Stakeholder Understanding and Opportunities for Learning About Structural Soundness in Beef Cattle: A Mixed Methods Study

Introduction

Structural soundness is an important part of beef cattle production as correct cattle are healthier, more profitable, and likely to remain in the herd longer than cattle exhibiting structural defects (Daniel & Kreise-Anderson, 2018; Giess et al., 2021). Comfortable locomotion relies on correct feet and leg structure, with most deviations from normal motion attributed to defects in conformation (Sitz et al., 2023). Overarchingly, lameness is the most economically devastating disease in cattle, manifesting in changes to gait, pain, and diminished performance (Langova et al., 2020). Structural issues can impact the entire operation, often resulting in increased veterinary expenses and earlier culling, both of which undercut an operation's profitability (Shults-Mauney, 2025). Experts in the industry agree that there is room for improvement when it comes to cattle conformation (Smith, 2011). Recently, breed associations have introduced hoof scoring systems that are translated into a registered animal's EPD (expected progeny difference) profile. This tool relies on producers to visually assess cattle and assign them a foot angle (1-9), and claw set score (1-9) (Retallick, 2019). Despite visual aids being available, producers inputting these scores must have sufficient knowledge of cattle conformation to accurately identify deviations from normal in an animal's hoof. However, literature addressing this population’s evaluation abilities is lacking.

Education targeting beef cattle enthusiasts is a core tenet as cattle organizations and extension groups look to improve beef cattle production outcomes. However, adult learning is a complicated process as this group is self-directed, problem-centered, and motivated by a complex combination of internal and external factors (Knowles et al., 1980). Providing opportunities for adults to improve their knowledge and skills is only successful if the adults engage in those opportunities. Understanding the motivations of adults to engage in learning is especially relevant when looking at specific populations such as those engaged in agriculture.

Conceptual Framework

This study examined learning motivations of a specific group of adult learners, beef industry enthusiasts, in relation to a specific topic, structural soundness. The focus of the study was twofold: 1) to add to the theoretical framework of adult learning through a deeper understanding of a specific population and 2) to provide guidance in the development of training for the beef industry. The assumptions of adult learning state that adults prefer self-directed learning, relating the material to their past experiences and the ability to apply the lesson immediately. Their motivation to learn is often driven by clear relevance to their current roles (Knowles, 1984). However, adults must also navigate financial and time-related constraints that may hinder their ability to engage in formal learning opportunities (Merriam & Bierema, 2014). Given the uniqueness of adult learners, it is logical that understanding the specific characteristics, motivations, and needs of adults involved in the beef cattle industry requires targeted study to inform practice. This approach ensures that educational interventions are relevant and effectively address the real-world challenges and goals faced by this population.

Methods

Our study followed an explanatory sequential mixed methods design (Creswell & Plano Clark, 2018). In the first phase, an online survey instrument was used to capture participants'

understanding of beef cattle structure. The survey also examined how structural evaluation plays into decision making as well as perceived causes of structural soundness issues. Respondent demographics were collected to determine their relationship to knowledge score. Phase 1 responses were analyzed and used to inform phase 2 instrument creation. In the second phase, a qualitative instrument was distributed as an online, short-answer survey. It explored participants' philosophies on structural correctness in beef cattle, their motivations for learning, and their preferred methods for receiving information. By employing a mixed methods design, the quantitative data could be enriched with qualitative insights into participants' views and motivations (Morse, 2010; Tashakkori & Teddlie, 2003).

Results

Four hundred sixty-six unique survey responses representing 36 states were received. The average knowledge test score was 69.65%. Respondents were split 59.01% male (n= 275) and 39.91% female (n= 186), with females demonstrating a significantly higher technical knowledge score ($p < 0.01$). Individuals ranging from 18 to 75+ years old with a variety of tenure and background in the industry completed the instrument. Those with greater years of experience scored higher on the knowledge test ($p < 0.01$). Of respondents that identified as cow-calf producers, those involved in seedstock production scored higher than commercial cow-calf producers ($p < 0.01$). On average, participants were accurate in identifying front leg, hoof, and pastern defects whereas questions on hindleg and overall skeletal correctness produced varied responses. A high percentage of respondents (67.80%) ranked structural soundness of foremost importance in relation to other selection factors; those who ranked structural soundness of foremost importance scored higher on the knowledge test ($p < 0.01$). Still, 84.44% of respondents make culling decisions based on structure. When asked if there is a need for further education on this topic, 84.55% of respondents agreed that a need exists.

Following quantitative analysis, the second survey featuring short-answer questions was distributed. Analysis of written feedback (n=19) revealed themes of (1) educational preferences, (2) phenotypic selection criteria and industry pressures, and (3) development of selection philosophy and the importance of firsthand experience in beef cattle evaluation. Although respondents represented an array of backgrounds, they shared a passion for learning about beef related topics. Although they still prioritize in person learning, many also look to podcasts, social media, and YouTube for new information. There was a shared sentiment that beef cattle producers have moved away from structurally correct cattle but must renew focus on this topic to increase animal productivity, operation profitability, and overall industry sustainability.

Conclusions/Implications

Our findings illuminate an area where beef cattle enthusiasts' knowledge could be enhanced. Results provide evidence that participants find this topic relevant and immediately applicable to their position in the beef cattle industry. Given the need expressed, there is a necessity to create materials that are appropriate for producers. These materials should include images, videos, and podcasts that focus on technical knowledge, explanations of how structure connects to profitability, and clarification of why and how decisions should be made relative to structure. Moving forward, efforts by educational organizations, including beef breed associations and extension programs, should focus on disseminating materials on this topic to their audiences in the formats suggested by participants.

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