The Old School, Brewhouse Hill, Wheathampstead,
Hertfordshire AL4 8AN, UK

Animal Welfare 2007, 16: 267-271
ISSN 0962-7286

Using the Piglet Scream Test to enhance piglet survival on farms: data from outdoor sows

S Held*†, G Mason‡ and M Mendl†

† Centre for Behavioural Biology, Department of Clinical Veterinary Science, University of Bristol, Langford, BS40 5DU, UK
‡ Department of Animal & Poultry Science, University of Guelph, Guelph, Ontario, N1G 2W1, Canada
* Contact for correspondence and requests for reprints: suzanne.held@bris.ac.uk

Abstract

The point of the Piglet Scream Test is to identify those sows that increase the survival of their piglets through good maternal behaviour. For this to work, sows must be shown to differ in their test responsiveness, for differences to be consistent across parities and for responsiveness to be associated with piglet survival. Our data provide some first evidence that outdoor sows, kept under commercial production conditions, differ consistently from each other in their test responsiveness across parities. However, there was no evidence that this was associated with the survival of their litters. This, together with the lack of consistent evidence from other studies for a relationship between Piglet Scream Test responsiveness and piglet survival and concerns about its possible causes, cautions against the use of the test to enhance piglet survival on farms without further study. The paper highlights lack of standardisation of the test and pseudoreplication as concerns.

Keywords: *animal welfare, maternal behaviour, outdoor sows, piglet mortality, Piglet Scream Test, Playback Test*

Introduction

The 'Piglet Scream' or 'Playback' Test examines a sow's response in a simulated overlay situation (Cronin & Cropley 1991). It measures how strongly and/or quickly she reacts to playback of a pre-recorded piglet scream, and thus detects individual differences in the responsiveness of sows to a piglet trapped under their body (Signoret *et al* 1975; Cronin & Cropley 1991; Hutson *et al* 1991).

Wechsler and Hegglin's study (1997) provided some initial evidence that such maternal responsiveness may be related to the survival rate of her piglets: sows that were more responsive in the Piglet Scream Test crushed fewer piglets than less responsive sows. This suggested that responsiveness to a piglet scream might be a good measure of mothering ability, where mothering ability is the ability of a sow to enhance the fitness and survival of her offspring through her behaviour (Fleming *et al* 1996).

However, subsequent studies have reported conflicting results: Špinka *et al* (2000) and Grandinson *et al* (2003) failed to find evidence for a phenotypic relationship between responsiveness in the Piglet Scream Test and piglet mortality, while Andersen *et al* (2005) report a relationship. Of these studies, only that of Grandinson *et al* (2003) was conducted on a commercial farm. This raises the question of whether greater responsiveness in the Piglet Scream Test is, indeed, associated with lower piglet mortality under commercial conditions, where more factors can affect the survival of piglets in the immediate post partum period than under experimental conditions (Edwards 2002). Furthermore, most studies to date have looked at sows in only one or two parities. It is, thus, unclear whether individual differences remain consistent across parities. Consistency of differences across parities is a prerequisite for maternal responsiveness being a stable individual characteristic with a possible underlying genetic component.

The purpose of this paper is thus two-fold. It presents data on sow responsiveness in a Piglet Scream Test and piglet survival from first to fourth parities on a commercial outdoor farm. Data were collected as part of a larger study on the maternal responsiveness in outdoor pigs (see Held *et al* 2006). In addition, it highlights some specific points about the use of Piglet Scream Tests to enhance piglet survival on farms.

Materials and methods

The sections below give a brief summary of the methods. Full details are given in Held *et al* (2006).

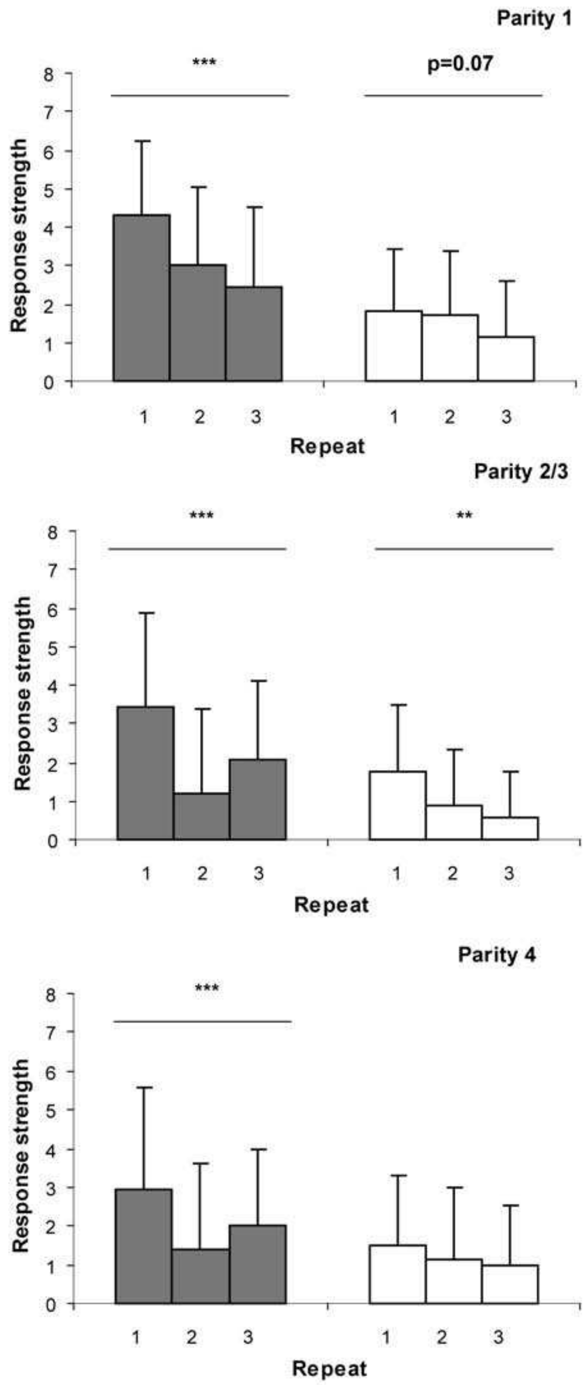
Animals and management

Data were collected on a commercial outdoor pig unit in the UK for first (gilts) to fourth parities from 41 sows (Landrace/Duroc × Large White). Sows were introduced to individual farrowing paddocks one week before their estimated farrowing date. Each paddock contained a farrowing hut and a water trough.

Piglet Scream Tests

Piglet Scream Tests were carried out in the mornings of day 5 or 6 post farrowing. Each sow was tested three times

Figure 1



Response strength in three subsequent playbacks of a piglet distress call (dark bars) and of a control sound (light bars); means (± SD) shown: *** $P < 0.001$, ** $P < 0.01$, * $P < 0.05$. P-values are given where $P < 0.1$.

with the pre-recorded scream of a 6-day old piglet which was alternated with the control sound of a nightingale call. The sow's strongest behavioural response during the 30 second playback period was scored, ranging from no reaction (0) to nudging/pawing the loudspeaker (8).

Table 1 Response scores in the Piglet Scream Test and their definitions (modified after Hutson *et al* 1993).

Score	Sow's maximal behavioural response
0	no reaction
1	head movement
2	head movement towards sound
3	body movement towards sound
4	sits up
5	stands up
6	stands up and orients towards loudspeaker
7	gentle physical contact with loudspeaker
8	nudges or paws loud speaker

Piglet mortality

Live-born mortality was calculated as the total number of piglets born per sow minus the number still-born, minus the number fostered off, minus the number of own-weaned piglets. Live-born mortality was expressed as a percentage of the number of live-born piglets.

Data analysis

Data were collected on 41 sows. However, severe flooding in 2000 and the UK Foot and Mouth Disease epidemic and its aftermath in 2001, resulted in data losses in all four parities; particularly parities 2 and 3. For the analyses, we therefore combined parities 2 and 3 into a mixed data set containing data from 27 of the 41 sows in their second parity and 14 sows in their third (Held *et al* 2006). To investigate the effect of parity on maternal responsiveness, and individual consistency across parities, these analyses included only the 12 sows for which data were available for all three parities (first, second or third and fourth).

The following variables were used in the analyses: response strength in each separate Piglet Scream Test (maximum response score in each repeat; maximum achievable score per sow per repeat was 8, [see Table 1 for definitions]); 'responsiveness' which was the total response strength in the three repeats of the Piglet Scream Test (sum of maximum scores in the three repeats; maximum achievable score per sow per parity was thus 24); live-born preweaning mortality (see above).

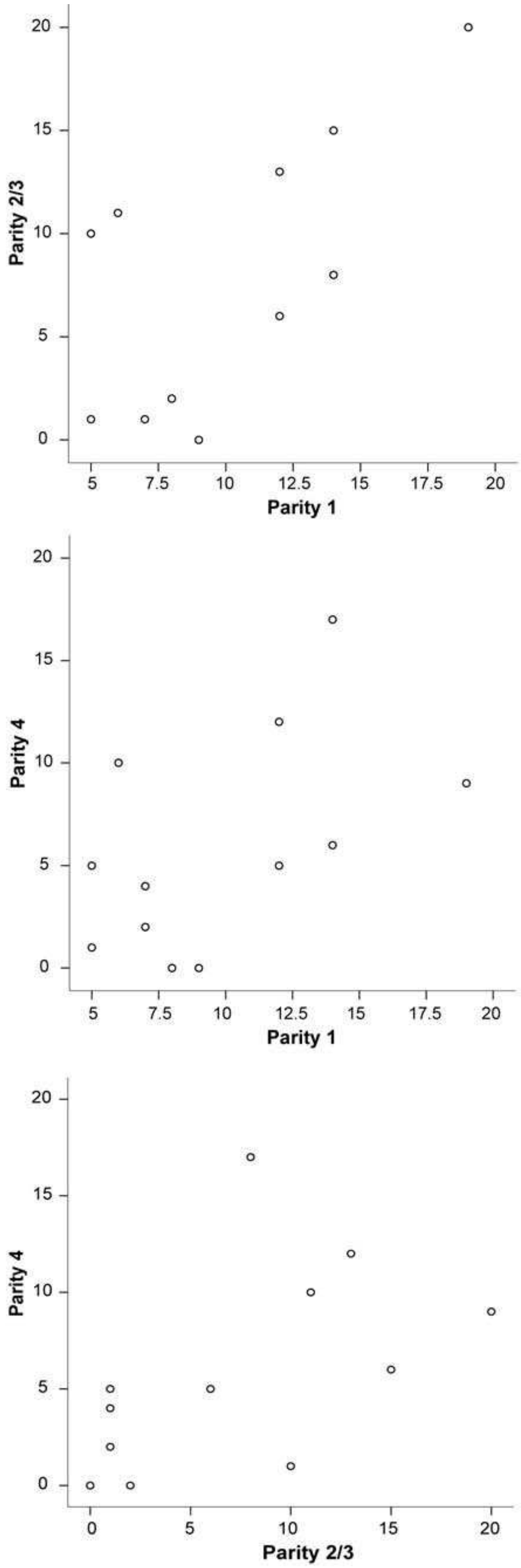
Individual consistency across parities was investigated with Pearson correlations. Non-normally distributed data were square-root transformed. The relationship between test responsiveness and live-born piglet mortality was analysed in separate GLMs for the three parities with live-born mortality as the response variable, litter size as a covariate and test responsiveness as the explanatory variables (see also Held *et al* 2006). Standardised residuals were checked for normality. Further details for the statistical tests are given with the respective results.

Results

Response strength in the Piglet Scream Test decreased significantly over the three repeats in each parity (Figure 1;

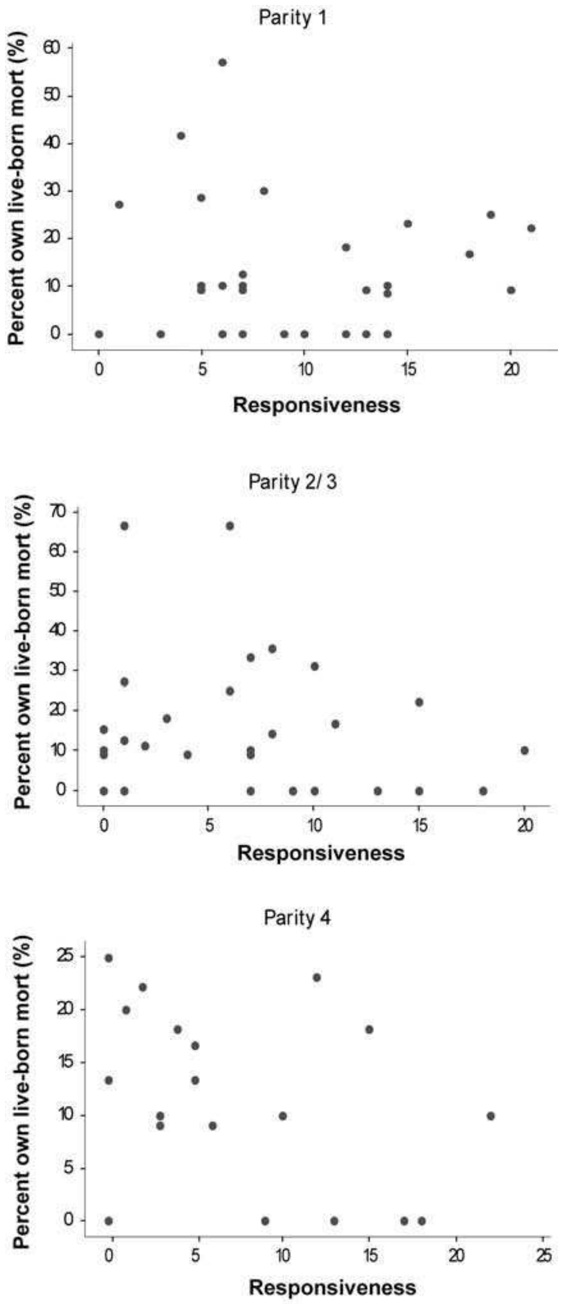
https://doi.org/10.1017/S0962728600031493 Published online by Cambridge University Press

Figure 2



Correlation between test responsiveness of individual sows across parities: statistics are given in the text.

Figure 3



Test responsiveness and live-born mortality of individual sows in three parities.

Repeated Measures Analysis; Parity 1: $F_{2,66}$ = 25.23, $P < 0.001$; Parity 2/3: $F_{2,52}$ = 10.64, $P < 0.001$; Parity 4: $F_{2,42}$ = 9.18, $P < 0.001$). There were large individual differences in responsiveness in all three parities (see standard deviations).

Sows remained consistent relative to each other in test responsiveness from the first to the second/third parity (see Figure 2; Pearson's correlation: n = 12, r = 0.682, P = 0.015). Correlations between first and fourth parities, and second/third and fourth tended towards significance

(Figure 2; n = 12; P1 and P4: $r = 0.521$, $P = 0.08$; P2/3 and P4: $r = 0.534$, $P = 0.074$). Absolute levels of test responsiveness decreased significantly between first and fourth parities (Repeated Measures Analysis: $F_{2,22} = 3.55$, $P = 0.046$).

Figure 3 shows the test responsiveness and live-born mortality of individual sows over the four parities. GLM analyses showed no evidence for an association between the two variables in any of the parities.

Discussion

Our data provide some first evidence that outdoor sows kept under commercial production conditions differ consistently from each other in their test responsiveness across parities. However, there was no evidence that this was associated with the survival of their litters. This, together with the lack of consistent evidence from other studies (eg Špinka *et al* 2000; Grandinson *et al* 2003) and concern about its possible causes, cautions against the use of the test to enhance piglet survival on farms without further study.

In our study, sows that were the most responsive as gilts stayed the most responsive in the later parities even though the absolute level of responsiveness decreased over subsequent parities. However, these most responsive sows did not have the lowest piglet mortality. Studies that have previously reported a relationship between Piglet Scream Test responses of sows and litter mortality were conducted under controlled experimental conditions (Wechsler & Hegglin 1997; Andersen *et al* 2005). When data were collected under commercial conditions, no such relationship was found (Grandinson *et al* 2003, present study [see also Held *et al* 2006]). These discrepancies raise some important general concerns for the validity of the Piglet Scream Test as a basis for enhancing piglet survival on farms.

Some general points have already been discussed in Held *et al* (2006). We would like here to highlight some further specific concerns. One is the lack of standardisation of the Piglet Scream Test. The test is usually conducted within the first week of the piglets' life; ideally as close to farrowing as possible as overlying is most likely in the first two days post partum. But within this timeframe of one week, the age of the squeezed piglet which donated the scream for playback may vary, as may the age of the litter when the test is conducted (eg Grandinson *et al* 2003 versus Pitts *et al* 2002 versus Andersen *et al* 2005). Testing sows at different ages of their litters with playbacks of differently aged piglets might, therefore, explain some of the differences between studies. The body position of the sow is another non-standardised factor when the Piglet Scream Test is conducted. Ideally, the scream should be played back just as the sow is in the process of lying down as this most closely resembles the commonest overlying situation (eg Špinka *et al* 2000; Andersen *et al* 2005). However, catching that precise lying-down moment is not always possible on farms because of practical constraints. Many investigations, including this one, have therefore applied the test when the sows have finished 'the process of lying down' and are lying down ('settled') on their udders or sides, but neither nursing nor sleeping (eg Wechsler & Hegglin 1997; Grandinson *et al* 2003). Our results suggest that differences in responsiveness between sows can be detected even when sows are lying down 'settled', which makes it easier to carry out the Piglet Scream Test. While these different body positions should have limited effects on the internal validity of the Piglet Scream Test results, they may be another factor contributing to the reported differences between studies.

Another concern regards the played-back scream itself. For practical reasons many studies, including this one, have used only one playback exemplar which is then played back to all subject sows (eg Špinka *et al* 2000; Pitts *et al* 2002; Grandinson *et al* 2003), while others have not (eg Wechsler & Hegglin 1997; Andersen *et al* 2005). Using the same playback call for all subject sows is a form of pseudoreplication (McGregor 2000) in that responsiveness to that particular scream is tested over and over again. Results of the test even if based on a large sample of sows may thus be due to the nature of that particular exemplar rather than to screams of any squeezed piglet. Comparing results across studies when only one playback exemplar was used respectively is problematic for the same reason. Ideally, different exemplars should be used for blocks of sows within the same study so that a potential exemplar effect can be eliminated statistically. However, such an experimental design would require a greater number of replicates (sows) than commonly available for this type of study.

Finally, our results show some habituation to the piglet scream and control sound when sows are tested repeatedly within a period of up to 100 minutes. We suggest that this has implications for using the test on commercial units where sows are housed at high densities, such as in crated or indoor loose systems. Repeated testing within hearing range of a sow may habituate her to the piglet scream before she herself is tested. While it is important to use more than one playback per sow, care must be taken not to test habituated neighbours. This might be achieved, for example, by only testing sows that are out of hearing range of each other.

Acknowledgements

This study was funded by the BBSRC of the UK through research grant 7/D11141 and a David Phillips Research Fellowship to GM.

References

Andersen IL, Berg S and Bøe, KE 2005 Crushing of piglets by the mother sow (*Sus scrofa*) – purely accidental or a poor mother. *Applied Animal Behaviour Science 93:* 229-243

Cronin GM and Cropley JA 1991 The effect of piglet stimuli on the posture changing behaviour of recently farrowed sows. *Applied Animal Behaviour Science 30:* 167-172

Edwards SA 2002 Perinatal mortality in the pig: environmental or physiological solutions? *Livestock Production Science 78:* 3-12

Fleming AS, Morgan HD and Walsh C 1996 Experiential factors in postpartum regulation of maternal care. *Advances in the Study of Behaviour 25:* 295-33

Grandinson K, Rydhmer L, Strandberg E and Thodberg K 2003 Genetic analysis of on-farm tests of maternal behaviour in sows. *Livestock Production Science 83:* 141-151

Held S, Mason G and Mendl M 2006 Maternal responsiveness of outdoor sows from first to fourth parities. *Applied Animal Behaviour Science 98:* 216-233

Hutson GD, Wilkinson JL and Luxford BG 1991 The response of lactating sows to tactile, visual and auditory stimuli associated with a model piglet. *Applied Animal Behaviour Science 32:* 129-137

Hutson GD, Price EO and Dickenson LG 1993 The effect of playback volume and duration on the response of sows to piglet distress calls. *Applied Animal Behavioural Science 37:* 31-37

McGregor PK 2000 Playback experiments: design and analysis. *Acta Ethologica 3:* 3-8

Pitts AD, Weary DM, Fraser D, Pajor EA and Kramer DL 2002 Alternative housing for sows and litters; Part 5 Individual difference in the maternal behaviour of sows. *Applied Animal Behaviour Science 76:* 291-306

Signoret JP, Baldwin BA, Fraser D and Hafez ESE 1975 The behaviour of swine In: Hafez ESE (ed) *The Behaviour of Domestic Animals* pp 295-329. Balliere Tindall: London, UK

Špinka M, Illmann G, de Jonge F, Andersson M, Schuurman T and Jensen P 2000 Dimensions of maternal behaviour characteristics in domestic and wild × domestic crossbred sows. *Applied Animal Behaviour Science 70:* 99-114

Wechsler B and Hegglin D 1997 Individual difference in the behaviour of sows at the nest-site and crushing of piglets. *Applied Animal Behaviour Science 51:* 39-49