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Using qualitative behaviour assessment to explore the link between stockperson behaviour and dairy calf behaviour

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ABSTRACT

Dairy farming usually implies close and frequent contact between the stockperson and the animals. A good human–animal relationship (HAR) is therefore essential for good animal welfare. To fully understand the quality of the HAR both the stockperson behaviour and the animals' reaction to the handler needs to be assessed, as they mutually affect each other. Qualitative behaviour assessment (QBA) has during the last decade become a method to assess animal welfare through scrutiny of animal body language. The application of this method to characterize stockperson behaviour, on the other hand, is novel. This study aimed to, through the use of QBA, to characterize stockperson behaviour and to portray the body language dairy calves of the animals in his/her care. Further, the study tested the relationships between stockperson behaviour and calf behaviour using structural equation modelling (SEM). The assessments were performed in 2006–2008 on 110 Norwegian dairy farms. The stockperson sample consisted of 79.6% males and 20.4% females, with a mean age of 46 years. The dairy calves (including young stock) were mostly Norwegian Red and were 3 to 298 days old at the day of observation. Ten items of the stockperson QBA were analysed through Principal component analysis. The handling styles that emerged were termed calm/patient, dominating/aggressive, positive interactions and insecure/nervous. The 31 items of the calf QBA were also analysed using principal component analysis and revealed two dimensions of calf behaviour labelled pos/neg mood and high/low arousal. Based on the expected relationships between stockperson behaviour and calf behaviour a structural model was developed and tested using SEM. The analysis revealed that stockpersons who handle their calves patiently and pet and calmly talk to them during handling have animals with higher levels of positive mood, as characterized by high scores on QBA items like friendly and content. Stockpersons with a nervous handling style, or who were dominating and aggressive, on the other hand, had calves with more negative mood. These findings are important as they show the direct link between human behaviour and calf behaviour and once again confirm the significance of good stockmanship. The results also highlight the importance of proper training and self-awareness for those working with livestock.

1. Introduction

1.1. Human–animal relationship

In dairy farming, the stockperson is in frequent and close contact with his/her animals during procedures such as

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milking, cleaning and inspection. This is especially true for a country like Norway where production units are small (average dairy herd size is in 2013 was 24 cows (Statistics-Norway, 2013) and animals are kept indoors most of the year.

A good human–animal relationship (HAR), here defined as "the degree of relatedness or distance between the animal and the human, i.e., the mutual perception, which develops and expresses itself in their mutual behaviour" (Estep and Hetts, 1992, p. 6) is therefore fundamental to good animal welfare. A vast number of publications have been dedicated to the topic of HAR in various species, including companion (e.g. Marinelli et al., 2007; Ellingsen et al., 2010) and productions animals (e.g. Coleman et al., 1998; Waiblinger et al., 2002; Breuer et al., 2003). What is generally found, is that animals having a positive bond with their caretaker are safer and easier to handle, while lack of habituation to people, as well as negative handling with shouting and hitting leads to poorer animal welfare, more fear, acute and chronic stress (Hemsworth et al., 2000; Hemsworth, 2003; Simensen, 2004) and reduced reproduction (Hemsworth et al., 1986). Studies have also shown that a negative HAR leads to decreased milk yield and increased residual milk in dairy cattle (Rushen et al., 1999; Waiblinger et al., 2002). On the other hand, calm touching and talking to cattle during milking leads to higher milk yield (Hemsworth and Coleman, 1998).

It has been known for some time that a major factor influencing the HAR is the nature of the daily interactions between the stockperson and the animal (Hemsworth et al., 1981a,b), as stockperson behaviour determines the animals' reaction towards humans (Waiblinger et al., 2006). During the last decades a great deal of work has therefore been done in the area of HAR and animal welfare assessment in production animal species (e.g. Rushen et al., 1999; Waiblinger et al., 2006; Bertenshaw et al., 2008; Windschnurer et al., 2008; Welfare Quality, 2009). In this process a method called qualitative behaviour assessment (QBA) has undergone extensive testing and is proving a time efficient and valid addition to a number of these animal welfare assessment protocols.

1.2. Qualitative behaviour assessment

QBA is an integrated assessment of the whole animal where the animal's body language is evaluated as an indication of the animal welfare state (Wemelsfelder and Lawrence, 2001). Originally the QBA was developed by the use of spontaneous judgements in a process called Free Choice Profiling. Untrained personnel were asked to observe animals for a period of time and then write down the behaviours or mental states they felt best described the animals' status. The observers showed high agreement and the method had good repeatability and correlated well with other behavioural and physiological measures of animal welfare (Wemelsfelder and Lawrence, 2001). The scale was then further developed to a pre-fixed list of descriptors containing words like happy, content, nervous, frustrated and aggressive, as seen in Welfare Quality® (Wemelsfelder et al., 2009a). The QBA has been validated on a wide range of species including veal cattle and calves, dairy cattle (Rousing and Wemelsfelder, 2006; Wemelsfelder et al., 2009a), horses (Napolitano et al., 2008), pigs (Wemelsfelder et al., 2001) and dairy buffaloes (Napolitano et al., 2012). Using QBA to describe stockperson behaviour, however, is a novel way of characterizing handling styles.

1.3. Aims

Using QBA on stockperson behaviour, this study aimed to characterize different handling styles of stockpersons interacting with their dairy calves and young stock. Using Qualitative Behaviour Assessment on the dairy calves, we also set out to portray the body language of the animals. Haskell et al. (2003) suggested the use QBA to evaluate the response of dairy cows to humans and Brscic et al. (2009) stated that QBA may be sensitive to the quality of human contact. The final aim of the study was therefore, using structural equation modelling (SEM), to develop and test a model showing how stockperson behaviour correlates with the behaviour of the animals.

2. Materials and methods

2.1. Data collection

The current study is based on qualitative behaviour assessment of stockperson and dairy calves, including young stock up to 10 months of age, conducted on 110 Norwegian dairy farms between January 2006 and March 2008. All behaviour registrations were carried out by the same observer, an experienced livestock inspector and agricultural advisor. Farms were randomly selected from a list of dairy producers covering pre-defined regions of Southern Norway. All selected farms were members of the Norwegian Cattle Health Recording System (NCHRS). NCHRS commenced nationally in 1975 (Østerås et al., 2007) to guide farmers in management related issues, including feeding and breeding. Membership is not mandatory, but 98.5% of the Norwegian dairy herds regularly report milk yield, disease occurrence and treatment of individual animals (Tine, 2012). The stockperson that participated was the one who on a daily basis managed the farm's calves and young stock.

The stockperson sample consisted of 88 (80.0%) males and 22 (20.0%) female, with a mean age of 46 years (SE ± 0.04). 87 (79.1%) participants were married or had a partner and 58 (52.7%) had children. 13 (11.8%) of the respondents had primary school as their highest level of finished education, 73 (66.4%) had completed upper secondary school and 14 (12.7%) had university college or university degrees. Educational information was missing for 10 (9.1%) of the sample. The stockpersons were generally very experienced with dairy calves, as mean years of experience was 24.5 (SE ± 1.22).

The vast majority of the calves included in the QBA were Norwegian Red. Remaining calves were Norwegian Red cross breeds, Jerseys, Simmental, or the local breeds Norwegian Red Polled Cattle and Blacksided Trønder and Nordland Cattle. The mean number of calves and young stock on the farms that were included in the study was 31

(range 10–120 animals) and their age at the time of the visit varied from 3 to 298 days. At each farm, five calves were observed. The test animals were randomly chosen from a list containing the ear tag numbers of all suitable calves before entering the barn. Some farms had concentrated calving and hence the five animals were approximately the same age. Other farms had spread calving resulting in up to six months age differences in the test animals.

2.2. The qualitative behaviour assessment—Stockperson

The first QBA was performed to determine the behaviour of the stockperson. The stockperson was blind to the purpose of the study and therefore, even though the observer could interfere with the usual farm management, a "true" stockperson management behaviour could be expected to be observed. The stockperson was asked to do a chest measurement on five calves successively, and data is hence based on $5 \times 110 = 550$ interactions. In addition to obtaining calf weights the observer monitored the behaviour of the human in his/her interactions with the calves. After the observation period had finished, the observer scored, from memory, the body language of the stockperson according a list of 17 descriptors on a visual analogue scale (VAS). The descriptors included in the stockperson QBA were: quick, dominating, aggressive, fearful, patient, careful, calm, determined, focused, insecure, careless, talks to the animals, cuddles the animals, inventive, nervous, boisterous and including. After the test had ended, the stockperson was informed of the second objective of the study and was asked for permission to use the data. All 110 participants consented.

2.3. The qualitative behaviour assessment—Calf

The second QBA was carried out to evaluate the behaviour of dairy calves on the 110 farms. According to standard test procedure, the observer studied the animals for 10–20 min and then assessed the animals' behavioural expression by scoring them on a given list of 31 descriptors on a VAS. To avoid further influence from the animals, this was done in another room/section of the barn. The descriptors included in the calf QBA were: nervous, frustrated, fearful, enjoying, distressed, uncomfortable, friendly, content, sociable, uneasy, calm, confident, agitated, unwell, happy, scared, positively occupied, relaxed, boisterous, inquisitive, playful, tense, aggressive, bored, depressed, active, lively, irritable, vigilant, apathetic, indifferent and welfare overall. The terms used in our study were the same terms as used in Welfare Quality®, but as the descriptor "welfare overall" includes non-animal environmental features, this item was excluded from the analyses, as recommended (Wemelsfelder et al., 2009a).

2.4. Statistical analyses

For analysis, the VAS was converted into a 125 mm long line and the distance from the left-hand side of the VAS to the line drawn by the observer was measured, giving the score for that descriptor. To create clearly defined handling styles with optimal factor loading, the stockperson QBA was further analysed using Principal Component Analysis (PCA) with Varimax rotation on 10 descriptors. To comply with the standard way of analysing animal QBAs (e.g. Andreasen et al., 2013; Phythian et al., 2013), all 31 items were included in the calf QBA analysis with no rotation performed. The factor scores of each individual handling style, along with the factor scores of the two dimensions of calf behaviour, were used as separate variables in a structural equation model (SEM) (Byrne, 2010). The suitability of both QBA scales were analysed using the Kaiser–Meyer–Olkin measure of sampling adequacy.

Several fit indices were utilized to evaluate the suitability of the SEM. First, normed Chi square (X^2/df) was chosen over traditional Chi-square statistics (X^2), as it takes into consideration the complexity of the model and is less sensitive to sample size. The normed Chi square should be less than 2 (Schumacker and Lomax, 2004). Second, the Comparative Fit Index (CFI) was used. With this measure, values above 0.90 and 0.95 indicates acceptable and good fit, respectively (Byrne, 2010). Lastly, the Root Mean-Square Error of Approximation (RMSEA) was utilized. RMSEA values of less than 0.05 indicate good fit (Byrne, 2010).

All statistical analyses were performed using SPSS v.20. The SEM was created using AMOS v. 20.

3. Results

3.1. Principal component analysis (PCA)

Prior to performing PCA, the suitability of both scales for factor analysis was assessed. Inspection of the correlation matrix revealed a majority of coefficients of 0.3 and above. The Kaiser–Meyer–Olkin value was 0.77 for the stockperson QBA and 0.89 for the calf QBA, hence both exceeding the recommended value of 0.6. Bartlett's Test of Sphericity reached statistical significance for both scales, supporting the factorability of the correlation matrices.

3.2. The qualitative behaviour assessment—Stockperson

Principal component analysis with extraction of four components explained 25.5%, 24.4%, 18.1% and 16.9% of the variance, respectively. To aid in the interpretation of these four components Varimax rotation was performed (Table 1).

PCA analysis revealed four relevant handling styles termed; calm/patient (PC1), dominating/aggressive (PC2), positive interactions (PC3) and insecure/nervous (PC4). A stockperson who has positive interactions actively engages in contact with the animals, talking calmly and/or touching and petting them. By calm/patient is implied that the stockperson treats the animals in a quiet and careful way, without rushing or stressing them. This handling style does not, however, infer the same degree of closeness or passion as positive interactions. A dominating/aggressive handling style holds that the stockperson is noisy, rowdy and forceful when handling the animals, while the final handling style, insecure/nervous, aims to portray a person who is uncomfortable working with calves and shows anxious or apprehensive behaviour. The two former handling styles

Table 1
The table shows how the 10 stockperson behaviour scores (QBA) are grouped in four handlings styles (PC1–4). The items were analysed using principal component analysis with Varimax rotation.

Item	PC1	PC2	PC3	PC4	Communalities
Calm	**0.914**	−0.210	0.125	−0.046	0.897
Careful	**0.889**	−0.289	0.183	0.104	0.918
Patient	**0.741**	−0.401	**0.366**	−0.035	0.845
Dominating	−0.175	**0.882**	−0.177	−0.138	0.858
Boisterous	**−0.350**	**0.818**	−0.140	0.110	0.823
Aggressive	**−0.373**	**0.717**	−0.038	0.290	0.739
Talks to the animals	0.174	−0.062	**0.892**	0.029	0.832
Cuddles the animals	0.191	−0.184	**0.882**	−0.038	0.849
Insecure	0.096	−0.165	−0.026	**0.916**	0.877
Nervous	−0.093	**0.352**	0.024	**0.845**	0.848

Note: Loadings > ± 0.30 for each item are bolded.

(PC1 and PC3) can be viewed as positive, the two latter (PC2 and PC4) as negative.

3.3. The qualitative behaviour assessment—Calf

Principal components analysis with extraction of two components was performed. The two factors explained 45.4% and 15.7% of the variance. To comply with the standardized way of analysing QBA data, no rotation was performed. A loading plot showing the relationship among the calf QBA descriptors is given in Fig. 1.

PCA analysis revealed two dimensions of calf behaviour labelled positive/negative mood (PC1) and high/low arousal (PC2) (Table 2.

Distinct clusterings along two axes were discovered in the calf QBA data. Animals receiving low scores on PC1 (Mood) have high levels of positive descriptors and low levels of negative descriptors, while animals receiving high scores on the axis have high levels of negative descriptors and low levels of positive descriptors. Mood descriptors can either be high or low in arousal, as reflected by their location relative to the PC2 (Arousal) axis.

3.4. Structural equation modelling

Based on the expected relationships between stockperson behaviour and calf behaviour a structural model was developed and tested using SEM (Fig. 2).

All pathways were significant at the 0.05 level. The first endogenous variable, positive/negative mood, had four direct pathways from exogenous variables. In descending order or magnitude, these pathways reflected the influence of positive interactions ($\beta = -0.41$), calm/patient ($\beta = -0.28$), insecure/nervous ($\beta = 0.25$), and dominating/aggressive ($\beta = 0.23$). Combined these four variables account for 36% of the variance in positive/negative mood within the context of the model. The second endogenous variable, high/low arousal, also had four direct pathways from exogenous variables, reflecting the influence of insecure/nervous ($\beta = -30$), calm/patient ($\beta = -0.25$), dominating/aggressive ($\beta = 0.23$), and positive interactions ($\beta = 0.20$) in descending order of magnitude. Combined these four variables account for 24% of the variance in high/low arousal within the context of the model.

Put differently, results showed that a stockperson who interacts with the animals through gently petting and talking calmly have calves with a higher degree of positive mood, as characterized by high scores on QBA items like friendly, content and sociable. The same is true for stockpeople who are calm and patient when interacting with their animals. Stockpersons who have a nervous or insecure handling style, or stockpeople who show dominating or aggressive behaviour in contact with the calves, have more negative mood among the animals, as characterized by high scores on QBA items like nervous, frustrated and fearful.

The fit statistics indicated an almost perfect fit of the model to the data (X^2 (7) = 0.78, $p > 0.05$, $X^2/df = 0.11$, CFI = 1.0, RMSEA = 0.00).

Table 2
The table shows how the 31 calf behaviour scores (QBA) are grouped in two dimensions (PC1–2) representing mood and arousal. The items were analysed using Principal component analysis without rotation.

Item	PC1	PC2	Communalities
Nervous	**0.837**	**0.378**	0.664
Frustrated	**0.816**	0.240	0.479
Fearful	**0.816**	0.247	0.658
Enjoying	**−0.814**	0.250	0.726
Distressed	**0.806**	−0.001	0.721
Uncomfortable	**0.805**	−0.100	0.617
Friendly	**−0.803**	0.134	0.192
Content	**−0.793**	**0.402**	0.579
Sociable	**−0.775**	0.157	0.292
Uneasy	**0.773**	**0.345**	0.637
Calm	**−0.761**	−0.010	0.791
Confident	**−0.759**	0.201	0.473
Agitated	**0.756**	**0.386**	0.725
Unwell	**0.745**	−0.026	0.345
Happy	**−0.740**	**0.542**	0.723
Scared	**0.734**	**0.440**	0.662
Positively occupied	**−0.713**	**0.487**	0.279
Relaxed	**−0.689**	−0.068	0.718
Boisterous	**0.676**	**0.506**	0.746
Inquisitive	**−0.666**	0.202	0.555
Playful	**−0.657**	**0.535**	0.735
Tense	**0.620**	0.298	0.732
Aggressive	**0.505**	0.191	0.485
Bored	**0.458**	−0.264	0.631
Depressed	**0.435**	−0.051	0.843
Active	0.063	**0.812**	0.713
Lively	**−0.348**	**0.783**	0.716
Irritable	**0.550**	**0.574**	0.625
Vigilant	**0.556**	**0.573**	0.401
Apathetic	0.291	**−0.562**	0.842
Indifferent	0.265	**−0.524**	0.650

Note: Loadings > ± 0.30 for each item are bolded.

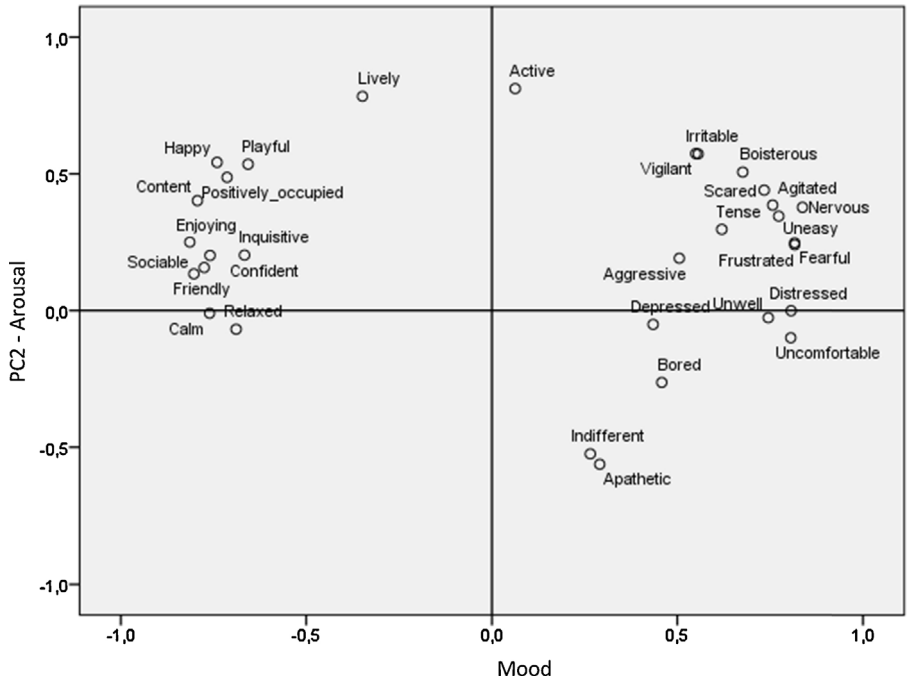

Fig. 1. This 2-dimensional loading plot shows the relationship among the 31 QBA items describing calf behaviour on PC1 (Mood) and PC2 (Arousal). A low score on PC1 indicates positive mood, while a high score indicates negative mood. A low score on PC2 indicates low level s of arousal, while a high score indicates high arousal.

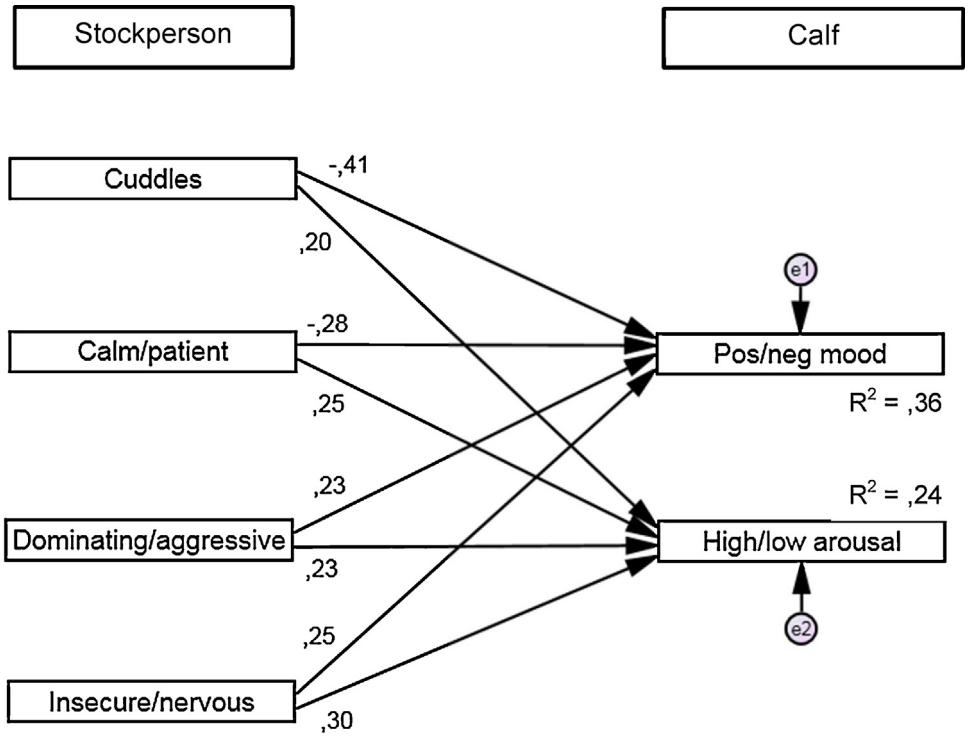

Fig. 2. This figure shows how the four stockperson handling styles (PC1–4) relate to the two dimensions of calf behaviour (PC1–2). A structural equation model with standardized regression weights (*B*) is used. R^2 values are given for each of the two dependent variables. e1 and e2 denotes measurement error associated with observed variables.

4. Discussion

4.1. Stockperson behaviour

In the current study, four relevant handling styles were identified, termed positive interactions, calm/patient, dominating/aggressive, and insecure/nervous. Other research papers have characterized handler behaviour similar to the dimensions the current study. In 2002, Waiblinger et al. investigated the relationship between attitudes, personal characteristics and behaviour of stockpersons and subsequent behaviour and production of dairy cows. In their study, positive stockperson behaviour was used as a collective term to describe handlers who talked quietly, petted or touched the cattle (Waiblinger et al., 2002). (Lensink et al., 2000, 2001) also used 'positive farmers' contacts with calves' to characterize farmers who petted, touched, and talked to the calves in a friendly manner. Negative or aversive stockperson behaviour is often characterized by hitting, slapping and loud vocalizations (e.g. Munksgaard et al., 1997; Waiblinger et al., 2002). No forceful tactile interactions were observed in the current study.

4.2. Calf behaviour

Two dimensions of calf behaviour, positive/negative mood and high/low arousal, were detected in the current analyses. Variations of these dimensions are commonly seen in QBA studies. Following Free Choice Profiling and generalized procrustes analysis (GPA), Rousing and Wemelsfelder (2006) found two main dimensions associated with social behaviour expression in dairy cattle. The first dimension was characterized as relaxed/calm versus aggressive/bullying and the second as passive/indifferent versus playful/sociable. Reliable clustering along two dimensions was also reported by Wemelsfelder et al. (2009a), based on the same QBA items as the current study. Looking at QBA data for dairy cattle, beef bulls and veal calves, the authors reported that one dimension distinguished between positive and negative mood, while the other dimension discriminated between high and low levels of arousal in these moods (Wemelsfelder et al., 2009a). An Italian study looking to integrate QBA with clinical/health protocols in veal calves also found one dimension associated with positive and negative mood descriptors, while the other dimension related to activity and boredom (Brscic et al., 2009). In yet another recent study, Andreasen et al. (2013) two QBA dimensions were also identified, one characterized by calm/relaxed to uneasy/agitated, the other by indifferent/distressed to lively/playful. Similar dimensions are also found in QBA studies on pigs (Wemelsfelder et al., 2001; Rutherford et al., 2012) and sheep (Phythian et al., 2013).

4.3. The effect of stockperson behaviour on calf behaviour

Our results support the previously recognized relationship between stockperson handling style and calf mood and level of arousal. Waiblinger et al. (2006) state that "the stockpersons' behaviour is a major variable determining animals' fear of or confidence in human beings and, hence, the quality of the HAR". It is well established that cows (Munksgaard et al., 1997) and dairy calves (de Passille et al., 1996) can discriminate between handlers based on treatment, as seen by avoidance behaviour. Cows that experience a high percentage of positive interactions (talking quietly, petting and touching) and low percentage of negative interactions (forceful use of stick or hand, shouting and impatient talk) with handlers in the milking parlour, were found to avoid humans less (Waiblinger et al., 2002). Cows, however, kept a greater distance to the handler, as well as urinated and defecated more frequently, following aversive treatment (striking the cow forcefully with open hand) (Munksgaard et al., 1997). Lower levels of withdrawal is also associated with positive contact (petting, touching, talking in a friendly manner) between calves and handlers, as shown by Lensink et al. (2001). Hemsworth and Coleman (1998) have shown that withdrawal is associated with fear in the animals, and behaviour by the stockpeople causing withdrawal is hence associated with poor animal welfare. Our findings confirm these results. A high score on QBA descriptors like tense, fearful, scared and nervous, loading high on the negative mood dimension is therefore associated with aggressive/dominating as well as insecure/nervous handlers. Descriptors like confident, calm, and friendly, on the other hand, loading high on the positive mood dimension, is associated with handlers who are calm/patient and touches and talks to the calves.

A link between insecure and nervous handlers and tense and fearful animals has also been suggested in horses (Hallman and Demmin, 2005). Fear and nervousness in animals is associated with stress and reduced animal welfare (Rushen et al., 1999). In addition, nervous animals are more unpredictable and unsafe to handle, hence increasing the risk of injury to themselves or the stockperson (Hemsworth and Coleman, 1998; Rushen et al., 1999). Waiblinger et al. (2006) also suggest that a negative feedback cycle might be established between the animals and their caretaker whereby the attitudes and behaviour of the handler worsens with subsequent increases in fear of humans among the animals. This could perhaps also be the case in our sample. If handlers who are insecure/nervous experience more negative mood in their herds, they may feel the need to use dominating/aggressive behaviour to control the animals.

In accordance with current results, a number of studies have also found stockperson behaviour to influence the level of arousal in the animals. The use of negative tactile interactions, loud harsh vocalisations and high speed of movement among the handlers when moving cows have been found to be positively correlated with restlessness in the animals (Breuer et al., 2000). Waiblinger et al. (2002) also suggest that positive, calming interactions might reduce the activity level in cattle. This was not supported in the current study as all four handling styles were positively related to high arousal in the animals. A reason for this may be that the two studies above were conducted on adult cattle, while our observations were based on calves. Grown cattle spend about 5–8 h ruminating and rest lying for about 10–12 h per 24 h (Ekesbo, 2011), implying that low activity levels are desirable. The

calves in our sample, on the other hand, were aged between 1 and 9 months, meaning that more play behaviour can be expected (Bekoff, 2001). It is also likely that calves are more easily aroused by handlers, in contrast to adult cattle that have been habituated to humans over several years. According to Wemelsfelder et al. (2009a), arousal does not directly influence welfare. The dimension instead has an important function in giving a meaningful transition between positive and negative mood on the first dimension, and hence adds to the information on animal welfare given by the mood dimension.

4.4. The validity of qualitative behaviour assessment

During recent years, QBA has been used to evaluate cattle welfare, mood and behaviour in a number of ways, including pre-slaughter behaviour in Angus steers (Stockman et al., 2012), stress during transport (Stockman et al., 2011) and social behaviour in dairy cows (Rousing and Wemelsfelder, 2006). More and more papers are also being published correlating QBA with physiological measures (Stockman et al., 2011, 2012; Rutherford et al., 2012; Wickham et al., 2012) and suggesting that the method can detect subtle differences equal to or beyond what quantitative measures can detect (Wemelsfelder et al., 2001). Superior ability to pick up small changes between herds was also one potential explanation for why Andreasen et al. (2013) failed to find meaningful relationships between QBA scores and other Welfare Quality® measures (see Andreasen et al., 2013 for discussion). Two studies published in 2009 concluded that rearing environment for pigs (Wemelsfelder et al., 2009b) and veal calves (Brscic et al., 2009) did not distort observer characterization of behaviour expression. It has also been shown that diverging backgrounds, experience and views do not have negative effect on inter- or intra-observer reliability (Wemelsfelder et al., 2012). The use of QBA as a measure of welfare on production animals has hence been validated by those groups.

Conversely, QBA of stockperson behaviour is novel and has so far not been validated. It is impossible without validation to know how e.g. attitudes, demographics and societal norms influence stockperson QBA scores. This uncertainty is the reason why stockperson QBA was analysed differently than the calf QBA. While the latter was analysed in accordance with other QBA studies (all items, no rotation), well-defined and relevant handling styles were created through Varimax rotation of certain QBA descriptors in order to optimize factor loadings. Based on the significant associations also found in other studies, our study has shown promising potential of the stockperson QBA to predict animal behaviour.

5. Conclusions and implications

Our findings suggest that human and animal behaviour are closely linked. This underlines the significance of good stockmanship. Not only proper education of stockpersons but also awareness of one's own behaviour is essential for those working with livestock. The knowledge generated in this study also allows us to tailor attitude and behaviour change interventions to stockpersons, which in turn may cause advancements in the HAR and ultimately lead to a higher level of animal welfare.

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