Same Pig, Different Conclusions: Stakeholders Differ in Qualitative Behaviour Assessment

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Abstract Animal welfare in pig production is frequently a topic of debate and is sensitive in nature. This debate is partly due to differences in values, forms, convictions, interests and knowledge among the stakeholders that constitute differences among their frames of reference with respect to pigs and their welfare. Differences in frames of reference by stakeholder groups are studied widely, but not specifically with respect to animal behaviour or welfare. We explored this phenomenon using a qualitative behaviour assessment (QBA). Participating stakeholders were classified into two expert groups consisting of pig farmers (N = 11) and animal scientists (N = 18) and a lay-group consisting of urban citizens (N = 15). The stakeholders were asked to observe the behaviour of a specific pig in each of the nine videos and to assign a score for each video using 21 predefined terms describing the mood, such as 'happy' or 'irritated'. They were asked to complete two additional questionnaires to obtain information on their frames of reference. Results from the QBA showed

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that the pig farmers observed the behaviour of pigs more positively than the urban citizens and the animal scientists. This was evident from the consistently higher scores on the positive terms to assess pig behaviour. The questionnaires revealed that the farmers had a different frames of reference regarding pigs and different understanding of welfare, which might explain the differences in assessment. In a follow-up stakeholder workshop, which focussed on differences in observation, QBA showed to be an effective tool to stimulate mutual learning among stakeholders, which is necessary to find shared solutions.

Introduction

In the Netherlands, animal welfare in animal production has surpassed the stage of hype and has acquired a permanent place on the political, scientific and private agenda (Hopster 2010). Despite of agreement on the need of welfare improvement, the issue is still frequently a topic of debate (Eijsackers and Scholten 2010). This is partly the result of different visions between stakeholder groups on how to treat animals (Te Velde et al. 2002; Miele et al. 2011; Lassen et al. 2006). These different visions between stakeholder groups may make it difficult to reach agreements on approaches for improvement of animal welfare.

Different stakeholder groups tend to signal different problems in animal welfare and suggest different solutions. Their visions around animal welfare are constructed according to so-called *frames of reference* (Te Velde et al. 2002). This is a frame that helps to make sense of complex realities: it provides a perspective to structure knowledge, position experiences and to judge and respond to issues (Schön and Rein 1994). A frame of reference is based on the entire set of a person's norms, values, knowledge, convictions and interests (see Table 1) (Te Velde et al. 2002). These variables are usually in coherence with each other (Vinken and Soeters 2004), as people prefer to have a harmony between them (Festinger et al. 1956). Values are the most stable variable (Rokeach 1973), and conflicting visions between persons or groups are frequently the result of implicit value conflicts. Value conflicts often do not arise on the question whether single values are wrong or right, but on the order in which a set of values is prioritized (Schwartz and Bilsky 1990).

In this study, we explored to what extent stakeholder groups observe pig behaviour differently and whether that is related to differences in frames of reference. It is known that observations are not only shaped by the given scene or object, but also by peoples framings. This implies that people with different framings, who are observing the same scene or object, might have different observations (Raftopoulos and Machamer 2012). Different observations of the same situation might result in different convictions and beliefs and thereby strengthen and even validates one's own frame of reference.

Differences in observation might therefore have an important role in the animal welfare debate. In an earlier study, we noticed that pig farmers were very critical to scientific insights on pigs and their welfare when presented by animal scientists

Table 1 Variables that form the frame of reference (Te Velde et al. 2002)

Variable	Meaning
Values	The things that matter to people
Norms	The translation of values into behavioural rules
Convictions	Taken for granted assumptions
Interests	The issues people are concerned with
Knowledge	Constructs from experiences, facts, stories and associations

during an interactive symposium. This was partly due to differences in observation (Benard et al. 2013). The pig farmers and the animal scientists appeared to have a different approach for observing: the pig farmers were used to observe pigs by scanning their surroundings and noticing abnormalities, whereas animal scientists were used to observe pigs from a rather modelled with an emphasis on the individual animal. Consequently, they did not recognize some of each other's observations ('blind spots'), which contributed to disagreement on the importance of the natural foraging behaviour for good pig welfare.

In this study, we applied the qualitative behaviour assessment (QBA) to assess differences in observation between stakeholder groups. QBA was originally developed as a tool for quantitative assessment of animal welfare (Wemelsfelder et al. 2001; Rousing and Wemelsfelder 2006; Wemelsfelder 2007; Temple et al. 2011). It primarily relies on human perception: different observers are asked to define an animal's mood by using descriptive terms such as 'active', 'happy' or 'irritated' (Wemelsfelder 2007). The method was first described to evaluate the animal's overall welfare state (Wemelsfelder et al. 2000, 2001) and studies have been performed on a wide range of animal species. This assessment is unique in the sense that it goes beyond identifying pain and distress, and also addresses positive aspects of animal welfare by observing the animal as a whole. Differences in QBA assessment between stakeholder groups was studied by Wemelsfelder et al. (2012), whereby agreement on terms was found between pig farmers, veterinarians and animal activists.

The aim of this study is to investigate potential differences between stakeholder groups by using QBA similar to Wemelsfelder et al. (2012), but with an alternative approach by using QBA to specifically address differences in observations. In the discussion, we illustrate how the insights of this study can be used in multi-stakeholder learning processes. Multi-stakeholder learning processes are acknowledged as the most constructive approach to find shared solutions among stakeholders on complex issues such as animal welfare improvement in pig production (Hisschemöller and Hoppe, 1995). These processes aim to develop congruency among visions by a process of mutual learning. An important element in this is frame reflection, which is defined by Schön and Rein (1994) as: "to put themselves in the shoes of other actors in the environment (…) and to overcome the blindness induced by their own ways of framing the policy situation". By exploring a shared perspective on the problem, "horizons become fused" (Gadamer 1965),

and thereby the chance of success in creating solutions that match the diversity of societal perspectives increases.

Materials and Methods

The use of the QBA method for assessing differences and similarities between stakeholder groups was first tested in a pilot study, which served to amend the protocol for the main study. We first describe the use of the pilot study to the main study, after which the materials and methods of the main study are described.

Pilot Study

In November 2011, a pilot QBA was carried out with 15 participants. Twelve participants were animal scientists from different disciplines within Wageningen University (Animal Breeding and Genomics; Adaptation Physiology Group), and three participants were representatives from either an animal welfare organization, a farm branch organization, or the meat industry. They were shown 16 videos of 2 min each. Based on this pilot study, the number of videos for the main study was reduced to 10. In addition, videos were more focussed on the behaviour of a single animal rather than the whole group, resulting in videos of variable length. Furthermore, the word 'curious' was added to the scoring list on pig moods (described in the section 'scoring form and questionnaires') as suggested by participants of the pilot study.

Main Study

QBA Participants

Based on framing differences described in literature (Benard and Cock Buning 2013; Benard et al. 2013; Te Velde et al. 2002; Vanhonacker et al. 2008; Miele et al. 2011) three stakeholder groups were selected, which were expected to have different frames of reference. The first two groups consisted of pig farmers (N = 11) and animal scientists (N = 18). They were defined as 'experts', meaning that they had frequent contacts and prior knowledge of pigs. The third stakeholder group were urban citizens (N = 15). They were defined as 'lay-people', meaning that they had no or limited contact with farm animals in general. All participants were recruited through personal invitation by a person who was known to the participant (colleague or farm advisor). Participants were naïve in the sense that they were not familiar with negotiating or stakeholder learning processes, such as dialogues, at a professional level.

Pig farmers were selected from a rural area in the Netherlands (province Noord-Brabant) where there is a dense pig population compared to the average in the Netherlands (> 6,000 pigs/km^2 compared to 376 pigs/km^2 (CBS 2013). They had

conventional intensive pig farms (N = 9) or complied with slightly higher animal welfare standards (one 'star' on a three point 'star'-scaling system for farming systems with higher animal welfare standards ("Beter Leven kenmerk") (N = 2). A majority of stakeholder in this group consisted of man (10 out of 11), with an average age of 35 (range 20–49). Five pig farmers had an education level of BSc. or higher. All pig farmers daily ate meat from a standard welfare segment, of which pork was the most favourable meat.

The animal scientists were all part of the Centre for Animal Welfare and Adaptation (CAWA), which is a collaboration between two of the largest research groups on welfare of production animals in the Netherlands: the chair group Adaptation Physiology of Wageningen University and the department of Animal Welfare of Wageningen UR Livestock Research in Lelystad. Scientists had on average 11 years of experience of working with pigs. The scientists consisted of 7 males and 11 females, with an average age of 39 (range 24–52). They all had an education level of BSc. or higher. Six scientists ate meat daily, nine scientists between 3 and 5 times a week, one less than 3–5 times a week, one less than 1 time a week, and one was a vegetarian. Half of the scientists ate meat from a standard welfare segment and the other half from a higher welfare segment. They had no specific preference for a particular type of meat.

The urban citizens had no agricultural background or direct link with agriculture and were living in the Randstad of the Netherlands (a Dutch metropole). Nine out of 15 had never visited a pig farm and the others once. The group of urban citizens consisted of 3 males and 12 females, with an average age of 27 (range 20–34). They all had an education level of BSc. or higher and worked at a non-agricultural department at the VU University Amsterdam. Two urban citizens daily ate meat, two urban citizens were vegetarians and nine purchased meat from a higher animal welfare segment than standard. Chicken and beef were the most favourable meat.

Video Recordings and Selection of Videos

Video recordings of the pigs were collected at the animal facilities of Wageningen University (Wageningen, the Netherlands) in 2012. Pigs were housed in groups of six with a space allowance of 1 m^2 per pig (0.2 m^2 above minimum requirements of the Dutch legislation). Half of the pens had a conventional half slatted and half solid concrete floor, whereas the other pens had a deep litter bedding of sawdust and straw. All pens contained a metal chain with ball (in line with Dutch legislation) and a jute sack as a distraction material. Video footage was collected when a pig in the pen had specific behaviours such as drinking, sleeping, playing or oral manipulation of pen mate(s).

Nine video fragments were selected to represent a wide-range of behaviours and expressions which were either active or passive (Table 2). Video fragments were selected based on the behaviour shown (variation between the video fragments), the clarity in which the behaviour was expressed, and representation of both housing conditions (barren and straw-enriched). The length of the videos varied between

Table 2 Description of the nine videos which were shown to the three stakeholder groups

Video	Performed behaviour
1	Pig is trying to lie down on a part of the pen where another pig is lying, and touching this pig's body
2	Pig is sniffing and touching a pen mate
3	Pig is drinking water from the drinker nipple which results in water dripping on the head of a pig lying under the drinker nipple. This pig shakes his head in return
4	Pig is chewing the tail of a pen mate
5	Pig is sniffing, touching and biting on a ball hanging on a chain attached to the wall
6	Pig is biting and sniffing a jute sack which is attached to the pen wall
7	Pig is chewing on straw and sniffing in the straw while lying with eyes open
8	Pig is lying in the straw with eyes closed
9	Pig is sniffing in the straw while lying with eyes open

34 s and 1.55 min depending on the length of the expressed behaviour. At the beginning of the video, an arrow indicated on which pig the scoring should be performed. The nine videos were played in row, whereby the second video was repeated as the tenth video to be able to calculate the intra-observer reliability.

Scoring Form for Videos and Questionnaires

In order to assess a pig on the videos, the method described in the Welfare Quality® Assessment protocol for sows and piglets (2009) was used (for Welfare Quality® see e.g. Blokhuis 2008). All 20 terms from the protocol were used. The word 'curious' was added based on the pilot study. This led to the following list of terms: 1: active, 2: relaxed, 3: fearful, 4: agitated, 5: calm, 6: content, 7: tense, 8: enjoying, 9: frustrated, 10: sociable, 11: bored, 12: playful, 13: positively occupied, 14: listless, 15: lively, 16: indifferent, 17: irritable, 18: aimless, 19: happy, 20: distressed, and 21: curious. These descriptive terms with an expressive connotation were used to reflect the mood of an animal in a certain situation (Wemelsfelder 2007). All terms were translated into Dutch for common interpretation by the participants. The participants were given time to read and understand the terms, although the meaning of the terms was not openly discussed before scoring started. The score-sheet included all 21 terms. Each term was followed by a horizontal line (125 mm in length) from minimum (not fitting the mood of the pig) to maximum (completely fitting the mood of the pig). Participants ticked the line at an appropriate point based on their assessment of the video.

In addition there were two questionnaires (Appendices 1, 2). Questionnaire 1 was to gain insight in the background of the participants and included general information such as age and education, questions on contact with animals and questions on meat consumption. Questionnaire 1 was used to define the stakeholder groups as described earlier. Questionnaire 2 was comparable to the questionnaire published in Wemelsfelder et al. (2012), and served to gain a better understanding of the participants' framings of pigs. This questionnaire consisted of three parts: part 1 'how do you view pigs' (continuous scale from disagree to agree), part 2 'situations involving pigs' (continuous scale from 'not at all' to 'very much'), and part 3 'what do you think pigs can do' (5-point Likert scale; 'yes, very sure' to 'no, very sure' including a neutral midpoint 'not sure'). When the questions were following a continuous scale, the participants ticked the scale at an for them appropriate point. All questions were written in Dutch for a clear interpretation by the participants. The results of the completed questionnaires of all participants are given in Supplementary Material 1.

Assessment Procedure

In November 2012, the three stakeholder groups were subjected to the QBA on separate locations, each in a location which was familiar to them. The stakeholder groups received identical instructions prior to the start of the video assessment.

They were told not to communicate and to remain silent until the end of the session. First, the participants were asked to fill in the two questionnaires. Then, videos were displayed using an overhead projector with sound. A test video was shown to get acquainted with the scoring method. Thereafter, the 10 main videos were shown. The number of each video was clearly indicated at the beginning. Directly after each video, participants were given 1 min to score the video using the lines besides the 21 terms listed on a score-sheet. At the end of the session, the score-sheets were collected.

Statistical Analysis of the QBA

For the analysis of the QBA, the distance in millimetres between the left end of the scale ('minimum') and the tick of the participant was measured. These distances were collected in one matrix in an Excel spread sheet. These distances were subsequently analysed using a principal component analysis (PCA, no rotation) on stakeholder group level using R package FactoMineR (Markljung et al. 2008). PCA was used to reduce the dimensionality of the dataset (both the number of terms and the number of participants are large). A PCA summarizes the variables into a smaller number of terms, and may clarify coherence between groups (e.g. participants) for the different terms. Two main dimensions were generated to describe the variance between pig behaviour and each video fragment on each of these dimensions. Since all participants scored the same video fragments, each video received as many scores on each dimension of a PCA as there were participants included in this study. Results were then grouped per stakeholder group to identify similarities or differences between the stakeholder groups.

The units of the variables were scaled to unit variance and presented in a correlation circle where the first two principle dimensions were presented. Every term (N = 21) was placed in the correlation circle indicated with an arrow. The more an arrow had an absolute magnitude close to 1 on the first dimension (x-axis) or second (y-axis) dimension, the more weight it had as a descriptor for that dimension. The angle between two arrows represented the strength of the correlation between two terms. An angle of 90° indicated no correlation between the terms. To investigate differences between stakeholder groups, the average PCA score of each stakeholder group was graphically presented in a factor map. This factor map corresponds to the correlation circle in the sense that the interpretation of the x-axis and y-axis is the same. Significant differences between stakeholder groups were indicated by constructing a confidence ellipse (95 % CI) around the group mean (which is determined by the variability of the individuals within the stakeholder group). The construction of the confidence ellipses followed the parametric bootstrap method as described by Dehlholm et al. (2012). To determine whether the ranking of videos was different between stakeholder groups, the correlation between the stakeholder groups for the first and second dimension over the nine different videos was calculated, i.e. this would indicate whether all stakeholder groups would find video x the most positive or negative compared to the other videos. Insight in

the ranking of videos is especially relevant to the comparison between this study and studies which performed a QBA using Free Choice Profiling whereby observers generate their own terms for the observed behaviours. The alternative approach to QBA did not enable comparison between studies based on level, but did enable comparison based on how video fragments were ranked between different stakeholder groups.

Intra-observer reliability was determined to indicate whether the responses of the participants were stable over time by comparing the results from video 2 and video 10, which was the same video fragment repeated. A correlation coefficient between the responses for the two videos was calculated per participant. The correlation coefficients were averaged per stakeholder group to see whether video 2 was interpreted differently from video 10, within the three stakeholder groups. A PCA was performed to determine whether video 2 was interpreted differently from video 10 when all participants were analysed together. A confidence ellipse was drawn to determine whether the differences between video 2 and 10 were significant.

Statistical Analysis of the Questionnaires

Means with standard errors were calculated by stakeholder group for part 1 and part 2 of questionnaire 2. Comparisons between stakeholder groups were analysed by ANOVA and the Tukey test. Pairwise p-values were used to indicate significant differences between the groups. Part 3 of questionnaire 2 followed a 5-point Likert scale and a Kruskal–Wallis test was used to test for significant differences between stakeholder groups. For questions where a significant difference between groups was observed, a post hoc analysis for pairwise comparison using a Mann–Whitney U test was performed between the stakeholder groups to investigate differences between the three groups.

Results

The three stakeholder groups, namely pig farmers, animal scientists, and urban citizens showed remarkable differences and similarities in how they observed the behaviour of the pigs in the videos. These results are described in the first paragraph. The stakeholder groups also had different visions on pigs and their welfare in general, as became apparent from the questionnaires, which is described in the second paragraph.

Qualitative Behaviour Assessment (QBA)

The first two dimensions of the principle component analysis (PCA) explained the most variance between the pig behaviours and the video fragments. The first

Table 3 The three most positive and most negative significant correlations ($p < 0.05$) between the first dimension from the PCA and the terms from the scoring list, and between the second dimension and the terms from the scoring list, for each stakeholder group

	Dimension 1				Dimension 2			
	Positively correlated term	Positive correlation	Negatively correlated term	Negative correlation	Positively correlated term	Positive correlation	Negatively correlated term	Negative correlation
Urban citizens	Positively occupied	0.81	Distressed	−0.61	Tense	0.84	Listless	−0.25
	Happy	0.77	Indifferent	−0.65	Frustrated	0.83	Satisfied	−0.43
	Satisfied	0.71	Listless	−0.68	Irritable	0.78	Relaxed	−0.73
Pig farmers	Satisfied	0.86	Frustrated	−0.69	Active	0.88	Calm	−0.32
	Enjoying	0.83	Irritated	−0.72	Lively	0.87	Listless	−0.52
	Happy	0.76	Tense	−0.78	Playful	0.80		
Animal scientists	Calm	0.60	Tense	−0.84	Lively	0.81	Listless	−0.44
	Enjoying	0.68	Frustrated	−0.81	Curious	0.79		
	Satisfied	0.78	Irritated	−0.80	Active	0.75		

dimension showed strong correlations with the terms 'happy', 'satisfied' and 'enjoying' for all three stakeholder groups (Table 3). On the opposite site of the axis of this first dimension, the terms 'frustrated', 'irritated' and 'tense' correlated with the pig farmers and the animal scientists, whereas the terms 'distressed', 'indifferent', and 'listless' correlated with the urban citizens (Table 3). This dimension explained 28.6 % of the variation among the videos for the urban citizens, 35.5 % for the pig farmers, and 34.7 % for the animal scientists. The terms explaining most variation for the first dimension, showed consensus between the stakeholder groups.

The second dimension showed a strong correlation with the terms 'active' and 'lively' for both the pig farmers and the animal scientists, whereas the terms 'tense', 'frustrated', and 'irritable' showed a strong correlation for the urban citizens. On the opposite site of the axis of the second dimension, all three stakeholder groups correlated with the term 'listless' (Table 3). The second dimension explained 26.1 % of the variation among the videos for the urban citizens, 19.7 % for the pig farmers, and 19.0 % for the animal scientists.

The pig farmers scored the videos significantly different compared to the animal scientists and the urban citizens (Fig. 1a). This difference was well reflected in a combined analysis, where the stakeholder group was included as a categorical variable. In this combined analysis the first dimension reflected 'satisfied', 'enjoying' and 'happy' on one side of the axis and 'distressed', 'frustrated' and 'tense' on the other side of the same axis. The second dimension was reflected by 'active', 'lively' and 'curious' on one side of the axis and by 'calm', 'relaxed' and 'listless' on the other side of the same axis (Fig. 1b). When terms are closely located to each other in Fig. 1b, the correlation between the two terms is also high, for example 'enjoying' and 'satisfied' have a correlation of 0.79. The first dimension explained 31.9 % of the variation between the stakeholder groups, and the second dimension explained 20.9 % of the variation. The stakeholder groups significantly differed on the first dimension ($r^2 = 0.15$; $p < 0.001$), whereby the pig farmers had a higher coordinate (1.49) than the urban citizens (−1.06) and the animal scientists (−0.45) (Fig. 1a). In addition, the stakeholder groups also differed on the second dimension ($r^2 = 0.03$; $p = 0.001$), whereby the pig farmers had a higher coordinate (0.56) on the axis than the urban citizens (−0.43) (Fig. 1a).

The stakeholders ranked the videos similar regarding their judgement of the most positive or negative video (Fig. 2). For example, video 4 was scored as most negative for all three stakeholder groups, even though its placement on the dimensions, indicating the scoring of subjective terms on moods, was quite different between the three stakeholder groups (Fig. 2). Correlations were relatively high on both dimensions. Correlations for the first dimension were 0.63 between pig farmers-urban citizens, 0.71 between urban citizens-animal scientists and 0.90 between pig farmers-animal scientists. Correlations for the second dimension were 0.91 between pig farmers-urban citizens, 0.96 between urban citizens-animal scientists and 0.97 between pig farmers-animal scientists.

Fig. 1 PCA analysis of the combined analyses. The *x*-axis indicates the first dimension and the *y*-axis indicates the second dimension. **a** Observer plot with the three stakeholder groups. The *ellipse* represents a 95 % CI around the stakeholder group mean. **b** Correlation circle with an arrow per variable. Length of the *arrow* indicates the correlation with the dimension. The angle between *two arrows* represents the strength of the correlation between two terms. An angle of 90° indicates no correlation between the terms. **b** Corresponds to the observer plot in the sense that the interpretation of the *x*-axis and *y*-axis is the same. For example, the terms 'distressed' and 'satisfied' are strongly correlated with the first dimension

Fig. 2 PCA analysis of the videos per stakeholder group. This figure corresponds to Fig. 1 in the sense that the interpretation of the *x*-axis and *y*-axis is the same. The numbers written next to the symbols indicate the nine different videos (Table 2). The *colours* in the legend indicate the stakeholder groups

Intra-observer correlation was relatively high with 0.61 for pig farmers, 0.68 for animal scientists, and 0.66 for urban citizens. No significant difference was found between the two identical videos, using a 95 % confidence ellipse in the PCA

Table 4 Means and standard errors (SE) for each stakeholder group on the questionnaire 'How do you view pigs' (Questionnaire 2—part 1)

	Urban citizens (N = 15)		Pig farmers (N = 11)		Animal scientists (N = 18)		p*
	Mean	SE	Mean	SE	Mean	SE	
I like pigs	48.5[a]	3.7	68.8[b]	1.8	63.2[b]	1.7	<0.001
I think pigs are fascinating animals	37.7[a]	4.5	69.2[b]	1.8	62.7[b]	1.8	<0.001
I think pigs are handsome animals	24.0[a]	4.2	57.1[b]	4.2	36.4[a]	3.7	<0.001
I think pigs are cute	58.2	3.9	61.5	3.8	57.9	2.5	0.74
Would feel frightened	27.2[a]	5.4	2.5[b]	0.7	7.9[b]	2.4	<0.001
Would you be bothered by their smell or dirtiness	38.1[a]	5.5	4.3[b]	1.7	27.1[b]	3.6	<0.001
Would you feel like going up to them and stroking or patting them	41.3[a]	5.5	21.9[b]	6.9	43.6[a]	3.8	0.02
Would you feel like talking to them	33.7	6.9	25.3[a]	7.9	48.7[b]	4.7	0.04
Would you feel that you could communicate with them in some way	34.8[a]	5.5	45.2	7.5	51.7[b]	2.7	0.05
Would you feel that they could communicate with you in some way	35.3	4.3	42.6	8.0	50.1	3.0	0.08

The higher the score on a scale from 0 to 75, the more the stakeholder would agree with the statement

* $p = p$ value to indicate whether the stakeholder groups were significantly different

[a,b] Averages within a row with different superscript letters differ significantly by $p < 0.05$

analysis. This indicates a high repeatability within participants and consensus on the interpretation of the terms over different videos.

Questionnaires

The stakeholder groups significantly differed in their perceptions on eight of the ten questions of the questionnaire 'How do you view pigs' (Questionnaire 2—part 1 as described in the "Materials and Methods") (Table 4). The pig farmers consistently scored higher on questions on the appearance of pigs (i.e. the questions 'I like pigs', 'Pigs are fascinating' and 'Pigs are handsome') compared to the urban citizens. In addition, the pig farmers showed less fear for pigs compared to urban citizens and were significantly less bothered by the smell or dirtiness of a pig than the urban citizens and animal scientists. In contrast, pig farmers were less likely to stroke or pat a pig than both the urban citizens and animal scientists, and they were less inclined to talk to a pig compared to animal scientists. The animal scientists were more inclined to talk to pigs than the pig farmers or urban citizens.

The stakeholder groups significantly differed in two out of five questions on how they would feel, or how they thought that the pig would feel, in the different situations (Questionnaire 2—part 2) (Table 5). Both the animal scientists and urban citizens felt happier than the pig farmers when imagining a pig rolling in the mud. How the pig would feel when rolling in the mud was judged the same by the stakeholder groups. The pig farmers felt worse as compared to the animal scientists when picturing a pig being blocked at the feeder. The pig farmers also, more than the animal scientists, thought that the pig would feel worse when it was blocked at the feeder. On this question, the urban citizens did not significantly differ from the other two stakeholder groups, with a score in between both groups (Table 5).

The 11 questions on 'What you think pigs can do' (Questionnaire 2—part 3) resulted in five significant differences between the stakeholder groups (Table 6). The animal scientists were more sure that pigs could 'remember something that happened yesterday' as compared to the urban citizens. The pig farmers were less sure than the urban citizens that pigs could 'anticipate something that might happen tomorrow' or that pigs could 'actively think about something that might happen tomorrow'. Also, the pig farmers were less sure than the animal scientists that pigs could 'recognize an object they saw 2 or 3 months ago'.

Discussion

In this study, QBA was used as a tool to unveil whether three stakeholder groups, i.e. pig farmers, animal scientists and urban citizens, observed pig behaviour differently. The application of QBA to assess differences in observation is an alternative approach as it was originally developed as qualitative tool to asses animal welfare (Wemelsfelder et al. 2001; Rousing and Wemelsfelder 2006; Wemelsfelder 2007; Temple et al. 2011). The pig farmers observed pig behaviours

Table 5 Means and standard errors (SE) for each stakeholder group on the questionnaire 'Situations involving pigs' (Questionnaire 2—part 2)

	Who	Urban citizens (N = 15)		Pig farmers (N = 11)		Animal scientists (N = 18)		p^*
		Mean	SE	Mean	SE	Mean	SE	
You see a pig lying in the corner, its skin badly scratched after losing a fight with another unfamiliar pig	Pig	14.9	2.7	11.5	4.3	12.8	2.2	0.72
	You	18.7	4.1	20.8	7.3	18.3	2.5	0.92
You see a pig rolling about in a wallow of mud on a hot sunny day	Pig	64.0	3.3	54.2	7.0	60.5	1.7	0.24
	You	58.9[a]	3.5	35.2[b]	8.0	51.9[a]	3.9	0.01
You see a young pig unable to feed because other pigs are blocking its way to a feeder	Pig	17.4	3.2	10.5[a]	4.2	21.9[b]	2.5	0.06
	You	21.9	3.3	15.5[a]	6.6	29.5[b]	2.7	0.06
You see a group of piglets scampering about together in fresh straw	Pig	59.3	3.5	52.2	8.3	56.4	1.9	0.57
	You	53.3	3.3	42.3	8.6	51.0	2.3	0.25
You see a piglet squealing as it is castrated	Pig	7.1	2.9	13.5	4.8	10.6	3.5	0.51
	You	10.4	2.9	17.3	6.2	13.6	3.3	0.52

The higher the score on a scale from 0 to 75, the more happy the stakeholder felt about the situation. 'Who' indicates whether the stakeholder felt happy himself in the situation (You) or that he or she thought the pig felt happy about the situation (Pig)

$*$ $p = p$ value to indicate whether the stakeholder groups were significantly different

[a,b] Averages within a row with different superscript letters differ significantly by $p < 0.05$

Table 6 Means and standard errors (SE) for each stakeholder group on the questionnaire 'What do you think pigs can do' (Questionnaire 2—part 3)

	Urban citizens (N = 15)		Pig farmers (N = 11)		Animal scientists (N = 18)		p^*
	Mean	SE	Mean	SE	Mean	SE	
Remember something that happened yesterday	2.2[a]	0.1	1.9	0.3	1.3[b]	0.1	0.003
Actively think about something that happened yesterday	2.0	0.2	2.3	0.3	1.9	0.1	0.50
Anticipate something that might happen tomorrow	3.0[a]	0.2	4.2[b]	0.3	3.3	0.3	0.04
Actively think about something that might happen tomorrow	3.4[a]	0.2	4.3[b]	0.3	3.6	0.3	0.03
Recognize a particular stockperson	1.5	0.1	1.5	0.2	1.2	0.1	0.06
Prefer to be handled by a particular stockperson out of a group of familiar stockpersons	1.7	0.1	2.7	0.4	1.7	0.2	0.24
Recognize an object they saw two or three months ago	2.4	0.2	3.1[a]	0.3	2.1[b]	0.2	0.02
Favour particular individual pigs but dislike others	1.7	0.2	2.5	0.3	1.6	0.1	0.75
Deceive another pig	2.3	0.2	3.1	0.4	2.8	0.2	0.31
Go to the aid of another unrelated adult pig	2.0	0.1	2.9	0.4	2.3	0.2	0.29
Form a picture in its mind of where things are in the area in which it lives	1.9	0.1	2.5	0.4	1.9	0.22	0.01

The score went from 1: Yes (very sure) to 5: No (very sure)

* p = p value to indicate whether the stakeholder groups were significantly different

[a,b] Averages within a row with different superscript letters differ significantly by $p < 0.05$

more positively than the animal scientists and the urban citizens. This can be concluded based on higher scores on the positive terms used to describe the pig behaviours. Intra-observer analysis indicated that the differences between the stakeholder groups were likely not due to interpretation differences of the terms.

Reflecting on the QBA Approach

Originally, QBA has been designed to assess animal welfare, and has as such been applied to a wide range of species (pigs: Wemelsfelder et al. 2000; Wemelsfelder et al. 2001; Rutherford et al. 2012; dairy and beef cattle: Rousing and Wemelsfelder 2006; Stockman et al. 2011; sheep: Phythian et al. 2013; horses: Napolitano et al. 2008; and dogs: Walker et al. 2010). QBA terms showed significant correlations with animal based welfare parameters, such as physiological parameters (Stockman et al. 2011) and quantitative ethograms (Rutherford et al. 2012; Rousing and Wemelsfelder 2006). QBA is thereby increasingly applied to assess animal welfare (e.g. Temple et al., 2011). However, if different stakeholders give consistently different scores in QBA studies, the conclusions on animal welfare may depend upon the participants. Wemelsfelder et al. (2012) assessed differences between three stakeholder groups using QBA. They showed agreement and consistency between pig farmers, veterinarians and animal activists. Wemelsfelder et al. (2012), however, made use of free-choice profiling whereby observers generate their own terms for the observed behaviours, and they could therefore not compare levels between groups but could only compare ranking of videos. Also in this study the three stakeholder groups did not differ on how they ranked the videos, as rank correlations between the groups were high. However, differences in level between stakeholder groups should also be considered when discussing animal welfare aspects. For example animal scientists emphasize on more play material within pens while pig farmers have the opinion that the current play material offers sufficient distraction to pigs. Therefore, to obtain a balanced assessment on animal welfare from a QBA study, it would be important to compose a group of participants from various backgrounds and with a varying degree of familiarity with the animal species under study.

Frames of Reference

Differences between the stakeholder groups were found in the level of how given terms were judged, whereby the pig farmers judged the terms systematically more positively than the animal scientists and urban citizens. For example, they were more inclined to give a higher score to the terms 'satisfied' and 'enjoying'. We realize that due to the small sample size, we did not cover the diversity of perspectives within the stakeholder groups. However, we did not aim to capture the complete diversity, but aimed to gain insight in the mechanism of observing by real life groups. In the current study, differences in observation seemed to be related to the differences in frames of reference, as the outcomes of the questionnaires also showed differences between the pig farmers on the one hand, and the urban citizens and animal scientists on the other

hand. All three stakeholder groups (except for the vegetarians) seemed to perceive pigs as production animals, or as a source of food, which became apparent from their consumption behaviour. In the direct human-animal relationship, however, the responses indicated that the pig farmers had a different perception of pigs than the animal scientists and the urban citizens. The pig farmers view pigs as production animals, but the urban citizens and the animal scientists tended to view pigs more respectfully. For example, although the pig farmers liked pigs and considered them fascinating and handsome animals they kept a more emotional distance from the pigs by not feeling tempted to stroke or pat them or to talk to them, contrary to the animal scientists and the urban citizens.

Animal Welfare Approaches

The different framings might be the cause of different animal welfare approaches. Animal welfare is generally described in three approaches: the biological functioning, feeling and natural living approach (Fraser et al. 1997). The pig farmers showed a *biological functioning approach*, which emphasizes the health, fertility and productivity of animals (e.g. the pig farmers felt unhappy when a pig was denied access to a feeder, questionnaire 2). Both the animal scientists and the urban citizens expressed a natural feeling pigs as with a natural living being, which emphasize the need of a good mental wellbeing and the need to behave naturally (e.g. they were happy when a pig could be rolling in the mud, questionnaire 2). Also in other studies, farmers evaluated animal welfare more positively than other stakeholder groups, and valued health as most important, whereas urban-citizens or animal scientists valued natural behaviour as most important (Marie 2006; Te Velde et al. 2002; Boogaard et al. 2006; Lassen et al. 2006; Vanhonacker et al. 2008; Hubbard and Scott 2011). From the video fragments it could be clearly observed that pigs were healthy, but some of the natural behaviours could not be fulfilled (e.g. no possibility to root or wallow). This might explain why the pig farmers were more positive than the animal scientists and urban citizens in observing the videos.

Application of QBA to Stimulate Multi-stakeholder Learning Processes

Multi-stakeholder learning processes have been addressed as strategy to handle conflicts which involve conflicting framings and polarization (Dunn 1988; Hisschemöller and Hoppe 1995; Schön and Rein 1994; Termeer et al. 2010). The outcome of multi-stakeholder learning processes may highly depend on the presence of different observations. In an earlier study reporting from a symposium organised by animal scientists for pig farmers, we showed how these differences can potentially give rise to misunderstandings or even create a deadlock due to distrust. The fact that participating farmers had different experiences and observations on which they based their believes, was for a few farmers the reasons to question the reliability of scientific findings (Benard et al. 2013).

Based on the outcomes of the here presented study, we organized a workshop in which pig farmers, animal scientists, and farm advisors were brought together to observe and assess a new series of videos and images of pigs (Benard and Cock Buning under review). All groups jointly watched the behaviour of (groups of) pigs (e.g. calm or restless), the facial expression of pigs, the positioning of the tail, and they judged pigs' vocalizations. Again, the participants differed in their observations and interpretations of the images and sounds. To stimulate dialogue and mutual learning, questions were asked what influenced the scoring, what was understood by the moods or QBA terms, and whether and why they considered certain terms as relevant for pig welfare. Contrary to the symposium reported in Benard et al. (2013), a constructive in-depth discussion was established. This way of organizing a workshop was generally positively valued by the participants. By confronting stakeholder groups with their differences in observation, the differences became explicit and inescapable, and by careful facilitating the dialogue, this may result in "calibration" of the way of observation. Using observation differences in multi-stakeholder learning processes might prevent misunderstandings, raise insights in each other's observations and underlying framing, and may therefore be an effective strategy in creating shared solutions that match the diversity of societal perspectives.

Conclusions

In this study, QBA was used as a tool to unveil to what extent pig farmers, animal scientists and urban citizens observe pig behaviour differently. Pig farmers observed pig behaviours more positively than animal scientists or urban citizens did, which seemed to be related to different underlying framing about pigs. Differences in observation can trouble multi-stakeholder learning processes as it might lead to different convictions and beliefs on animal welfare. This study shows the need of addressing potential observation differences in multi-stakeholder learning processes and illustrates how this can be achieved.

Appendix 1: Questionnaire 1

General background of the pig farmers

General information

1. Age:

2. Gender:

☐Male	☐Female

3. In which municipality were you raised?

4. In which municipality are you living at the moment?

5. What is the highest level of education you have completed

6. How many years of work experience do you have in the pig sector?

☐ 0-5 years	☐ 10-20 years
☐ 6-10 years	☐ 21 > year

7. What kind of farm do you have?

☐ Weaner production	☐Finisher operation
☐ Breeding farm	☐Farrow-to-finish farm
☐ Other:	

8. How would you describe your farm?

☐Intensive	☐According to 1 star	☐ According to 2 star

	farming*	farming
☐ According to 3 star farming (organic)		☐ Other

* A three point 'star'-scaling system for farming systems with higher animal welfare
standards; "Beter Leven kenmerk", www.beterleven.dierenbescherming.nl/varkens.

Questions directed to your contact with pigs and animals in general

9.   Currently, how often would you say you come into contact with pigs?

☐ 1 x a day	☐ 2 or more times per day	☐ 1-2 days a week
☐ Few times a month	☐ Few times a year	☐ Less than one time a year
☐ Never		

10. Do you currently keep any animals (except pigs)?

☐ Yes, a guard dog	☐ Yes, an outdoor cat	☐ Yes, a horse	☐ Yes, other animals (fill in which) :
☐ Yes, a pet dog	☐ Yes, a pet cat	☐ No, no animals	

11. In the past, have you ever kept any animals (except pigs)?

☐ Yes, a guard dog	☐ Yes, an outdoor cat	☐ Yes, a horse	☐ Yes, other animals (fill in which) :
☐ Yes, a pet dog	☐ Yes, a pet cat	☐ No, no animals	

Questions related to meat consumption

12. What kind of animal products do you consume (multiple answers possible)?

☐ Beef	☐ Fish	☐ Eggs	☐ Dairy products	☐ None of these
☐ Pork	☐ Chicken			

13. If you consume meat, how often do you eat meat?

☐ Every day	☐ 3-5 times a week	☐ Less than three times a week	☐ Less than one time a week

14. If you consume meat, what kind of meat do you consume the most?

☐ Beef	☐ Pork	☐ Chicken

14. If you consume meat, what animal welfare segment you buy most?

☐ Standard	☐ One star[*]	☐ Two stars
☐ Three stars (organic)	☐ Others	

* A three point 'star'-scaling system for farming systems with higher animal welfare standards; "Beter Leven kenmerk", www.beterleven.dierenbescherming.nl/varkens.

Questions directed to knowledge on social behaviour

15. Do you take behaviour of pigs into account in your management?

☐ No	☐ To a certain extend	☐ Yes	☐ Not aware

16. How would you value your knowledge on social behaviour?

☐ Low	☐ Average	☐ High

General background of the urban citizen, i.e. 'lay-people'

General information

1. Age:

2. Gender:

□Male	□Female

3. In which municipality were you raised?

4. In which municipality are you living at the moment?

5. What is the highest level of education you have completed

Questions directed to your contact with pigs and animals in general

6. If you have been to a farm where animals were kept, what kind of farm was that (multiple answers are possible)

□ Pig farm	□ (Dairy) cattle farm	□ Chicken farm
□ Children's farm	□ Riding school	

7. Do you currently keep any animals?

□Yes, a guard dog	□Yes, an outdoor cat	□ Yes, a horse	□Yes, other animals (fill in which) :
□Yes, a pet dog	□Yes, a pet cat	□ No, no animals	

8. In the past, have you ever kept any animals?

□Yes, a guard dog	□Yes, an outdoor cat	□ Yes, a horse	□Yes, other animals (fill in which) :
□Yes, a pet dog	□Yes, a pet cat	□ No, no animals	

Questions related to meat consumption

9. What kind of animal products do you consume (multiple answers possible)?

□ Beef	□ Fish	□ Eggs	□ Dairy products	□ None of these
□ Pork	□ Chicken			

10. If you consume meat, how often do you eat meat?

☐ Every day	☐ 3-5 times a week	☐ Less than three times a week	☐ Less than one time a week

11. If you consume meat, what kind of meat do you consume the most?

☐ Beef	☐ Pork	☐ Chicken

12. If you consume meat, what animal welfare segment you buy most?

☐ Standard	☐ One star[*]	☐ Two stars
☐ Three stars (organic)	☐ Others	

* A three point 'star'-scaling system for farming systems with higher animal welfare standards; "Beter Leven kenmerk", www.beterleven.dierenbescherming.nl/varkens.

General background of the animal scientists

General information

1. Age:

2.   Gender:

☐Male	☐Female

3. In which municipality were you raised?

4. In which municipality are you living at the moment?

5. What is the highest level of education you have completed

6. How long have you been working in the field of animal science concerning pigs?

☐ 0-5 years	☐ 10-20 years
☐ 6-10 years	☐ 21 > year

7. Did you ever participate in a Qualitative Behaviour Assesment?

☐ yes	☐ no

Questions directed to your contact with pigs and animals in general

8. Currently, how often would you say you come into contact with pigs?

☐ 1 x a day	☐2 or more times per day	☐ 1-2 days a week
☐ Few times a month	☐ Few times a year	☐ Less than one time a year
☐ Never		

9. What kind of farm you come in contact with most often?:

☐ Conventional	☐ Organic
☐ Experimental facility of the University	☐ Other (Fill in what kind of farm)

10. Do you currently keep any animals?

☐Yes, a guard dog	☐Yes, an outdoor cat	☐ Yes, a horse	☐Yes, other animals (fill in which) :
☐Yes, a pet dog	☐Yes, a pet cat	☐ No, no animals	

11. In the past, have you ever kept any animals?

☐Yes, a guard dog	☐Yes, an outdoor cat	☐ Yes, a horse	☐Yes, other animals (fill in which) :
☐Yes, a pet dog	☐Yes, a pet cat	☐ No, no animals	

Questions related to meat consumption

12. What kind of animal products do you consume (multiple answers possible)?

☐ Beef	☐ Fish	☐ Eggs	☐ Dairy products	☐ None of these
☐ Pork	☐ Chicken			

13. If you consume meat, how often do you eat meat?

☐ Every day	☐ 3-5 times a week	☐ Less than three times a week	☐ Less than one time a week

14. If you consume meat, what kind of meat do you consume the most?

☐ Beef	☐ Pork	☐ Chicken

15. If you consume meat, what animal welfare segment you buy most?

☐ Standard	☐ One star[*]	☐ Two stars
☐ Three stars (organic)	☐ Others	

* A three point 'star'-scaling system for farming systems with higher animal welfare standards; "Beter Leven kenmerk", www.beterleven.dierenbescherming.nl/varkens.

Questions directed to knowledge on social behaviour

16. How would you value your knowledge on social behaviour?

☐Low	☐Average	☐High

Appendix 2: Questionnaire 2

Part 1: how do you view pigs (Wemelsfelder et al. 2012)

To indicate your view on the questions below, please mark the line at the appropriate place between "not at all" and " very much".

1. I like pigs:
   not at all ——————————————— *very much*

2. I think pigs are fascinating animals:
   not at all ——————————————— *very much*

3. I think pigs are handsome animals:
   not at all ——————————————— *very much*

4. I think pigs are cute:
   not at all ——————————————— *very much*

If you were standing in a pen with about 10 female pigs (of ± 60 kg, the size of a large dog), who were busy rooting in straw but looked up when you came in,

1. Would you feel frightened?
   not at all ——————————————— *very much*

2. Would you be bothered by their smell and dirtiness?
   not at all ——————————————— *very much*

3. Would you feel like going up to them and stroking and patting them?
   not at all ——————————————— *very much*

4. Would you feel like talking to them?
   not at all ——————————————— *very much*

5. Would you feel that you could communicate with them in some way?
   not at all ——————————————— *very much*

6. Would you feel that they could communicate with you in some way?
   not at all ——————————————— *very much*

Part 2: situations involving pigs (Wemelsfelder et al. 2012)

Please indicate

a. What you think the pig described would be feeling like in the following situations;
b. What you think you would be feeling like as a result of seeing the pig in those situations.

To indicate your view on the questions below, please tick the line at the appropriate place between "unhappy" and "happy".

1. **You see a pig lying in a corner, its skin badly scratched after loosing a fight with another unfamiliar pig**
   a. The pig would be feeling:
      unhappy ——————————————— *happy*

   b. You would be feeling:
      unhappy ——————————————— *happy*

2. You see a pig rolling about in a wallow of mud on a hot sunny day:
   a. The pig would be feeling:
       unhappy ——————————————— *happy*

   b. You would be feeling:
       unhappy ——————————————— *happy*

3. You see a young pig unable to feed because other pigs are blocking its way to the feeder:
   a. The pig would be feeling:
       unhappy ——————————————— *happy*

   b. You would be feeling:
       unhappy ——————————————— *happy*

4. You see a group of piglets scampering about together in fresh straw:
   a. The pig would be feeling:
       unhappy ——————————————— *happy*

   b. You would be feeling:
       unhappy ——————————————— *happy*

5. You see a piglet squealing as it is castrated:
   a. The pig would be feeling:
       unhappy ——————————————— *happy*

   b. You would be feeling:
       unhappy ——————————————— *happy*

Part 3: what do you think pigs can do (Wemelsfelder et al. 2012)

Please tick one box for each question.
Do you think pigs can:

1. Remember something that happened yesterday.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

2. Actively think about something that happened yesterday.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

3. Anticipate something that might happen tomorrow.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

4. Actively think about something that might tomorrow.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

5. Recognize a particular stockperson.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

6. Prefer to be handled by a particular stockperson out of a group of familiar stockpeople.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

7. Recognize an object they saw 2 or 3 months ago.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

8. Like particular individual pigs but dislike others.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

9. Deceive another pig.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

10. Go to the aid of another unrelated adult pig.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

11. Form a picture in their mind of where things are in the area in which they live.

☐————————☐————————☐————————☐————————☐
Yes(sure)   Yes(probably)   I don't know   No(probably)   No(sure)

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