Preparing cattle at home: less stress during slaughter

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https://doi.org/10.34776/afs17-199e Publication date: 11th August 2026

Training on the farm can help reduce stress levels at the slaughterhouse while also making daily handling easier. (Photo: Eva Föller)

Summary

Young animals from suckler cow herds live largely in a natural environment and often have little contact with humans. Therefore, procedures at a slaughterhouse are particularly unfamiliar and potentially stressful to them. This project investigated whether targeted and repeated exposure to slaughterhouse-relevant situations on the farm of origin can mitigate stress responses in animals at slaughter. The protocol involved passing through a panel alley, as well as a brief restraint on the scale or in the treatment chute.
The training was carried out at least three times on each of five suckler cow farms with young animals intended for slaughter. All farm managers had previously attended a course in Low Stress Stockmanship (LSS), a method of calm, controlled cattle handling that utilises the natural social behaviour of cattle to work with the animals in a low-stress and efficient manner. The method works for handling a single animal as well as an entire herd. At around ten months of age, the animals were slaughtered at a large slaughterhouse. At the slaughterhouse, animal behaviour, the use of electric prods, and the blood parameters lactate and cortisol were recorded. Young cattle from the same transport without comparable training served as control animals. A total of 38 trained animals and 37 control animals were included in the analysis. A difference was observed in cortisol levels, particularly in male animals: trained animals exhibited lower levels than control animals. Thus, the results suggest that repeated training at the farm of origin can reduce stress levels at the slaughterhouse. The participating farmers rated both the work with the animals and the facilities set up for this purpose as positive. The installation and the method can also be helpful for further procedures, such as weighing and treatments.

Key words: slaughter stress, low-stress stockmanship, cortisol, cattle handling.

Introduction

In Switzerland, most young animals from suckler cow herds are slaughtered at around ten months of age. Until this point, they live with their mothers in stable herd groups with daily access to pasture in summer and outdoor access in winter. The day of separation from the mother usually coincides with transport to the slaughterhouse and simultaneously marks weaning. This is a pivotal event in the animal's life.

Slaughter itself is described as one of the most stressful events for a farm animal (Cockram & Corley, 1991). The loading and unloading process, transport, and the unfamiliar environment at the slaughterhouse, with novel stimuli such as new sounds, smells, animals, and people, can cause stress. Furthermore, especially in larger slaughterhouses, animals are driven through single-file races and restrained in a stunning box, which is also a new situation for most animals.

The degree to which animals are stressed depends on various influencing factors. Grandin and Shivley (2015) identify the specific situation, genetics, handling, and previous experience as relevant factors; they also point out that stressed animals are more difficult to move. In such cases, animals may hesitate, back away, or refuse to move forward. Such situations can lead to the use of electric prods, which further increases the animals' stress (Warner *et al.*, 2007). The stress experienced by animals immediately prior to slaughter, as well as its reduction, is a central topic in animal welfare research (Grandin, 1997; Probst *et al.*, 2012; Reiche *et al.*, 2019). In addition to technical improvements in slaughterhouses, spurred in particular by the work of Temple Grandin (2001, 2021), there is an increasing focus on the targeted preparation of animals for slaughter. Previous studies show that early habituation to humans prior to slaughter can positively influence animal behaviour and reduce physiological stress indicators (Probst *et al.*, 2012, 2013).

Stress in animals is a subjective experience based on the individual assessment of situations. The perception of threat can lead to fear and physiological reactions such as the release of cortisol or increased muscle activity (Terlouw *et al.*, 2022). Since the animals' internal experience itself cannot be directly measured, stress reactions are assessed through behavioural observations and by determining biomarkers such as cortisol, lactate, or glucose in the blood (Spengler Neff *et al.*, 2023).

Previous studies by FiBL showed that targeted touch in the form of Tellington Touch treatments (Tellington-Jones, 1999), applied to both very young animals and animals ready for slaughter, could reduce stress at the slaughterhouse (Probst *et al.*, 2012, 2013). However, the practical implementation of these methods is time-consuming. A potentially more practical alternative is the repeated, low-stress herding of animals through a panel alley, for example to a scale or a treatment chute. It makes sense to combine this with the "Low Stress Stockmanship" (LSS) method.

LSS is a concept for handling cattle based on the targeted application of pressure and release, as well as the strategic positioning of people. The goal is to utilise the animals' natural flight and herd behaviour to enable low-stress and safe handling. The method avoids physical contact or the use of feed bait. A study by Thys *et al.* (2021) examined the effect of LSS training on 17 employees at a dairy farm. The results showed that the employees' positive behaviour increased significantly after the training, particularly through the increased use of pressure and release, while the use of sticks when herding cows decreased. On the cows' part, more calm and positive behaviours were observed in the long term, while stress indicators, such as tail swishing, decreased significantly.

The aim of the present study was to investigate whether driving young animals from suckler cow systems through a panel alley at least three times during the rearing period using LSS leads to a reduction in stress responses at the slaughterhouse. This is expected not only to improve animal welfare but also to positively influence the working conditions of personnel involved in the slaughter process. In addition, improvements in animal handling on the source farms are anticipated, as moving, treating, and weighing the animals should become easier and thus more efficient and less stressful. This aspect was additionally assessed through a survey of the participating farmers.

Animals, Materials, and Methods

A total of five farms with suckler cow herds participated in the trial. All animal handlers attended a "Low Stress Stockmanship" (LSS) course beforehand.

Preparation on the farm

The training was conducted at least three times with each animal on each farm. The procedure required the animals to be moved through a narrow panel alley at least six metres long and approximately one metre wide. At the end of the alley there was a scale or a treatment chute where the animal was restrained and had to stand still. The animal was only released from the scale or treatment chute once it had become completely calm. Thus, "release" served as a reward for "calmness", an important aspect of the "Low Stress Stockmanship" method.

Selection of control animals

Slaughter took place at a large cattle slaughterhouse in Switzerland. Typically, several animals from different farms are loaded together and transported to the slaughterhouse. The control animals were selected as follows: Shortly before the day of slaughter, the livestock trading companies provided information on which additional animals were scheduled for transport alongside the experimental animals. From this group, control animals were selected that matched the trained animals as closely as possible in terms of sex, age and breed and were thus exposed to the same transport and slaughter conditions. Additionally, it was inquired whether comparable measures, such as training or regular weighing, were carried out on the control animals' farms of origin. Only animals without corresponding prior experience were included as controls. A total of 38 young cattle were trained at the five project farms. Between five and ten of these animals from each farm were sent for slaughter. Additionally, 37 control animals from 19 other farms were included in the study. The slaughtering took place between October 2023 and December 2024.

Observations at the slaughterhouse

On the days of slaughter, both behavioural observations and physiological measurements were carried out at the slaughterhouse. The animals were first housed in the lairage pens. The waiting time was standardised to 30–60 minutes in order to ensure conditions that were as uniform as possible for all animals.

Animal behaviour

Behaviour was recorded in the single-file race and in the stunning box. In the single-file race, the use of the electric prod, backward movements, and vocalisations were documented. In the stunning box, behaviour was assessed based on defined categories.

1. **Use of the electric prod (single-file race / stunning box)**
   It was recorded whether an electric prod was used when driving the animals forward (yes/no).

2. **Backward movement (single-file race / stunning box)**
   It was observed whether animals moved backward (yes/no).

3. **Vocalisation (single-file race / stunning box)**
   It was recorded whether the animals vocalised (yes/no).

4. **Behaviour in the stunning box**
   The animals' behaviour immediately prior to stunning was classified into three categories. For the analysis, the categories "restless" and "nervous" were combined.

Calm	The animal shows no or only slight movements of the head and limbs.
Restless	Occasional movements of the head and/or limbs are observed.
Nervous	The animal exhibits vigorous movements of the head and limbs for more than two seconds, with visible movements of the entire body.

Physiological parameters

Blood samples were collected to measure physiological parameters. Lactate levels were determined on-site immediately using a rapid test (mmol/L; Lactate Scout, EFK Diagnostics GmbH, Mannheim, Germany). In addition, blood samples were collected, immediately stored in a cooler, and centrifuged in the laboratory for 10 minutes at 3,000 rpm. The resulting serum was pipetted off and frozen at –18 °C. Cortisol concentrations (μg/dl) were subsequently analysed at the Clinical Laboratory of the University Animal Hospital Zurich, Vetsuisse Faculty, University of Zurich. Serum cortisol concentrations were determined by chemiluminescence using an Immulite

2000 XPi analyser and a human cortisol assay employing a polyclonal rabbit anti-cortisol antibody (Siemens Healthineers, Zurich, Switzerland).

Statistics

Statistical analyses were performed using the *R* software (version 4.3.2; R Core Team, 2025). Generalised linear mixed models (GLMMs) were used for the analysis, calculated using the glmer function from the R package *lme4* (Bates *et al.*, 2015). A parametric bootstrap was used to determine the p-values, implemented via the mixed function from the R package *afex* (Singmann et al., 2024).

Outcome measures (dependent variables) were:

- Use of an electric prod (binary: yes/no)
- Backward movement in the single-file race (binary: yes/no)
- Vocalisation in the single-file race (binary: yes/no)
- Behaviour in the stunning box (ordinal, dichotomised: calm vs. restless/nervous)
- Blood lactate concentration (continuous)
- Serum cortisol concentration (continuous)

Group (control animal vs. trained animal), sex (male vs. female), and the interaction between these two factors were included in the models as fixed effects. For male animals, no distinction was made between castrated (steers) and uncastrated (bulls) animals, as the distribution of bulls was uneven (8 out of 19 trained animals vs. 2 out of 18 control animals).

The day of slaughter and the animals' farm of origin were included as random effects to control for potential cluster effects. The animals' age was not included as a covariate, as all animals were of comparable age (mean ± SD: 324 ± 19 days).

Other potential influencing factors, such as whether the animals were delivered from the farm as single animals or together with several others, could not be taken into account due to insufficient case numbers (only 5 out of 75 animals arrived individually, of which only one was a control animal). The identity of the respective handlers could also not be integrated into the models, as it correlated closely with the slaughter date factor. Breeds could not be taken into account either, as there were too many different breeds, resulting in insufficient case numbers per breed.

Survey of Participating Farmers

After the slaughter of all trained animals was completed, a telephone survey was conducted with the five farmers participating in the project. During this survey, they were asked the following questions:

1. Did the training of the animals go well on your farm, or was it rather difficult or cumbersome?
2. Was setting up the equipment so that you could practice with the animals complicated/time-consuming or simple?
3. How much time did the training take per animal, approximately?
4. Was the "Low Stress Stockmanship" method helpful?
5. Was loading the trained animals different from loading untrained animals?
6. Any further comments on the project?

Only after discussing the questions were the farmers informed of the project's results.

Results

Of the 38 trained animals, 19 were male and 19 were female; among the 37 control animals, 18 were male and 19 were female. The average age of all animals was 324 ± 19 days.

Behavioural observations

Overall, the behavioural analyses revealed no significant differences between the trained and control groups, nor between male and female animals. No differences were observed in backward movement in the single-file race between groups (group: $p = 0.566$), although high variability was present in all groups (Fig. 1). Neither sex ($p = 0.909$) nor the interaction between sex and group ($p = 0.307$) had an influence on this behaviour. The female trained animals vocalised numerically slightly more frequently than the female control animals; however, the differences between groups ($p = 0.178$) and sexes ($p = 0.382$) as well as the interaction ($p = 0.357$) were not statistically significant (Fig. 2). For the use of the electric prod, no effect of group ($p = 0.147$), sex ($p = 0.113$), or interaction ($p = 0.334$) was observed either. In the stunning box, nervous behaviour occurred numerically slightly less frequently in the trained animals than in the control animals, though without a statistically significant influence of group ($p = 0.294$), sex ($p = 0.410$), or their interaction ($p = 0.724$) (Fig. 3).

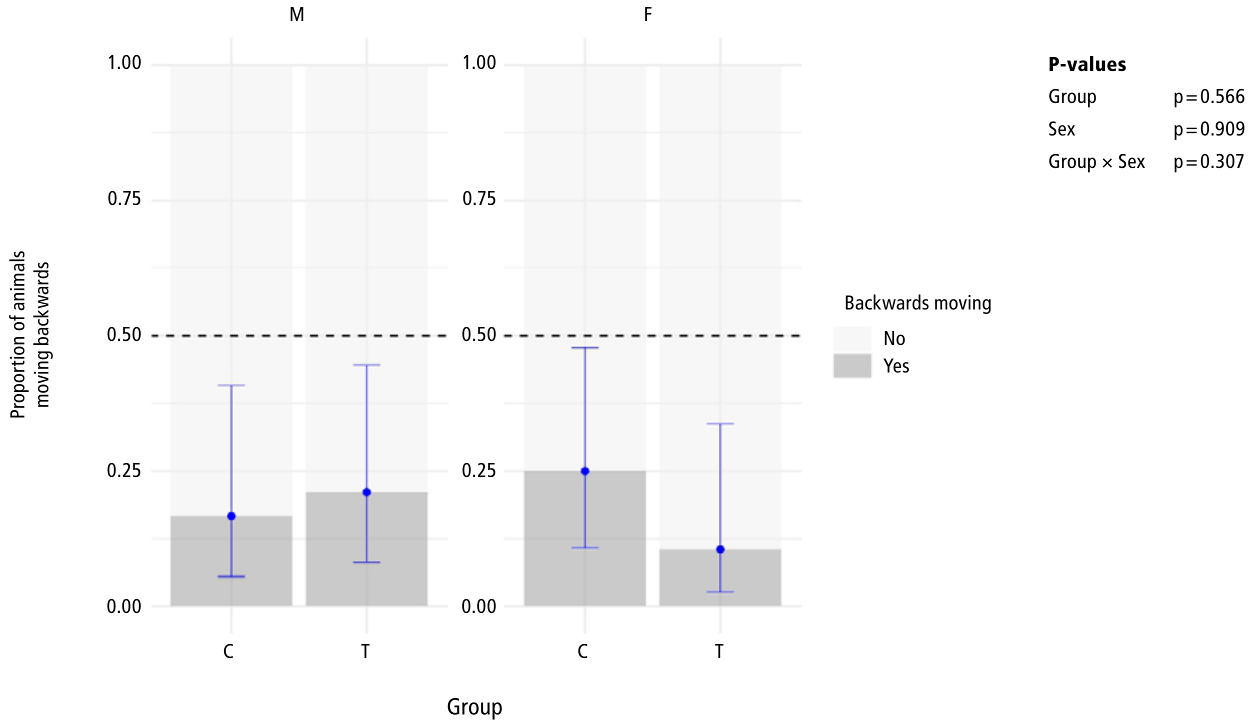

Fig. 1 | Proportion of animals that moved backwards in the single-file race in the control group (C) and the trained group (T), broken down by male (M) and female (F) animals.

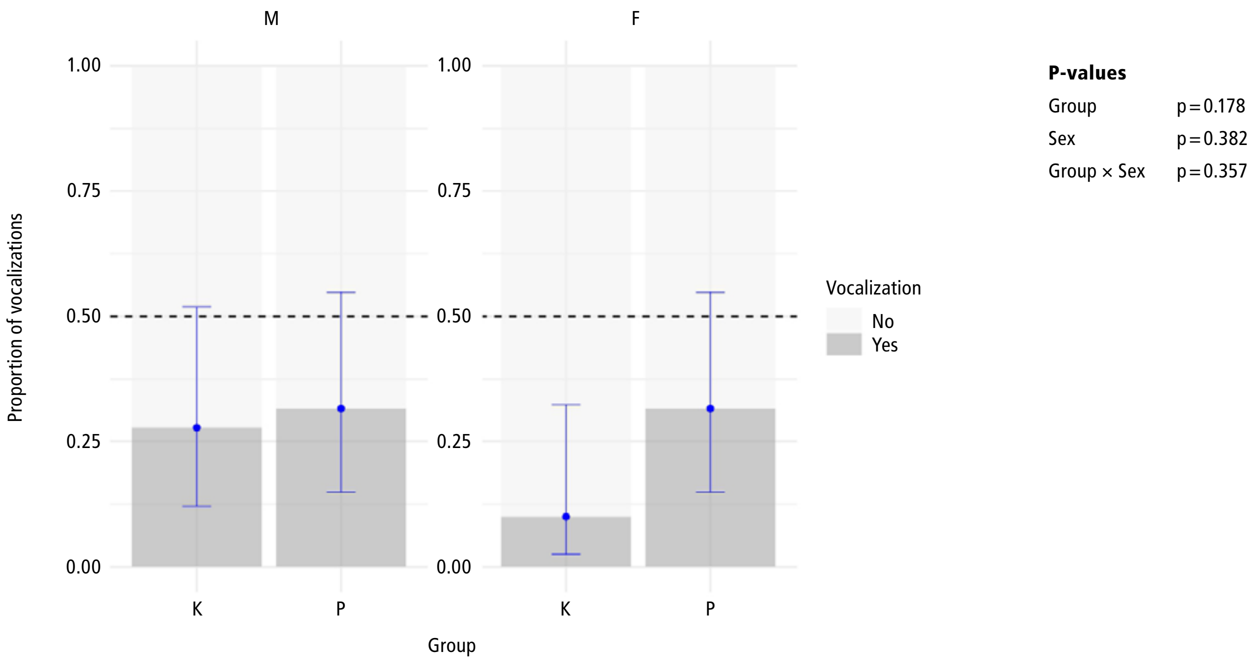

Fig. 2 | Proportion of animals that vocalised in the single-file race in the control group (C) and the trained group (T), broken down by male (M) and female (F) animals.

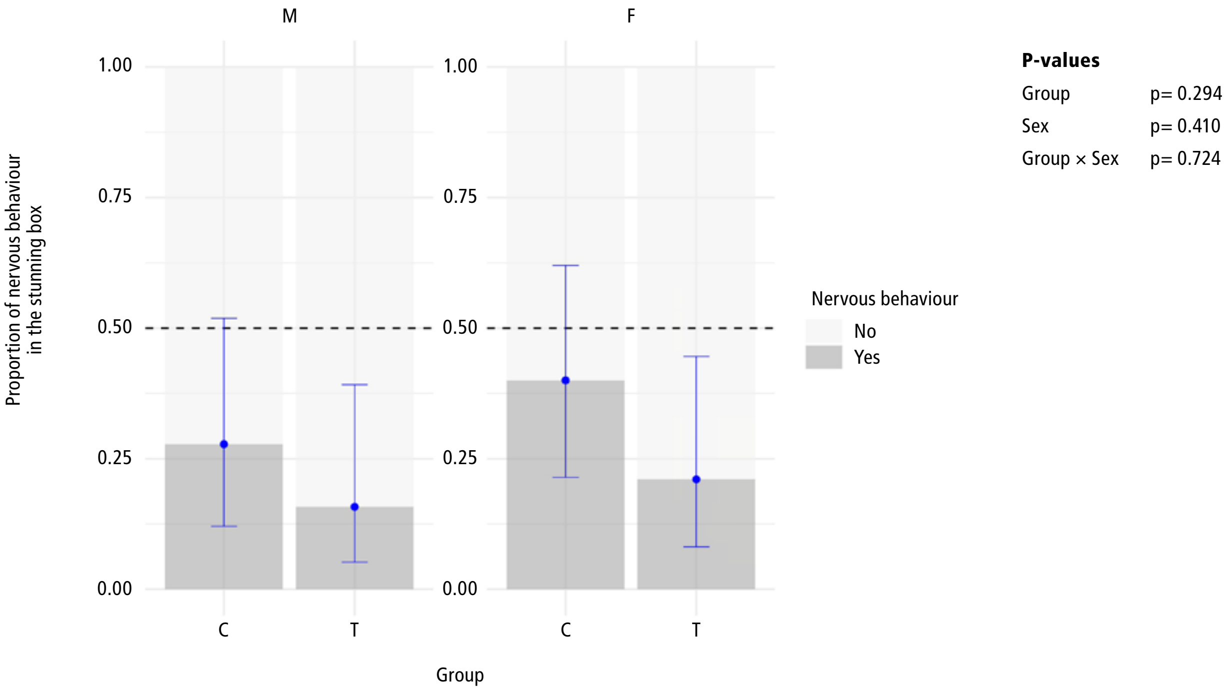

Fig. 3 | Percentage of animals exhibiting nervous behaviour (represented as 1 in the graph) in the stunning box, in the control group (C) and in the trained group (T), broken down by male (M) and female (F) animals.

Blood sample analyses

The rapid tests for lactate levels in the animals' blood samples revealed no differences between the two groups (p=0.594) or between the sexes (p=0.811). The interaction also had no effect on lactate (p=0.294).
In contrast, the trained animals showed lower levels of the stress hormone cortisol in serum samples than the untrained animals (p=0.009; Fig. 4). There was no difference between the sexes (p=0.106), and the interaction between group and sex showed a tendency to influence cortisol levels in the blood (p=0.055). The effect tended to be stronger in male animals.

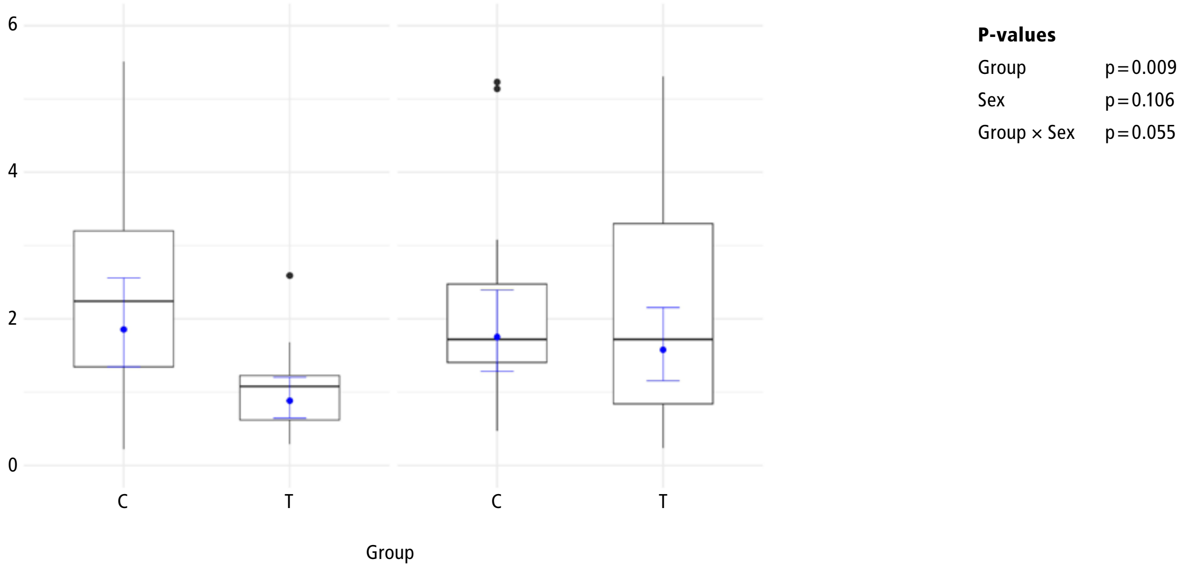

Fig. 4 | Cortisol levels in serum samples of control animals (C) and trained animals (T), broken down by male (M) and female (F) animals.

Survey among participating farmers

Question 1 ***How well did training the animals work on your farm? Were there any difficulties or was it cumbersome?***

All surveyed farms reported that training worked well once it was clear how the training setup had to be constructed and used. On one farm, the setup had to be rebuilt every time animals were trained, which was very time-consuming.

Question 2 ***How time-consuming was setting up the training situation?***

Setting it up did not go equally well for everyone. At one farm, it was very tedious at first; another took a long time to figure out how to do it; for the other three, it was not that difficult.

Question 3 ***How much time was required for training per animal?***

Most farms estimated the time required at about ten minutes per animal per training session, once the training setup was in place. Two farms reported needing even less than ten minutes per animal.

Overall – including setup, testing, and training – the average time required was about one hour per animal for a group size of eight to ten animals. For larger groups, the time required per animal decreased, as the setup was spread across more animals.

Question 4 ***Was the concept of Low Stress Stockmanship (LSS) found to be helpful?***

All respondents rated LSS as helpful and stated that they have since been regularly applying the techniques taught in their daily work. One farm reported, for example, that LSS had enabled them to separate a single animal from the herd in the pasture without causing stress – a task that had previously been impossible.

Question 5 ***Was loading the trained animals different from loading untrained animals?***

One farm manager reported that loading tended to be easier since he had learned about and started using LSS. Another explicitly noted that loading was easier with LSS. Three farms, however, saw no difference in the process, though they emphasized that loading had already been problem-free even before the project.

Question 6 ***Additional comments on the project***

All respondents were positive about the method and the design of the panel alley and saw them as providing clear added value. One even said that the project had been a blessing for him. Three managers expressed a desire for a more practice-oriented LSS course: While the content of the current course was well-received, it was perceived as too theoretical. Overall, all participants expressed strong interest in continuing or further developing the topic and considered it important to make the approaches developed accessible to other farms as well.

Discussion

The aim of this study was to investigate whether a training requiring minimal time and organizational effort is sufficient to reduce stress in animals at the slaughterhouse. For this purpose, moving the animals into a panel alley was carried out using the Low Stress Stockmanship (LSS) method. The results showed a significant effect of the training on cortisol concentration in serum. This suggests that trained animals were exposed to lower stress levels immediately prior to slaughter than untrained animals. However, this effect was more pronounced in male animals. This suggests that male animals benefit more from this type of preparation than female animals. One possible explanation is that female animals, on average, react more strongly to handling and may therefore require more repetitions or more intensive training before a comparable stress-reducing effect becomes apparent. Previous studies indicate that female cattle sometimes exhibit higher arousal/restlessness scores in standardised handling tests and are thus described in practice as more difficult to handle or drive. For example, Hoppe *et al.* (2010) report significant sex differences in temperament scores, with higher scores in female calves; comparable findings were also described by Gauly *et al.* (2001b) for calves in suckler cow herds. Against this background, it is conceivable that female animals would require more frequent or more intensive training to achieve a more pronounced stress-reducing effect. In the present study, however, sex did not have a significant influence on cortisol levels. Differences between the sexes have been observed in other studies. For instance, Probst *et al.* (2014) reported significantly lower cortisol concentrations in bulls compared to steers and female animals among beef cattle at a large Swiss slaughterhouse. Additionally, there was a tendency toward more frequent vocalisation in female animals compared to bulls and steers. Furthermore, the highest cortisol levels were measured in female animals. It is therefore plausible that female animals perceive slaughterhouse stimuli differently or more intensely than males. This could contribute to a training effect being less pronounced in female animals or not clearly visible statistically, even if a positive effect is fundamentally present.

The training showed no significant influence on the animals' behaviour in the slaughterhouse. Although nervous behaviours in the stunning box occurred numerically somewhat less frequently in the trained animals than in the control animals, the treatment had no statistically significant influence. In the study by Probst *et al.* (2012), however, the trained animals behaved significantly more calmly in the stunning box. This suggests that the more intensive preparation used in that study, involving regular handling during the first days of life, was more effective than the method employed in the present study. Nevertheless, the clear effect of the less intensive preparation on cortisol concentration is interesting.

Cortisol concentration provides a basis for assessing acute physiological stress. Grandin (1997) suggests that mean cortisol levels of >7.0 µg/dl in cattle should be interpreted as an indication of severe acute stress. By comparison, in the study by Probst *et al.* (2012), the median cortisol concentrations were 2.94 µg/dl in the group treated with Tellington T-Touch, compared to 4.97 µg/dl in the control group. In the FiBL study by Spengler Neff *et al.* (2023), 9.05 µg/dl was measured at the slaughterhouse, while 0.45 µg/dl was recorded for on-farm slaughter. Thus, our project mean of 1.87 µg/dl is below typical slaughterhouse averages but above the very low values for on-farm slaughter.

The participating farmers unanimously agreed that the method improves on-farm handling, reduces stress in the animals, and is not too labour-intensive. Several confirmed in the survey that they would recommend this form of training to other livestock owners as well. Additionally, the training offers the practical advantage that animals can be weighed at the end of the panel alley or treated as needed. Furthermore, this can increase farmers' confidence during treatments and when handling the animals. The training and existing facilities help lower the threshold for weighing or treatment, as these procedures involve less stress for both humans and animals. In addition, the LSS method can also be applied in other situations, such as on pasture, during loading, or when separating individual animals.

Conclusion

Based on the results of this project, we conclude that the LSS method, as well as the early acclimatisation of fattening animals to moving through panel passages, should be more strongly promoted and recommended. Particularly given the relatively low effort involved, there are multiple benefits: The measure can reduce stress in animals at the slaughterhouse, facilitates handling and treatment procedures on the farm, and can thus simultaneously contribute to improved working conditions and increased safety for the personnel involved. ■

Acknowledgments

We would like to thank the five participating farmers for their collaboration on the project. We also thank the Coop Fund for Sustainability for the funding and the Bell Food Group for making this project possible. We extend our gratitude to Mutterkuh Schweiz, Vianco, and Viegut AG for their valuable support throughout the project.

References

- Bates, D., Mächler, M., Bolker, B., & Walker, S. (2015). Fitting linear mixed-effects models using lme4. *Journal of Statistical Software,* **67**(1), 1–48. https://doi.org/10.18637/jss.v067.i01
- Cockram, M., & Corley, K. T. T. (1991). Effect of pre-slaughter handling on the behavior and blood composition of beef cattle. *British Veterinary Journal,* **147**, 444–454. https://doi.org/10.1016/0007-1935(91)90087-4
- Gauly, M., Mathiak, H., Kraus, M., Hoffmann, K., & Erhardt, G. (2001). Breed and sex differences in the temperament of calves in suckler cow herds. *Deutsche tierärztliche Wochenschrift,* **108**, 206–210.
- Grandin, T. (1997). Assessment of stress during handling and transport. *Journal of Animal Science,* **75**, 249–257. https://doi.org/10.2527/1997.751249x
- Grandin, T. (2001). Cattle slaughter audit form. https://www.grandin.com/cattle.audit.form.html
- Grandin, T. (2021). *Recommended animal handling guidelines & audit guide: A systematic approach to animal welfare.* North American Meat Institute.
- Hoppe, S., Brandt, H. R., König, S., Erhardt, G., & Gauly, M. (2010). Temperament traits of beef calves measured under field conditions and their relationships to performance. *Journal of Animal Science*. https://doi.org/10.2527/jas.2008-1557
- Probst, J. K., Spengler Neff, A., Leiber, F., Kreuzer, M., & Hillmann, E. (2012). Gentle touching in early life reduces avoidance distance and slaughter stress in beef cattle. *Applied Animal Behaviour Science,* **139**, 42–49. https://doi.org/10.1016/j.applanim.2012.03.002
- Probst, J. K., Hillmann, E., Leiber, F., Kreuzer, M., & Spengler Neff, A. (2013). Influence of gentle touching applied a few weeks before slaughter on avoidance distance and slaughter stress in finishing cattle. *Applied Animal Behaviour Science*, **144**(1), 14–21. https://doi.org/10.1016/j.applanim.2012.12.007
- Probst, J. K., Spengler Neff, A., Hillmann, E., Kreuzer, M., Koch-Mathis, M., & Leiber, F. (2014). Relationship between stress-related exsanguination blood variables, vocalisation, and stressors imposed on cattle between lairage and stunning box under conventional abattoir conditions. *Livestock Science,* **164**, 154–158. https://doi.org/10.1016/j.livsci.2014.03.013
- R Core Team. (2025). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing. https://www.R-project.org/
- Reiche, A.-M., Oberson, J.-L., Silacci, P., Messadene-Chelali, J., Hess, H.-D., Dohme-Meier, F., Dufey, P.-A., & Terlouw, E. M. C. (2019). Pre-slaughter stress and horn status influence physiology and meat quality of young bulls. *Meat Science,* **158**, 107892. https://doi.org/10.1016/j.meatsci.2019.107892
- Singmann, H., Bolker, B., Westfall, J., Aust, F., & Ben-Shachar, M. (2024). *afex: Analysis of factorial experiments* (R package version 1.5-0). https://CRAN.R-project.org/package=afex
- Spengler Neff, A., Probst, J. K., & Knösel, M. (2023). On-farm slaughter or slaughterhouse slaughter: Differences in stress-indicating parameters. *Agrarforschung Schweiz,* **14**, 90–95. https://doi.org/10.34776/afs14-90
- Tellington-Jones, L. (1999). *Improve your horse's well-being: A step-by-step guide to TTouch and TTeam training* (1st ed.). Kenilworth Press.
- Terlouw, C., & Bourguet, C. (2022). Quantifying animal welfare preslaughter using behavioral, physiological, and carcass and meat quality measures. In *Preslaughter handling and slaughter of meat animals* (pp. 13–61). Wageningen Academic Publishers.
- Thys, M., Valckx, M., Vanden Berghe, S., Vandaele, L., Ampe, B., & Tuyttens, F. (2021). Effects of low-stress stockmanship training on the behavior of stockpersons and dairy cows. In *VIIIth UFAW Animal Welfare Conference on Recent Advances in Animal Welfare Science (UFAW2021).*
- Warner, R. D., Ferguson, D. M., Cottrell, J. J., & Knee, B. W. (2007). Acute stress induced by the preslaughter use of electric prodders causes tougher beef meat. *Animal Production Science,* **47**(7), 782–788. https://doi.org/10.1071/EA05155