Journal of Veterinary Behavior 14 (2016) 17–19

Contents lists available at ScienceDirect

Journal of Veterinary Behavior

journal homepage: www.journalvetbehavior.com

Canine Research

Who is minding the bibliography? Daisy chaining, dropped leads, and other bad behavior using examples from the dog bite literature

Gary J. Patronek [a,*], Janis Bradley [b], Donald Cleary [b]

[a] Center for Animals and Public Policy, Cummings School of Veterinary Medicine at Tufts University, North Grafton, Massachusetts
[b] The National Canine Research Council, Amenia, New York

ARTICLE INFO

Article history:
Received 22 April 2016
Accepted 3 June 2016
Available online 16 June 2016

Peer-reviewed publications in the scientific literature are trusted to represent a high standard of discourse on any topic, and other scientists as well as the media may draw on them, and indeed depend on them, for reliable and accurate information. The literature review and other material contained in an Introduction form the foundation that supports the entire structure of any scientific article. An Introduction summarizes prior attempts to address the question at hand or related ones; clarifies the underlying assumptions on the subject (including the social or humane benefit of doing the research in the first place); and establishes that the authors are sufficiently familiar with the strengths, weaknesses, and gaps in the existing literature. Similarly, the citations in a Discussion help anchor a study's Results to a larger body of work, which allows the authors to highlight how their findings are consistent with, or deviate from, findings of others. A Discussion also lays out the premises from which the authors reason to their conclusions. However, if citations are used without due attention to the actual degree of evidence-based support they contain, or if key points asserted as fact are not supported with credible citations at all, the resulting argument and conclusions may be akin to a thread hanging from a poorly woven garment—1 small tug and the entire piece begins to unravel.

Given that guidelines for reporting scientific information (e.g., the CONSORT guidelines for reporting a randomized clinical trial [CONSORT, 2016], and the STROBE guidelines for observational studies [STROBE, 2016]) emphasize accuracy and completeness in the reporting of Methods and Results, one might be tempted to assume that an Introduction, Discussion, and the References which anchor those sections are relatively free of problems in scientific articles. We are not so sure such an assumption is appropriate. After carefully reading over 150 scientific articles on the topic of dog bites and performing a number of these "tugs," we are concerned that an insufficient degree of attention is being paid to these components of an article. Problems with citations include cases where an author's use of a citation does not match what was actually said or done in the original; placement of a citation in a way that implies that an off-hand comment or speculation made by an author in the Introduction or Discussion is instead a concrete finding based on data from the Results; or even attributing findings or other information to an article that actually includes no mention of the topic to which the citation refers.

To illustrate several common types of errors we have found, we will use citations about the force (also variably referred to as pressure or power in these articles) supposedly exerted by the jaws of domestic dogs as used in the literature about dog bites. Why bite force? First, the inconsistencies in the literature were easy to spot and remember. Second, these statistics have an emotional salience that lends themselves to hyperbole within an article, and therefore repetition by others. Third, the accuracy of the citations was easy to verify. Fourth, there were an ample number of citations to assess. Finally, this is a topic of relevance to the animal behavior literature.

In Figure 1, we diagram the relationships of over a dozen of different scientific papers from 1969 to 2009, and 2 legal cases from the United States Court of Appeals for the Fourth Circuit, that each make statement(s) about the force exerted by a dog's jaw during

* Address for reprint requests and correspondence: Gary J. Patronek, Center for Animals and Public Policy, Cummings School of Veterinary Medicine at Tufts University, North Grafton, MA 01536.
E-mail address: gary.patronek@tufts.edu (G.J. Patronek).

http://dx.doi.org/10.1016/j.jveb.2016.06.004

biting and use a citation to support the statement(s). We tracked each citation to 1 of 7 original sources and did not find verifiable evidence (or data obtained from a controlled experiment) about bite force in any of the articles. In 2 of the original sources, statements about bite force were found, but there were neither data nor a citation to support those statements (Chambers & Payne, 1969; Presutti, 1997). In 4 other original sources, none contained any statement or data about bite force, despite being cited by other scientific articles as though they had (Pinckney & Kennedy, 1980; Boenning et al., 1983; Wolff, 1998; Presutti, 2001). The final original source was not a scientific article at all, but a newspaper article that again provided no source for the data presented (Ferrigno, 1985). Tracked forward, that same newspaper article was cited (indirectly) in 2 decisions from the United States Court of Appeals for the Fourth Circuit (Melgar v. Greene, 2010; Vathekan v. Prince George's County, 1998). We say indirectly because the citation in the Court of Appeals opinion was to an article in a peer-reviewed human rights journal (Rosenthal, 1994) that had used the 1985 news article as its source. An even more convoluted series of connected, sequential citations goes from Monroy et al. (2009) to Wilberger & Pang (1983) to Callaham (1980) to Chambers & Payne (1969).

What other problems does this demonstrate? Chambers and Payne, in their 1969 article, used language that was very specific about how bite force may increase as a result of the training of US Air Force sentry dogs, and mentioned that at times, the bite force could be adequate to perforate the sheet metal gauntlet that is worn by handlers during training. As Figure 1 shows, Chambers' and Payne's perspective about events during military sentry dog training has morphed from its original meaning as it has been sequentially cited. Perforating the sheet metal gauntlet has become "sufficiently powerful to perforate sheet metal" (Wilberger & Pang, 1983) and the original notation of sentry dogs became "attack dogs" (Miller et al., 1993), which later morphed into generalizing about what occurs during "dog attacks" (De Munnynck & Van de Voorde, 2002).

What is the explanation for these inaccuracies? In some cases, indiscriminate sourcing may simply be a function of haste or a true lack of familiarity with the relevant literature. In other cases, what we refer to as "daisy chaining" appears responsible. This occurs when an author cites another author regarding a particular piece of information, but the cited author is not the primary source of that information, and was merely repeating it from what an earlier publication cited. Or put differently, citing someone else's Introduction (which itself may be citing yet another's Introduction), rather than someone's actual Results! Indeed, in 1 case (Akhtar et al., 2006), 1 chain of citation was tracked through 3 previous, sequential publications (Lackmann et al., 1992; Wilberger & Pang,

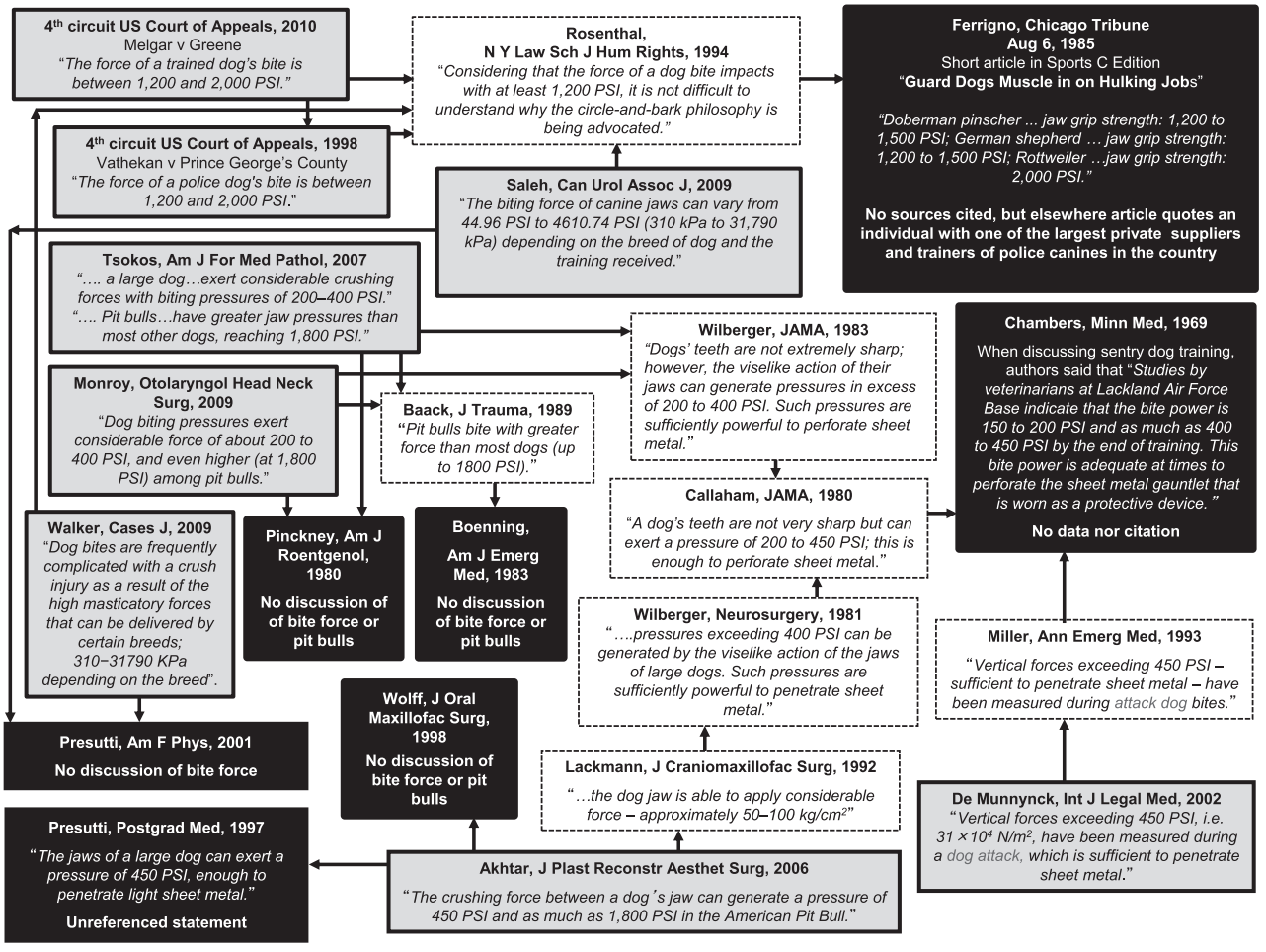

Figure 1. Diagram of cited text concerning canine bite force and citation pathways from most recent source (gray boxes) to intermediate (white boxes) and/or final sources (black boxes). Arrows show direction from latest to original source. Note that in some cases, in the original quote, pounds per square inch was spelled out in full. For space, we have abbreviated in the diagram. PSI, pounds per square inch.

1981; Callaham, 1980) before reaching the final article which contained no verifiable data about bite force, and whose original meaning had been subtly altered at each stage of the "daisy chain" (Chambers & Payne, 1969).

Other cases are even more perplexing. Four articles specifically claim that the bite force of a "pit bull" type dog can be as much as 1,800 pounds per square inch (Monroy et al., 2009; Tsokos et al., 2007; Akhtar et al., 2006; Baack et al., 1989). There is not a single original source reporting a Result that substantiates this claim. And what are we to make of cases where a source that literally did not contain any information about bite force was cited (e.g., Monroy et al., 2009 citing Pinckney & Kennedy, 1980; Baack et al., 1989 citing Boenning et al., 1983; Akhtar et al., 2006 citing Wolff, 1998; Saleh et al., 2009 citing Presutti 2001; Walker et al., 2009 citing Presutti 2001)?

Some might argue that this is much ado about nothing, but we contend the effect is not innocuous if the result is to misrepresent or invent data; to elevate someone else's off-hand comments, opinions, speculative musings, or non-published data to the level of peer-reviewed findings (so-called "data laundering") simply by citing them in a peer-reviewed forum; to create an impression (or sense of alarm) in the mind of the reader that is not justified by the Results of an actual study; or to inadvertently provide the opportunity for others to perpetuate the errors through subsequent citation, conferring "virtual immortality" on them. In a worst case scenario, in addition to distorting the scientific literature, inaccuracies can make their way into legal decisions which have very real-life consequences, as shown for the 2 cases in the United States Court of Appeals for the Fourth Circuit (Melgar v. Greene, 2010; Vathekan v. Prince George's County, 1998).

In an ideal world, the peer-review process would be a firewall to limit the extent of these occurrences. In reality, the peer-review process is a poor gatekeeper. Reviewers and journal editors, unless they are already very knowledgeable about the nuances of a particular subfield, may not recognize the error(s). Few reviewers are in a position to access and read all of the papers being cited, particularly for a lengthy article with many references. However, without such diligence, the "daisy chaining" of citations and the problems this introduces may never be recognized.

This leaves it to parties at the opposite end of the publication chain to exercise due diligence. For authors, this means using only primary sources to ensure that meaning has not been lost or distorted during subsequent citation by others. It also means refraining from the all-too-common practice of citing what an author said or speculated (e.g., in an Introduction or Discussion) because that lends the impression that such statements were supported by something the author actually did (e.g., as shown by data in the Results). In the age of electronic databases, this type of verification is no longer the daunting task it once was, and journals could require assurances that all references are original and/or have been verified by authors at the time of submission. Similarly, guidelines from expert bodies promoting evidence-based medicine could provide instructions on best practices for writing Introductions and Discussions, as they currently do for the reporting of Methods and Results. For readers, until such assurances are provided, perhaps "trust but verify" is the safest approach.

Acknowledgments

The authors thank Elizabeth Arps of the National Canine Research Council for help with proofreading and formatting this article. The idea for this article was conceived by all authors, and all authors contributed to the writing and review and approve this submission. There was no funding source beyond the relationships noted in the conflict of interest statement.

Ethical considerations

The ethical approval is not required for this study.

Conflict of interest

Gary Patronek is a paid consultant to the National Canine Research Council, a subsidiary of Animal Farm Foundation. Janis Bradley is an employee of the National Canine Research Council. Donald Cleary is an unpaid Policy and Research Consultant for the National Canine Research Council, and Treasurer of Animal Farm Foundation, Inc.

References

Akhtar, N., Smith, M.J., McKirdy, S., Page, R.E., 2006. Surgical delay in the management of dog bite injuries in children, does it increase the risk of infection? J. Plast. Reconstr. Aesthet. Surg. 59, 80–85.

Baack, B.R., Kucan, J.O., Demarest, G., Smoot, E.C., 1989. Mauling by pit bull terriers: case report. J. Trauma 29, 517–520.

Boenning, D.A., Fleisher, G.R., Campos, J.M., 1983. Dog bites in children: epidemiology, microbiology, and penicillin prophylactic therapy. Am. J. Emerg. Med. 1, 17–21.

Callaham, M., 1980. Dog bite wounds. JAMA 244, 2327–2328.

Chambers, G.H., Payne, J.F., 1969. Treatment of dog-bite wounds. Minn. Med. 52, 427–430.

The CONSORT Statement. Available at: http://www.consort-statement.org/. Accessed June 30, 2016.

De Munnynck, K., Van de Voorde, W., 2002. Forensic approach of fatal dog attacks: a case report and literature review. Int. J. Legal Med. 116, 295–300.

Ferrigno, R., 1985. Guard dogs muscle in on hulking jobs. Chicago Tribune. [SPORTS FINAL, C Edition].

Lackmann, G.M., Draf, W., Isselstein, G., Töllner, U., 1992. Surgical treatment of facial dog bite injuries in children. J. Craniomaxillofac. Surg. 20, 81–86.

Melgar v Greene, US Court of Appeals, 4th Circuit, No. 08-2393, January 29, 2010.

Miller, S.J., Copass, M., Johansen, K., Winn, H.R., 1993. Stroke following rottweiler attack. Ann. Emerg. Med. 22, 262–264.

Monroy, A., Behar, P., Nagy, M., Poje, C., Pizzuto, M., Brodsky, L., 2009. Head and neck dog bites in children. Otolaryngol. Head Neck Surg. 140, 354–357.

Pinckney, L.E., Kennedy, L.A., 1980. Fractures of the infant skull caused by animal bites. AJR A.m J. Roentgenol. 135, 179–180.

Presutti, R.J., 1997. Bite wounds. Early treatment and prophylaxis against infectious complications. Postgrad. Med. 101, 243–244, 246–252, 254.

Presutti, R.J., 2001. Prevention and treatment of dog bites. Am. Fam. Physician 63, 1567–1572.

Rosenthal, R., 1994. When K-9s cause chaos—an examination of police dog policies and their liabilities. N. Y. Law Sch J. Hum. Rights 11, 279–310.

Saleh, D., Shaw, D., Biyani, C.S., 2009. A dog bite to the adult scrotum. Can. Urol. Assoc. J. 3, E64–E66.

The STROBE statement. Available at: http://www.strobe-statement.org/index.php?id=strobe-home. Accessed June 30, 2016.

Tsokos, M., Byard, R.W., Püschel, K., 2007. Extensive and mutilating craniofacial trauma involving defleshing and decapitation: unusual features of fatal dog attacks in the young. Am. J. Forensic Med. Pathol. 28, 131–136.

Vathekan v Prince George County, US Court of Appeals, 4th Circuit, No. 96-2246, August 28, 1998.

Walker, T., Modayil, P., Cascarini, L., Collyer, J., 2009. Dog bite- fracture of the mandible in a 9 month old infant: a case report. Cases J. 2, 44.

Wilberger Jr., J.E., Pang, D., 1983. Craniocerebral injuries from dog bites. JAMA 249, 2685–2688.

Wilberger Jr., J.E., Pang, D., 1981. Craniocerebral injuries from dog bite in an infant. Neurosurgery 9, 426–428.

Wolff, K.D., 1998. Management of animal bite injuries of the face: experience with 94 patients. J. Oral Maxillofac. Surg. 56, 838–843. discussion 843–844.