



Taking Livestock Psychology Back to the Barn

Commentary on Marino and Allen (2017)

The Psychology of Cows

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Citation – Nawroth, C., & Langbein, J. (2017). Taking livestock psychology back to the barn. *Animal Behavior and Cognition*, 4(4), 519-521. <https://dx.doi.org/10.26451/abc.04.04.12.2017>

Keywords – Animal cognition, Animal welfare, Cognitive enrichment, Human-animal interaction, Social cognition

Although we agree with the authors that more research into the cognitive and emotional life of cows is necessary and that cognitive work on farm animals should not solely focus on applied aspects, we would like to add and emphasize that basic research covering different aspects of livestock psychology should always bear in mind its potential applied use, as it can provide new and exciting ways of improving farm animal welfare.

Scientific interest in different aspects of farm animal psychology, including emotionality, personality and cognitive abilities, is on the rise and shows no signs of abating. As such, the review by Marino and Allen (2017) is a timely attempt to cover findings on a rather neglected farm animal species, especially in terms of their cognitive abilities – the cow. In their review, they examine the current state of research on cow behavior, explicitly focusing on learning and cognition, emotions, personality and social complexity. We highly appreciate the authors' effort and are sincerely impressed by the amount of evidence they provide in a comprehensive and accessible format. The authors justly criticize that many cognitive studies on cows are often conducted away from purely basic research and instead emphasize applied sciences. We agree with them, but would like to add that basic research covering different aspects of livestock psychology should always bear in mind its applied use, as it can provide new and exciting ways of improving animal welfare in the long-term. Of course, by acknowledging that livestock animals experience their environment in personal, cognitive and emotional ways, awareness on how these animals are kept and handled will increase. However, we argue that it is not sufficient to only appreciate the cognitive abilities of livestock animals; rather, we must also think about ways of transferring these basic findings back into the barn to improve husbandry and management. Here, we want to highlight two aspects of cattle psychology that can specifically contribute to an improvement in their welfare in the long-term: animal learning and cognition and human-animal interaction.

Livestock housing conditions in commercial settings offer limited possibilities for exhibiting species-appropriate behavior and are kept structurally simple. These limitations can lead to boredom and frustration, which in turn can induce stress and reduce welfare (Wemelsfelder, 1993). One key to overcoming this is to increase the biological relevance of housing conditions by incorporating new elements or procedures into their environment. This environmental enrichment is supposed to elicit a higher degree of behavioral diversity by increasing the complexity of the livestock environment (Averós et al., 2010; Newberry, 1995). Despite structural enrichment, a loss of its novelty and the habituation that

follows can counteract its initial positive impact. Knowledge on learning and cognition in livestock will allow handlers to create and implement cognitively challenging tasks into the normal housing routine and use them as a form of cognitive enrichment (Clark, 2011). Previous studies in livestock have already shown that providing cognitive challenges improves how animals cope with their environment, and has positive effects on their behavior, physiology, and health (Langbein, Nürnberg, & Manteuffel, 2004; Puppe, Ernst, Schön, & Manteuffel, 2007; Zebunke, Puppe, & Langbein, 2013). In cattle, operant training to receive a food reward induced greater excitement than offering the same reward for free (Hagen & Broom, 2004). Given the opportunity, livestock animals seek cognitive challenges. When goats were offered a reward for free or only after participating in an operant task, a large number of the animals preferred to work for the reward, showing an intrinsic interest in cognitive challenges (Langbein, Siebert, & Nürnberg, 2009). To avoid overwhelming or boring the animals with cognitive tasks, it is crucial to know the species-specific perceptual, behavioral, physical, and cognitive abilities and limitations when designing appropriate cognitive enrichment tasks.

Human-animal interactions in commercial settings can also be improved by a better understanding of how livestock animals perceive, recognize, and interact with humans. In particular, our knowledge of cows in this regard is rather limited. They discriminate between handlers and unfamiliar people (Munksgaard, de Passillé, Rushen, & Ladewig, 1999; Rybarczyk, Koba, Rushen, Tanida, & de Passillé, 2001), but we do not know yet how they mentally represent humans (for cow-cow recognition, see Coulon, Deputte, Heyman, & Baudoin, 2009) or whether they are sensitive to human emotional expressions and/or attentional stance. For instance, the ability to generalize the attentive states of handlers might have severe impacts on stress responses in livestock animals, as gaze directed to an individual might be considered as a threat. Sheep (*Ovis aries*) show higher levels of locomotor activity when confronted with an attentive compared to an inattentive human (Beausoleil, Stafford, & Mellor, 2006), while goats approach an attentive human over a non-attentive person when they anticipate a reward (Nawroth & McElligott, 2017). Research on a number of livestock species has shown that fear-related stress levels induced by routine handling practices of handlers can limit their productivity and welfare, while positive human-animal interactions can increase productivity (Breuer, Hemsworth, Barnett, Matthews, & Coleman, 2000). Thus, it is crucial to know how negative impacts can be minimized by reducing aversive handling practices and to recognize and implement positive human-animal interactions to improve welfare as well as productivity (Waiblinger et al., 2006). By implementing findings from basic research, applied research can be better adjusted to measure how subtle human behavioral changes can have rewarding or aversive effects on livestock behavior (Hemsworth, 2003; Nawroth, 2017).

General research on livestock cognitive abilities is an important tool for understanding how farm animals perceive and react to their environment, which is of huge importance for improving housing and management practices. We are looking forward to seeing more studies apply relevant findings from basic research to applied settings. As such, we highlight the need for more research investigating the cognitive and emotional capacities of a diverse set of livestock animals. Their outcomes will help us to understand how livestock animals see their world and will improve animal welfare in the long-term.

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