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Pulling the wool from our eyes

Commentary on **Marino & Merskin** on *Sheep Complexity*

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Abstract: Marino & Merskin review evidence of the complexity of sheep cognition, concluding that researchers ought to feel sheepish about misrepresenting ovine cognitive capacities. However, the failure to situate the data in critical context risks pulling the wool over readers' eyes.

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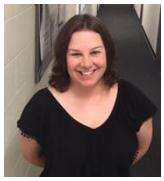

Domestic sheep do not occur naturally; they exist because of their utility to humans. Thus, it may be naïve to question whether they should be valued outside this context. It is, however, a worthwhile enterprise to consider whether human treatment of sheep is cruel or unjust considering their nature.

Although I understand why Marino & Merskin (2019) (M&M) focus on cognitive complexity in sheep, this is relevant only as it contributes to the capacity to suffer. Researchers should focus on attributes such as empathy, perspective-taking, prosociality, pessimism, and boredom rather than debating the intellectual merits of species. In addition, intelligence across species should not be defined in relation to human characteristics or valued above other attributes, such as adaptability.

If M&M choose to focus on intelligence, they must avoid cherry-picking examples of successful cognitive testing and ignoring instances of failure. For example, they report that sheep were able to use direct information to locate a reward (Nawroth et al., 2014); however, they omit that sheep, unlike goats, failed to make use of indirect information. Even when discussing sheep's failure in mirror tests, M&M conclude not that sheep lack self-awareness but that more research is needed. The same criteria for attribution of capacities must be applied regardless of whether the results are consistent with preferred hypotheses.

Ultimately, underlying mechanisms will be more telling than absolute measures of performance when comparing cognition across species. Sheep may be able to discriminate food items, but hierarchical classification can only be determined if subjects simultaneously represent internally that the same item belongs to categories at different levels of abstraction; e.g., an apple is a type of fruit and a type of food. Suggesting that sheep categorize foods in "much the same way chimpanzees … classify flowers" is overextrapolating unless the same underlying mechanism is demonstrated. If sheep use perceptual features but fail to abstract general categories, their categorization may not be equally complex. More information is needed to draw that conclusion. That sheep recognize a large number of individuals is not surprising given that they are flock

animals. The fact that they can recognize celebrities suggests that their 'recognition' is tied to visible features rather than a true representation of individual humans. To show the latter, it would be necessary to show cross-modal matching, not mere discrimination of images. Focusing on recognition of conspecifics and humans would be more effective if researchers could show that sheep form reputations or attachments to familiar beings.

The section on emotions is far more useful for judging the appropriateness of our treatment of sheep. However, in this section, misconceptions are still presented. For example, contagious yawning is not emotional contagion (see Massen & Gallup, 2017). If ewes pay more attention to offspring in pain compared to stressed offspring, they may be responding to external cues of danger present in the tail-docking condition rather than to the distressed psychological state of the offspring. Thus, the results may not indicate empathy but rather a fear response under threat conditions. What M&M do not report is that maternal behavior was correlated with pain behaviors exhibited by the lambs, which suggests that the maternal response was more than just a response to external cues such as blood, chemical odors as a result of the procedure, etc. (Hild et al., 2011a). Surprisingly, M&M also miss the finding that important maternal behaviors may be disrupted following aversive treatment from humans (Hild et al., 2011b), or that lamb behavior is adversely affected by aversive treatment of the ewes during their pregnancies (Coulon et al., 2011). Studies such as these may be more effective in altering perceptions about the effects of human treatment on sheep.

Last, I cannot agree that personality structure in nonhumans maps onto the five-factor model of human personality. It is more appropriate to identify traits uniquely associated with particular species rather than trying to impose a human model onto nonhumans. Although M&M indicate that sheep vary along personality dimensions within a group, they do not report on the extent of variation, which is crucial to arguing for individuality in these species. M&M need to be careful to explicate the importance of within and between species comparisons. They also report a correlation between species-level traits (e.g., social complexity and cognition) within single species (e.g., pigs, p. 14), which makes little sense.

Although the aim of M&M's review is to be lauded, the authors need to be more objective and focused in order to be more effective in pulling the wool from our eyes.

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