Journal of Veterinary Behavior 31 (2019) iv–v

Contents lists available at ScienceDirect

Journal of Veterinary Behavior

journal homepage: www.journalvetbehavior.com

Editorial

Separating belief and knowledge in animal science

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The first paper in this issue by Patronek et al. (2019) deserves to be read more than once. While the focus is behavioral evaluations of shelter dogs, the authors' comments about labels, behavioral evaluations, and experimental and statistical design are a masterclass for those characterizing behavioral patterns. Their review and analysis of 25 years of data on behavioral tests in shelter dogs should mandate that any assessments done in a shelter or on members of a population needing to be rehomed focus only on two classes of questions. As individuals, what are these dogs' needs and how can they best be met? In the process of 'sheltering', is the shelter setting altering behavior in a supportive and positive direction or an adverse, negative one that impairs welfare? It's fascinating to note that given the number of behavioral tests Patronek et al. discuss, none seek to routinely evaluate, using repeated measures, effects of their staff, environment and policies on canine behavior. It is truly past time to implement such evidence based quality control standards.

Ramos and Mills (2019) seek to understand what human labels—words—mean to a dog… a non-trivial task. They evaluate whether dogs learn about "OBJECT" commands—those involving nouns or labels of things - and "ACTION" commands—those involving acts or labels of responses/behaviors - in the same way. The authors couch this question in some interesting assertions about evolution and selection. The results suggest that we need to consider prior/early development/experience/exposure hen we ask if dogs "can" do something or understand something, and consider what's in it for the dog. That virtually none of the dogs in the study succeeded with the "OBJECT" commands, but most succeeded with the "ACTION" ones may reflect nothing more than the contextual difference between the two. In our interactions with dogs we are almost always asking them to do—or not to do—something. They are accustomed to looking, getting, coming, barking, not barking, going, staying… and so on. But a *label* we assign to an object which may have no meaning or little interest to the dog and is divorced from all context except 'approach' may leave dogs seeking information as to what we wish for them to do. Actions associated with goal objects that are meaningful to human children precede learning about unrelated labels in human development. Yet, even in human children, the rate with which these skills are acquired depends maternal-infant interaction style, relationship with the experimenter, and so on (Robson and Kuhlmeier, 2016). It's important to remember that these differences in humans further occur in an environment awash in verbal information where such signals are directed at the infant at least hundreds of times a day. The amount of exposure to consistently delivered verbal signals in studies like Ramos and Mills may be insufficient to tell us much, given the dogs' varied lives, especially when dogs of different ages are compared. Finally, we seldom test for experimenters' abilities to teach dogs the intended task. Given these inconsistencies, we may argue for standardization in such testing for anyone wishing to comment on evolution, domestication, adaptation, or selection, since the risk of arbitrary and unreliable attribution may be high.

West and Rouen (2019) further contribute to information of the incidence of dog bites, with a focus on Indigenous communities in one region of Australia. Information on dog bite epidemiology suffers from being patchy and episodic, but native or indigenous cultures are underserved everywhere. Interestingly, here the incidence rates were highest for 25-44 year olds, although rates varied across communities. This study benefitted from laws restricting alcohol which occurred mid-way in the study. This fortuitous outcome allowed the authors to learn that dogs bites decreased once such restrictions were put into place. Substance induced mental and emotional impairment—and the behavioral unpredictability that may accompany it—is likely a risk for dog bites across cultures, and here it is elevated to knowledge over belief because of data.

In a really fascinating paper, Arhant et al. (2019) surveyed veterinarians and veterinary students about ways to reduce stress during veterinary visits. What so interests me that the top scoring interventions are those requiring veterinary staff to change environments, not themselves, not their behavior. Only veterinary students rated client education about reducing stress during transport high, and working with clients with muzzle training dogs… both active interventions. Yet even the passive interventions of the top-rated 'separate cats from dogs during hospitalization and in waiting room' were deemed not to be feasible by veterinarians. At some point, we can hope that an investment in the welfare of animals who are happy to see you and for whom you can readily obtain accurate physical and laboratory evaluation data comes to be understood for what it is: time saving and revenue generating. But it appears that future veterinarians may have some understanding of this, which is good news.

Alves de Paula et al. (2019) asked whether the equine maternal pheromone affected horses having their hooves trimmed. As has been reported in numerous well designed, placebo controlled, double blind studies across species, there was no effect on heart rate, respiratory rate, blood sugar levels, heart rate variability or a range of behavioral responses. The design and data in this paper are clearly and well presented, and can serve as a model for such evaluations. The problem is that people like magic and would love to have interventions like pheromonal agents work. Here, it is critical that we favor knowledge over belief. Pheromonal interventions are not inexpensive, and the repeated lack of efficacy suggests that we should look elsewhere for interventions to improve husbandry, care, and effects of stress and anxiety.

Sutherland et al. (2019) also report a negative result in this issue, for the use of cryoablation over cautery to prevent horn growth in

https://doi.org/10.1016/j.jveb.2019.06.003

dairy calves. What's clear from the 3 classes of well-designed experiments on which the authors report is that all forms of disbudding cause pain and behavioral changes. When everything you do is equally concerning… an opportunity for radical, creative thought is needed. There is an important role in publishing negative results like these in keeping people focused on issues desperate for redress.

There is a lot more than meets the eye in sheep behavior, and my guess is that, given their uses, selection has rendered information about sheep behavior cryptic unless it's sought. In a really fascinating study, Miranda-de la Lama et al. (2019) identified 4 personality types that may have applications elsewhere (avoider, affiliative, aggressive and pragmatic). In this study these personalities are determined by social behavior and are not independent of reproductive performance parameters. Because the authors measured a range of physiological and behavioral factors, they were able to learn that sheep with the aggressive profile had the highest stress response, indicating that this commonly used measure of "social dominance" may not imply lower stress or better welfare or better productivity. One then has to ask… is "social dominance" a measure simply of aggression, and if so, what measures should we be taking if we are interested in understanding complex social structures and social cohesion?

Infectious diseases in fulminant stages clearly change behavior. So many viral burdens are sub-clinical that it is worth asking whether subclinical viruses affect physiological and behavioral characteristics of welfare. Using goats affected with small ruminant lentivirus and comparing them with unaffected controls, Górecka-Bruzda et al. (2019) showed few differences between groups, except for some differences in milk values. The latter suggest a deterioration of metabolic processes that would otherwise be masked and may warrant further study.

When we decide we wish to improve welfare, we must address variation in needs that may be breed or strain specific. Before we can do this, we must learn what those needs are. Ali et al. (2019) have done exactly this for four laying hen strains. There were substantial differences between strains in use of floor litter, nest use and perch behavior. These differences matter and should affect both aviary design and regulations that affect how chickens of difference stains live. There are likely thousands of PhD theses lurking the question "What does animal X, strain Y want and need?" and we need the answers.

Heat stress in tropical and subtropical climates is both a welfare and productivity concern for chickens. Sumanu et al. (2019) have added to the literature supporting the use of anti-oxidants to help spare chickens the effects of such stress, and the use of a probiotic to help mitigate stressful behaviors, including enhanced vigilance. This paper demonstrates the importance of clear, thoughtful and comprehensive study design to evaluate effects of welfare interventions.

The question of what we believe v. what we know was the impetus of the paper by Leenaars et al. (2019) on rats in a T-maze. When years of experiments have been based on one commercially available treat—and it goes away—how do you move forward and trust that your data are building on known outcomes rather than an artifact of study design? Quite simply, you do the experiment. Here, the new pellets were as reliable as positive reinforcers as were the old pellets. The authors emphasize another reason for this study: researchers now need not waste animals by repeating experiments that used the old reward. That's sane and helpful.

Deer are farmed in many parts of the world but there is little information about spatial use—which would determined the adequacy of the enclosure—especially for fawns. Janiszewski and Cilulko-Dolega (2019) showed that fawns never used the artificial shelters during their first 18 days of life, and that their hiding site needs were specific and repeatable. Such information can help make how the deer are kept a more humane and less stressful experience.

Finally, we conclude with a case report that shows what can happen when what you believe is not what happens. Samimi (2019) reports a behavioral accident that results in the death of male camel calf. Risk assessment matters and reports like these help determine the parameters of risk.

For those of you interested in canine behavior and genetics and standardized evaluation of dogs, don't miss the 2019 International Working Dog Conference (IWDC) to be held 1-6 September 2019 in Stockholm, Sweden (www.iwdba.org). This meeting brings together a diverse group of those who do research on or pertaining to working dogs and those who use or manage such dogs. The latter group is, itself, quite variable ranging from service dogs, to patrol dogs and dogs that detect explosives, weapons, drugs, cancer, endangered species and pretty much any other volatile compound that emanates from a substance that matters to human health, commerce and safety. The meeting has a novel configuration of workshops, roundtable/audience discussions led by experts in the field, and contributed research papers. Because the meeting is in Sweden, a place with a rich working dog ethology tradition, the main focus of the meeting is on temperament and behavioral assessments of working dogs, and the genetics underlying these facets and performance outcomes. Some of the best people in the world in these fields are on the schedule. The website contains the schedule and information about speakers and their topics.

We can see from all of these papers—and from the focus of the IWDC—that distinguishing what we believe from what we know is important.

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