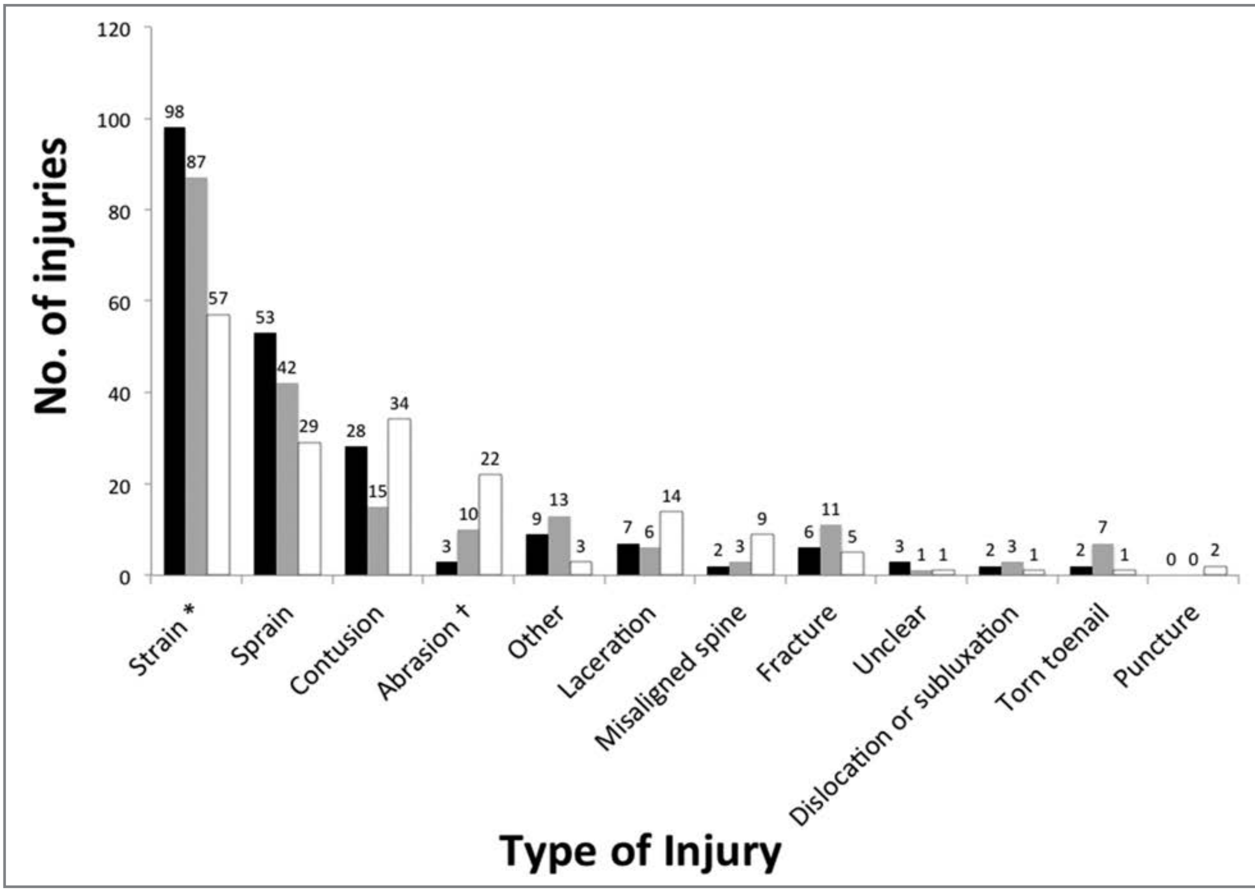

Figure 4—Common types of injuries attributed to the 3 most common causes of agility-related injury for the same dogs as in Figure 1. Results of Pearson χ^2 goodness-of-fit analyses indicated significant differences from expected equal injury distribution for injury type across the 3 most common causes of agility-related injury. *$P < 0.05$; †$P < 0.01$. *See* Figures 2 and 3 for key.

or fall from an A-frame (87 and 10 injuries, respectively) or bar jump (98 and 3 injuries respectively). The distribution of all other injury types resulting from the 3 most common causes of injury was similar to that for all causes combined (Figures 2 and 4).

The proportion of injuries that occurred during agility competitions (739/1,602 [46.1%]) was similar to those that occurred during practice sessions (726 [45.3%]). The activity setting for 137 (8.6%) injuries was classified as unknown. Of 1,209 first-reported injuries, 497 (272 mild and 225 severe) and 518 (269 mild and 249 severe) occurred during competition and practice sessions, respectively. One hundred ninety-four injuries for which severity, setting, or both was unknown were excluded from this analysis.

The number of mild and severe first-reported injuries attributed to various obstacles was summarized for each setting; no significant associations were identified via χ^2 analysis (**Table 2**). Injuries attributed to indirect or unknown causes (n = 285) and environmental conditions (146) were also analyzed with no significant differences found. Six other perceived causes of injury reported by handlers had insufficient data points to obtain meaningful results from a χ^2 analysis. These included human-dog collisions (n = 15), direct contact with or falls from the table (14), panel jump (6), long jump (7) and chute (closed tunnel; 21), and other mechanisms as reported by the handler (18). Because handlers could select multiple perceived causes for a given injury, the totals for all causes exceeded 1,209.

Table 2—Results of χ^2 analysis for first-reported injuries incurred by dogs (n = 1,209) during agility competitions or practice sessions and number of injuries classified as mild or severe for each obstacle.

Obstacle*	Competition	Practice	*P* value
Bar jump			1.0
Mild	46	54	
Severe	37	44	
A-frame			0.82
Mild	44	47	
Severe	34	32	
Dog walk			0.91
Mild	26	41	
Severe	22	31	
Seesaw			0.51
Mild	15	8	
Severe	9	9	
Spread jump			0.89
Mild	10	9	
Severe	12	8	
Tunnel			0.59
Mild	7	10	
Severe	7	5	
Tire jump			0.09
Mild	32	8	
Severe	13	10	
Weave poles			0.93
Mild	16	10	
Severe	10	8	

Data are reported as the number of first-reported injuries (total, 1,209); handlers were allowed to report up to 5 injuries/dog. Injuries that resolved in < 1 month were classified as mild, and those that required ≥ 2 months for recovery were classified as severe (on the basis of handlers' responses). Not all injuries involved an obstacle; additionally, 194 injuries for which severity, setting, or both was unknown were excluded from this analysis.

*Cause of injury was reported as resulting from direct contact with or falls from listed equipment.

Discussion

Results of the present study are consistent with the limited existing literature indicating that agility-related injuries affect approximately one-third of dogs participating in the sport and that soft tissue strains, sprains, and contusions to the shoulder, back, phalanges, and neck are most common types and sites of agility-related injury in dogs.[6] In the present study, survey respondents indicated that 969 of 1,602 (60.5%) of the described injuries were evaluated by veterinarians.

In our study, 672 of 1,602 (41.9%) injuries were attributed to interaction with 3 specific pieces of equipment: bar jumps (260 [16.2%]), A-frames (235 [14.7%]), and dog walks (177 [11.0%]). Dogs typically perform many more jumps on a given agility course, compared with navigation of A-frames or dog walks. We examined a convenience sample of 36 international course maps from several regions (including Canada, the United States, and the European Union) from the 2011 competition year and found that, in general, for a course that included 20 obstacles, 13 of these were bar jumps and only 1 A-frame and 1 dog walk were included; the remaining 5 obstacles comprised some combination of tunnels (open and closed), weave poles, other types of jumps (ie, broad, panel, spread, or tire jumps), and seesaws (unpublished data). Given the degree of exposure to bar jumps, it is not surprising that many injuries were attributed to contact with this type of obstacle. It is possible that injuries associated with a particular obstacle may in part be related to the previous obstacle, as it may influence, for example, the speed and direction that the dog approaches the obstacle. Since the obstacles in a given competition are performed in specific order, and the order changes among competitions, we were not able to evaluate the contribution of factors such as sequence of obstacles.

The fact that many injuries were attributed to interactions with A-frame or dog walk obstacles was disconcerting, considering the lower degree of exposure to these obstacles in typical competition courses. It is possible that the exposure to these obstacles could be different in practice sessions (eg, where handlers may choose to have a dog perform several repetitions of a particular obstacle in 1 training session). Levy et al[6] reported that a slightly higher percentage of mild injuries (60%) occurred in competition than in practice sessions but found a nearly equal distribution of major or chronic injuries between competition and practice settings. In the present study, the distribution of mild and severe first-reported injuries incurred was similar between competition (n = 272 and 225, respectively) and practice settings (269 and 249, respectively).

Several sites and types of injury were significantly associated with the handler-reported cause of injury in dogs of the present study. An apparent difference in the distribution of injuries was found when considering the cause of injury, compared with the distribution when this was not taken into account. When all injuries were considered together, shoulders, backs, phalanges, and necks were ranked as the most common sites of injury. However, Pearson χ^2 goodness-of-fit analyses and visual examination of data for the 3 most common causes of injury in this study indicated a higher than expected number of shoulders and phalanges were commonly injured when performing the A-frame task. In contrast, shoulder, antebrachium, stifle, and carpal joint injuries were more frequently reported than expected as resulting from contact with a bar jump, and contact with or fall from a dog walk was associated with a higher than expected number of ribcage and head injuries (although neither of these were frequently reported within the sample). Neck and back injuries were frequently reported but more equally distributed among the 3 most common causes of injury. Contact with or fall from a dog walk was associated with a high number of strains (although lower than expected) and a higher than expected number of abrasions, compared with the other 2 causes. The distribution of other injury types resulting from the 3 most common causes of injury was equally distributed across all causes, with strains, sprains, and contusions most frequently reported. These findings suggest that future research examining these obstacles should evaluate specific etiologies of injuries. Results of a recent study[17] investigating kinetic variables in dogs landing from agility course jumps found high peak vertical force in the forelimbs (4.5 times the body weight) when a bar jump was navigated at high speed (ie, 7.9 m/s). Those findings also indicated that further biomechanical studies are warranted to quantify relationships between anatomic sites and mechanisms of injury attributed to various agility activities. During the interval since the survey in the present study was conducted, some jurisdictions have implemented rule changes governing obstacle specifications. This may lead to changes in obstacle design and performance safety over time, which should be evaluated in future studies.

In the present study, 202 of 1,602 (12.6%) injuries were at least partially attributed to environmental factors. Commonly reported environmental factors involved in injuries included slippery conditions on wet grass, loose footing on dirt surfaces, hard and slippery indoor mat surfaces, glare from the sun, and slick wet contact surfaces. Studies[8,9,11,18] of horses participating in cross-country and steeplechase events have indicated that track conditions, speed, and distance of a race are important factors implicated in injuries. These factors should be considered when choosing suitable locations for agility practice and competitions, and further studies investigating these factors are warranted.

A considerable proportion of injuries (430/1,602 [26.8%]) reported in our study had an undefined (or nonspecific) cause of injury. When considered together with the 137 of 1,602 (8.6%) injuries that could not be attributed to a specific setting (agility practice vs competition), this suggests that handlers are not always attuned to identifying early signs of lameness or other injury in their dogs. This is not surprising, given that many clinicians regard diagnosis of canine lameness as challenging.[19–24]

Limitations of the present study should be considered when evaluating the results. The accuracy of the study findings is restricted by participant recall, use of handler-reported data, and lack of confirmation of the reported injuries by veterinarians. Memory degradation and accuracy are concerns with any retrospective survey design. However, several studies[25–27] in humans found high levels of agreement between retrospective self-reported data and prospectively collected objective data on sports injury variables, including number of injuries, anatomic location, type of injury, and level of treatment sought. Studies examining recall of parents for injuries and illnesses affecting their children indicate that retrospective data for injuries resulting from accidents are more accurate than those for illnesses such as bronchitis or otitis,[28] and that there is a greater likelihood of underreporting minor injuries than major injuries > 6 months after injury occurs.[29,30] However, for incidents that are recalled, an acceptable level of agreement between parental reports and pediatrician records has been described.[28,29] This suggests that findings of the present study could potentially underestimate the number of minor injuries that were incurred by agility dogs.

A prospective cohort or case-control study design would be preferential to a retrospective survey. However, results of our study indicate that nearly one-third (1,209/3,801) of the dogs included incurred ≥ 1 injury while practicing for or participating in agility competitions, and significant associations between the perceived cause of injury and anatomic site or type of injury were identified in this large group of dogs from various regions throughout the world.

Self-selection bias for survey respondents is also a recognized limitation of this study. Respondents that self-select or volunteer to participate in a study may not be representative of the population of interest.[31–34] However, studies[31,32,35] investigating differences between self-selected and random samples have shown that in situations where self-selected respondents are part of a community or care about the issue to be studied, their motivation to respond encourages them to provide more complete and higher quality data (eg, fewer missing data and more responses to open-ended questions), compared with those supplied by randomly selected participants. Comparisons of self-selected versus random samples often show few, if any, differences for many demographic variables, including income, education, age, and gender.[31–33] Although it was not possible to determine the effect of selection bias in the present study, it is likely that the respondents could be classified as belonging to a community (more specifically, an agility dog handler community) and that understanding the risks of injury to the dogs that they own or work with is an issue that they would care about.

Results of the present study provide a basis for experimental studies aimed at identifying mechanisms of various types of injury in dogs that participate in agility activities. An important future goal is to identify improvements in equipment, techniques, or both that may reduce the risk of injury among these canine athletes.

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From this month's *AJVR*

Degree and duration of corneal anesthesia after topical application of 0.4% oxybuprocaine hydrochloride ophthalmic solution in ophthalmically normal dogs

Jean-Yves Douet et al

Objective—To assess the anesthetic efficacy and local tolerance of topically applied 0.4% oxybuprocaine ophthalmic solution in dogs and compare its effects with those of 1% tetracaine solution.

Animals—34 ophthalmically normal Beagles.

Procedures—Dogs were assigned to 2 groups, and baseline corneal touch threshold (CTT) was measured bilaterally with a Cochet-Bonnet aesthesiometer. Dogs of group 1 (n = 22) received a single drop of 0.4% oxybuprocaine ophthalmic solution in one eye and saline (0.9% NaCl) solution (control treatment) in the contralateral eye. Dogs of group 2 (n = 12) received a single drop of 0.4% oxybuprocaine ophthalmic solution in one eye and 1% tetracaine ophthalmic solution in the contralateral eye. The CTT of each eye was measured 1 and 5 minutes after topical application and then at 5-minute intervals until 75 minutes after topical application.

Results—CTT changes over time differed significantly between oxybuprocaine-treated and control eyes. After instillation of oxybuprocaine, maximal corneal anesthesia (CTT = 0) was achieved within 1 minute, and CTT was significantly decreased from 1 to 45 minutes, compared with the baseline value. No significant difference in onset, depth, and duration of corneal anesthesia was found between oxybuprocaine-treated and tetracaine-treated eyes. Conjunctival hyperemia and chemosis were detected more frequently in tetracaine-treated eyes than in oxybuprocaine-treated eyes.

Conclusions and Clinical Relevance—Topical application of oxybuprocaine and tetracaine similarly reduced corneal sensitivity in dogs, but oxybuprocaine was less irritating to the conjunctiva than was tetracaine. (*Am J Vet Res* 2013;74:1321–1326)

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