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Bridging consumer perception and on-farm assessment of animal welfare

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Abstract

The present study aims to assess the relationship between consumer perception and on-farm assessment of animal welfare performed using the Animal Needs Index 35L (ANI). Two tie-stall, 2 straw yard and 2 cubicle farms were scored by trained assessors using the ANI and filmed to produce six 3.5 min videos. Each of them contained 4 clips: barn overall view, feeding, milking and individual animals. Ten untrained observers were asked to elicit terms describing how they perceived the observed farming systems to affect animal welfare using Free Choice Profiling (FCP). Data from FCP were subjected to Generalised Procrustes Analysis (GPA). GPA showed a significant consensus among observers. Observers characterised the first dimension with terms ranging from constrictive to comfortable conditions and the second one in terms of cleanliness/dirtiness. Principal Component Analysis (PCA) was conducted using the scores of the farms on the first two dimensions of GPA and the data gathered through the ANI. The first dimension of GPA (Comfortable), ANI's sheet 1 (Locomotion), sheet 2 (Social interaction) and sheet 6 (Total score) showed high loadings on the first component of PCA, whereas the second dimension of GPA (Clean), sheet 3 (Flooring) and sheet 4 (Stockmanship) were correlated with the second component of PCA. We concluded that FCP may be used to elicit lay person perception of welfare-related characteristics of dairy cattle farming systems, thus providing a tool to study the relationships between consumer perception and on-farm assessment of animal welfare.

Keywords: *Animal Needs Index, animal welfare, consumer perception, dairy cattle, Free Choice Profiling, qualitative assessment*

Introduction

The study of animal welfare is still facing two unresolved questions concerning the definition of animal welfare and the identification of reliable indicators. Such issues are likely to remain problematic as animal welfare is not a purely scientific issue in that it also deals with public concerns. In particular, Fraser (2003) stated that animal welfare is a "socially constructed concept" as it developed and is commonly used in society, where it acquired its own meanings independently from scientific studies conducted in this field. Thus this concept is, at least partly, driven by public perception. Therefore, the same author argued that, although animal welfare can and should be studied using scientific methodologies, scientists should be aware of the social meaning attributed to this concept in order not to misinterpret it thus producing irrelevant research. Nevertheless, the risk does exist that what consumers perceive as important for animal welfare and what scientists measure may diverge. Thus, an appropriate interplay should be favoured in order to keep consumers informed on critical scientific animal welfare issues and scientists aware of public concerns.

In the present study, Free Choice Profiling, a methodology recently applied to the qualitative assessment of animal behaviour (Wemelsfelder *et al* 2000, 2001), is used to elicit lay person perception of the welfare-related properties of the main dairy cattle farming systems. The aim was to appraise the relationship between consumer perception and on-farm assessment of animal welfare. Welfare monitoring was performed using a widely applied monitoring protocol: the Animal Needs Index 35L (ANI), as proposed by Bartussek *et al* (2000).

Materials and methods

ANI assessment of farms

Six dairy cattle farms located in the province of Potenza (Italy) were used. Farms were chosen according to the most common housing systems used for dairy cattle. In particular,

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two cubicle (CU), two straw yard (SY) and two tie stall (TS) systems were selected. Each farm was scored by 4 trained assessors using Bartussek *et al*'s ANI scheme.

Production of videos and their validation

Farms were filmed to produce six 3.5 min videos. Each of them contained 4 clips concerning: 1) housing (overall view of the barn; 1 min), 2) feeding (distribution of feeds; 1 min), 3) milking (milking routine; 1 min), 4) individual animals (zoom on single animals; 30 sec). Video recordings were carried out by a DVL-157 JVC video camcorder, captured and edited by Pinnacle Studio 7 v 7.06.11 as MPEG files.

A preliminary test was conducted with 10 experts in the field of animal welfare in order to validate the videos and verify whether they were representative of the welfare state of the animals. Ten academics involved in animal welfare studies first watched the 6 videos and were then asked to rate the degree of agreement with the following statement: 'The videos that I watched were descriptive of the housing conditions and welfare of the animals' on a 7-point scale labelled at the left end with 'I do not agree', at the right end with 'I do agree' and at the central point with 'I neither agree nor disagree' corresponding to the score 4.

Free Choice Profiling

Ten students from University of Basilicata were selected on the basis of their sensitivity to animal welfare issues and instructed to provide qualitative assessment of the videos of the six farms using Free Choice Profiling (FCP) methodology, which allows observers to generate their own descriptive vocabulary. Namely, they were asked to watch the videos and elicit terms describing how they perceived the observed faming systems to affect animal welfare. Observers were untrained in animal welfare assessment in order to obtain responses which could be considered comparable to those potentially given by ordinary consumers. These observers were instructed in FCP procedures as described by Wemelsfelder *et al* (2001) for qualitative behaviour assessment. In brief, FCP consists of two phases; during phase 1 observers generated their own vocabulary to describe their perception of animal welfare as affected by the farming system while watching the six 3.5 min videos of each farm. After each video they had 1.5 min to generate their terms. After a formal training for scale use with their own terminology, the second phase was conducted. In particular, observers watched the videos again and then had 1.5 min to score each animal on each term of their vocabulary. Attributes were rated on the basis of 125 mm unstructured lines with anchor points at each end (0: absent and 125: very strong). Scores were the distances (mm) from the left anchor point. FCP yielded 10 sets of descriptive terms generated and scored by 10 assessors. Such terms differed in number and kind but were all attributed to the same 6 farms.

Statistical analyses

The data matrices of 6 farms for the 10 observers (configurations) obtained from FCP were analysed using Generalised Procrustes Analysis (GPA), a multivariate statistical technique, which does not need fixed variables, as performed by Wemelsfelder *et al* (2000, 2001). These data were matched to find a consensus using the software Senstools® (Procrustes-PC v 2.2, OP & P, Utrecht, The Netherlands). In order to evaluate whether the data from each observer were significantly fitted by the model, the permutation test was performed (Dijksterhuis & Heiser 1995). This procedure rearranges at random each observer's score and produces new permutated data sets where the score no longer corresponds to the original animals, thus a distribution is obtained which gives the probability that the degree of fitness may have occurred by chance alone.

For the six farms (objects) a Principal Component Analysis (PCA) was carried out on the data gathered from the ANI scheme (Bartussek *et al* 2000) and the two main dimensions produced by GPA (6 variables from the ANI + 2 variables from GPA = 8 variables) in order to condense data by indicating which variables were most closely related. No rotation of data was performed.

Results and discussion

Validation of videos

The mean score obtained by the videos in the preliminary test (6.1) was well above the central point (4), which indicated a good agreement between the judgement of the 10 experts and the statement concerning the ability of clips to describe the welfare state of the animals. This result provided the validation of videos, which could be used for the subsequent study on consumer perception of animal welfare.

Lay person perception of animal welfare

GPA showed a significant consensus among observers ($P < 0.001$). The 2 main dimensions of the consensus profile explained 39.45 and 26.79% of the total variation, respectively. Observers characterised the first dimension of the consensus profile with terms ranging from constrictive to comfortable, unrestricted conditions and the second one in terms of cleanliness/dirtiness. Figure 1 shows the word chart produced by observer 1 as an example.

The position of farms is given in Figure 2. Such positions can be interpreted using the word charts of each assessor which allowed the naming of the axes using the labels indicated above (constrictive/comfortable and clean/dirty). According to these positions farms TS scored lower on the first dimension, being more restrictive and coercive than SY and CU, whereas on the second dimension CU received scores higher than SY as the former were considered cleaner and more hygienic.

ANI assessment of animal welfare

Although the ANI scheme can be considered to be based on design criteria and many protocols relying on direct observation of the animals are being developed, it is one of the systems most widely applied to on-farm welfare assessment. In our study each farm was scored by 4 trained observers. For each sheet (Locomotion, Social interaction,

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Figure 1

Word map of observer 1.

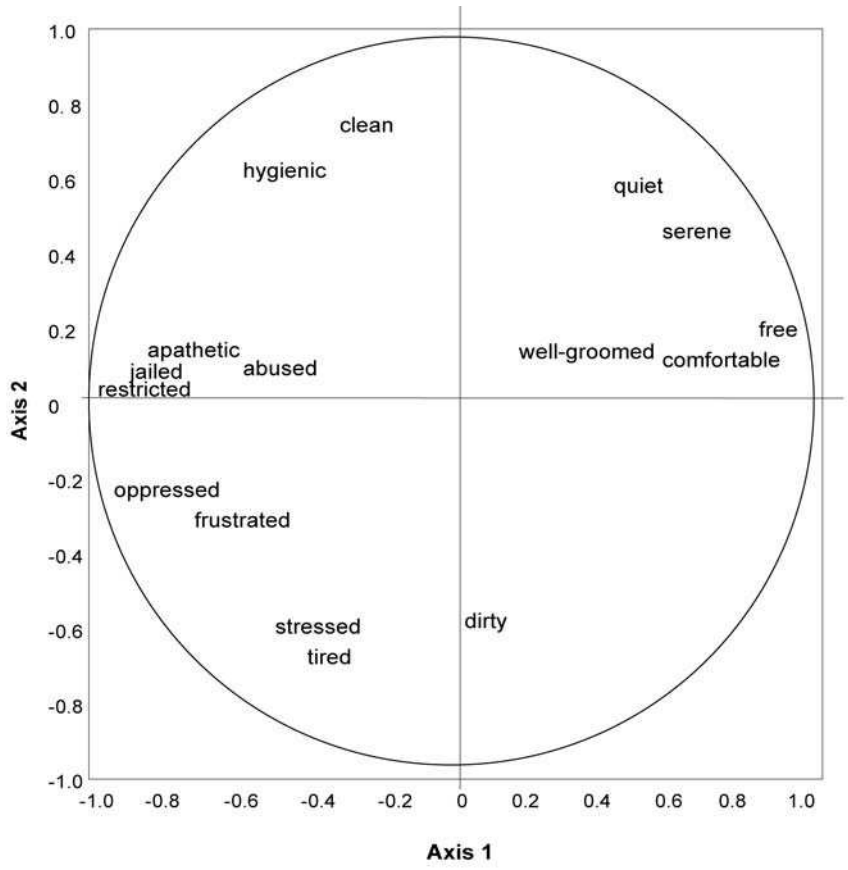

Figure 2

Plot of the farms in consensus space of GPA.

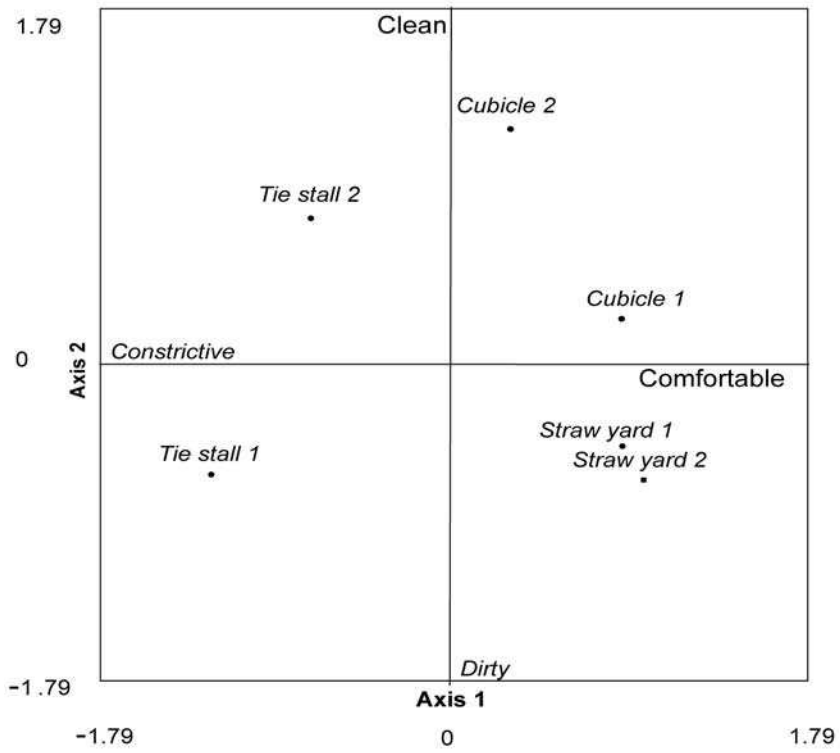

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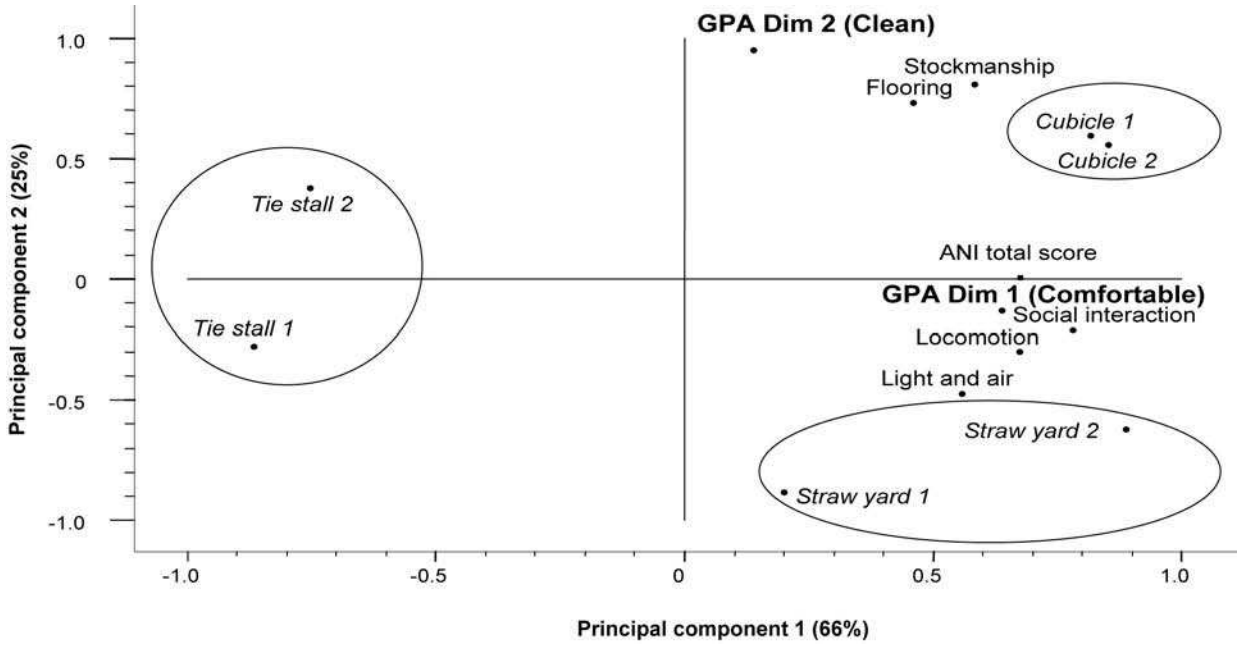
Table 1 Mean scores and Kendall's *W* coefficient obtained for each ANI sheet.

Sheet	Farming system						Kendall's *W*
	Tie stall		Straw yard		Cubicle		
	Farm 1	Farm 2	Farm 1	Farm 2	Farm 1	Farm 2	
Locomotion	1.50	1.00	7.50	5.50	6.25	5.50	0.988**
Social interaction	1.62	0.37	5.87	3.87	5.00	4.50	0.997**
Flooring	2.50	2.50	4.12	0.62	4.37	5.37	0.907*
Light and air	2.87	2.50	8.12	6.62	6.75	5.25	0.953**
Stockmanship	-0.25	2.37	2.62	0.50	3.87	5.00	0.929**
Total score	8.25	8.75	28.25	17.12	26.25	25.62	0.972**

* $P < 0.01$, ** $P < 0.001$.

Figure 3



Principal Component Analysis: score and loading plot.

Flooring, Light and air, Stockmanship, Total score) a high degree of concordance (Kendall's *W* coefficient > 0.90) was found, thus for each farm and each sheet a mean value was computed and used for further analysis (Table 1).

Relationship between on-farm assessment and lay person perception of animal welfare

The two main dimensions of PCA (Figure 3) explained 91% of the total variation. The first dimension (Dim 1) of GPA (comfortable, 0.39), ANI's sheet 1 (Locomotion, 0.42), sheet 2 (Social interaction, 0.42), sheet 4 (Light and air, 0.39) and sheet 6 (Total score, 0.43) showed higher loadings on the first component of PCA, whereas the second dimension (Dim 2) of GPA (Clean, 0.61), sheet 3 (Flooring, 0.45) and sheet 4 (Stockmanship, 0.49) were more correlated with the second component of PCA. Results showed that the variables with the highest loading on the positive end of axis 1 were indicative of systems allowing free movements and interactions (ie cubicle and straw yard systems), whereas the axis 2 of PCA displayed high loadings on the positive end for variables reflecting and/or affecting animal cleanliness as well as for farms using cubicle systems. Differences between TS1 and TS2 may be attributed to a different level of attention paid by the management to farm and animal cleanliness. Conversely, the different position of SY1 and SY2 may be due to the different space allowance available for the animals in the two farms (data not shown). ANI's total score was positively correlated only with axis 1. This result may be explained on the basis of the predominant weight given by Bartussek *et al*'s index to space allowance and access to open air and areas, which are scored in several columns of 3 sheets (Locomotion, Social interaction, Light and air) as compared to cleanliness, which is rated only in one column

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(b, cleanliness of lying area) of sheet 3 (Flooring) and two columns (a and d, cleanliness of pens and animals, respectively) of sheet 5 (Stockmanship).

Conclusions and animal welfare implications

We concluded that qualitative assessment may be used to assess how lay people perceive the farming systems to differ in their effect on animal welfare, thus providing a tool to study the relationships between consumer perception and on-farm assessment of animal welfare. In this study consumer perception and on-farm assessment seem to have at least some common criteria (ie cleanliness and unrestricted farming conditions). In addition, this methodology may help in identifying the information needed by consumers as assurance about animal welfare when purchasing products of animal origin.

Further studies are needed to assess whether information about animal welfare can affect food acceptability, willingness to pay and food choice.

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