THE HUMAN-ANIMAL RELATIONSHIP, ITS IMPLICATIONS FOR PIG WELFARE AND PRODUCTIVITY AND TRAINING STRATEGIES TO SAFEGUARD PIG WELFARE

G.J. Coleman and P.H Hemsworth
Animal Welfare Science Centre,
University of Melbourne, Parkville,
Victoria 3010, Australia.

Email: Grahame.Coleman@unimelb.edu.au

Introduction

In pig production, frequent interactions occur between humans and animals. The principle that supervising and managing animals affects farm animal welfare is widely recognized within the livestock industries. However, some aspects of the way in which the stockperson affects animal welfare, both directly and indirectly, are probably not fully appreciated. Although the duration of contact between pigs and their caretakers may be short, there is evidence that these interactions can significantly affect pig welfare and productivity. Further, together with the opportunity to perform their tasks well, stockpeople require a range of well-developed husbandry skills and knowledge to effectively care for and manage farm animals.

The results of research indicate a number of pathways whereby human-animal interactions may influence pig productivity and welfare. One of these pathways involves a sequential relationship between human attitude and behaviour and animal fear, stress and productivity, and there are published data which strongly support these relationships. The aim of this paper is to briefly review this research and to discuss training strategies to improve these relationships leading to improved welfare and productivity.

Human-animal interactions

The background research that led to an interest in the human factors that influence pig-human interactions began with the observation that, on Dutch farms where genetics, herd size, nutrition, housing systems and geographical and climatic conditions were similar, there was variation between farms in pig productivity (Hemsworth, Brand and Willems, 1981a). The fact that fear of humans was negatively

associated with reproductive performance suggested that human factors might be responsible for these differences.

This raises the question of what these human factors might be. Careful observation of animals to identify problems is considered an essential part of good stockmanship. Stockpeople must also interact with animals when they inspect equipment such as feeders and waterers in the animals' pens. As a result of these inspections, animals interact with humans hundreds of times during their lifetime. Although these interactions do not necessarily involve tactile contact with the animals, some of these interactions are potentially stressful. For example, studies with pigs and poultry have shown that visual contact with humans can indeed affect fear of humans (Jones, 1993; Hemsworth *et al.*, 1986, Barnett *et al.*, 1994). Further, in pig production, breeding animals are frequently moved and thus there is the opportunity for intense interaction, often involving tactile contact. The effects of these tactile interactions will be discussed in detail later in this paper. Handling may also be stressful for animals if the handling facilities are poorly designed or incorrectly utilised. Also, there are times when animals must be restrained and subjected to essential management or health procedures. These procedures are generally imposed infrequently and briefly and include vaccination, castration, ear tagging, tail-docking, teeth clipping and blood sampling. The effects that these procedures have on the human-animal relationship relates to both the aversiveness of the procedure and the association of people with the aversiveness of the procedure. Rewarding experiences, such as provision of a preferred feed or even positive handling, around the time of the procedure may ameliorate the aversiveness of the procedure (Hemsworth *et al.*, 1996b).

Fear of humans and the reproductive performance of commercial pigs.

In research similar to the Hemsworth *et al.* (1981a) study, Hemsworth *et al.* (1989) found a significant relationship fear of humans and reproductive performance of sows. As found in the Dutch study, reproductive performance was low at farms in which pigs were highly fearful of humans. In this second study, farms varied substantially in terms of size, housing systems, genetics, nutrition and locality and yet a significant fear-productivity relationship was found. Variation in fear of humans was found to account for about 20% of the variation in reproductive performance across the study farms, indicating that fear of humans is a major factor associated with the reproductive performance of commercial pigs. The magnitude of the associations between fear and productivity were remarkably similar in these two on-farm studies. The correlation coefficients, based on farm averages, between time to approach within 0.5m of the experimenter in a standard test and farrowing rate were -0.55 and -0.54, $P<0.05$ respectively (Hemsworth *et al.*, 1981b, 1989).

Effects of human behaviour on the productivity and welfare of pigs.

Research has been conducted on the effects of handling on the behaviour, stress physiology and productivity of pigs and this research indicates that human-animal interactions adversely affect the productivity and welfare of the animal. Commercial pigs may be fearful of humans (Hemsworth and Barnett, 1987) and research on

experimental pigs has shown that aversive handling treatments, which result in high levels of fear of humans by pigs, may markedly reduce the growth and reproductive performance of pigs (Gonyou *et al.*, 1986; Hemsworth *et al.*, 1981b, Hemsworth and Barnett, 1991).

Seabrook and Bartle (1992) also reported negative effects of aversive handling, but Paterson and Pearce (1989, 1992) and Pearce *et al.* (1989) found no effects of regular aversive handling on the growth performance of young pigs. There is no obvious explanation for these latter results, however differences between studies in the nature, amount and imposition of handling treatments may be responsible for the inconsistent results. For example, a behavioural response of animals to an apparently aversive stimulus (e.g. withdrawal to aversive handling by humans) in some situations may be an effective strategy to enable the animals to cope with this stimulus without having to resort to any long-term physiological adjustment. Furthermore, it is possible that because a stimulus is predictable, the aversiveness of the stimulus is diminished. Nevertheless, there is a general finding that aversive handling leads to increased fear levels in pigs and that this is often associated with decreased pig productivity.

Fear of humans and animal welfare

While fear has implications for pig productivity, it is also important to recognize the implications of fear of humans for the welfare of farm animals. Fear is generally considered an undesirable emotional state of suffering in both humans and animals (Jones and Waddington, 1992) and indeed one of the key recommendations proposed to the United Kingdom Parliament by the Brambell Committee in 1965 (Brambell *et al.*, 1965) was that intensive-housed livestock should be free from fear. Research reviewed by Hemsworth and Coleman (2011) and later in this paper has shown that farm animals that are both highly fearful of humans and in regular contact with humans may experience not only an acute stress response in the presence of humans but also a chronic stress response that is evident even in the absence of humans. For example, handling treatments that resulted in high fear levels in pigs resulted in not only an acute stress response in the presence of humans but also a chronic stress response measured on the basis of a sustained elevation in the basal concentrations of cortisol in isolation of humans (see Hemsworth and Coleman, 2011). Thus in addition to the concern about animals experiencing an undesirable emotion state such as fear, it is also ethically unacceptable to have animals that are chronically stressed. Furthermore, fearful animals are more likely to sustain injuries trying to avoid humans during routine inspections and handling. Chronic stress may also result in immunosuppression, which in turn may have serious consequences on the health of the animals.

Human factors regulating fear of humans by pigs.

Consistent findings of negative correlations between fear of humans, assessed on the basis of the behavioural response to humans, and the productivity of pigs have stimulated research to identify behaviours used by stockpeople associated with these fear responses. Coleman *et al.* (1998) and Hemsworth *et al.* (1989) found that the use of negative tactile behaviours by stockpeople, such as slaps and hits, was positively correlated with avoidance of humans by breeding sows. Further, research in the Australian pig industry has shown strong correlations between the attitude and the behaviour of the stockperson and the level of fear of humans and reproductive performance of commercial pigs (Hemsworth *et al.*, 1989). In general, stockpeople with a good attitude towards handling pigs exhibited less negative or aversive behaviours towards pigs. Furthermore, pigs under the control of stockpeople with a good attitude were less fearful of humans and the reproductive performance of these pigs was higher than that of pigs which were more fearful of humans. In contrast, a poor attitude by stockpeople was associated with a high proportion of negative behaviours, which in turn was associated with increased fear and reduced reproductive performance in pigs.

These negative or aversive behaviours by stockpeople, which were shown to increase the pig's fear of humans, included hits, slaps and kicks, while the positive behaviours, which were shown to decrease the pig's fear of humans, included pats, strokes, rubs and the hand of the stockperson resting on the back of the animal. High levels of fear of humans were best predicted at commercial farms when the classification of negative behaviours included not only forceful kicks, hits, slaps and pushes, but also the less intuitively obvious negative behaviours such as moderate slaps, prods and pushes. This is an important finding in that it indicates that moderate negative behaviours, together with forceful negative behaviours, by stockpeople play a major role in regulating the pigs' fear of humans, as well as indicating the sensitivity of pigs to human behaviour. In summary, the proportion of these negative interactions (both forceful and mild negative behaviours) to the total physical interactions (negative and positive interactions) by the stockperson was found to determine the commercial pig's fear of humans (Hemsworth *et al.*, 1989).

The identification of those attributes of human behaviour, which affect the performance and welfare of farm animals and also the origins of those attributes, is obviously important. Because a stockperson's behaviour towards animals is largely under his/her control, this behaviour is strongly influenced by the attitudes that the stockperson holds about the animals. The theories that provide a framework for understanding the relationships between attitudes and behaviour are the Theory of Reasoned Action (Ajzen and Fishbein, 1980) and the later revision, the Theory of Planned Behaviour (Ajzen, 1991). The former theory proposed that intention to perform a certain behaviour is determined by attitudes to the behaviours and beliefs about others' expectations of them regarding the behaviour. The Theory of Planned behaviour was directed to the prediction of actual behaviour rather than intention, and added a new component, control beliefs. These beliefs assessed the extent to which a person believes that they have control over their ability to carry out the behaviours. These attitudes and consequent behaviours predominantly affect the animal's fear of

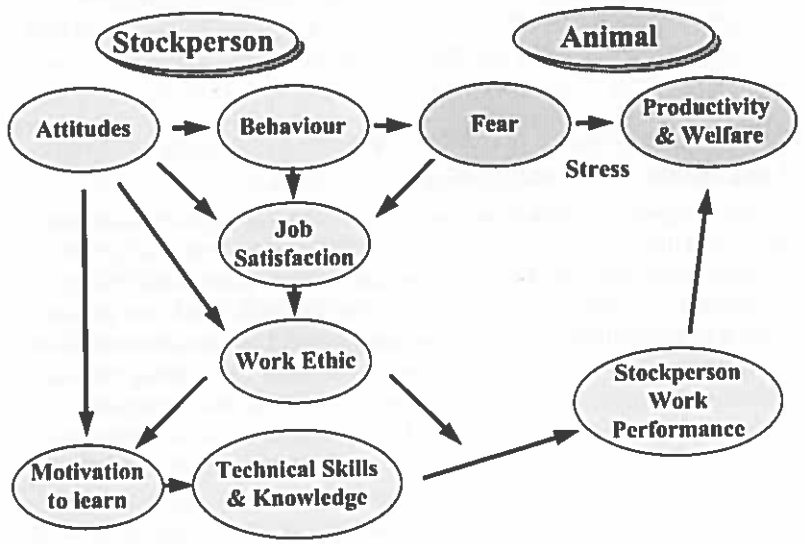
humans which, in turn, affects the animal's performance and welfare. Because attitudes are learned, it is possible to change them. This is important, because changing the relevant stockperson attitudes provides a way of reducing fear in pigs leading, in turn, to improved welfare and productivity.

Other pathways by which the attitudinal profile of the stockperson may affect pig productivity and welfare.

Some authors have highlighted the importance of other stockperson characteristics such as empathy and personality variables (English, 1991; Seabrook, 1972a, 1972b, 1994). For example, Seabrook (1972a, 1972b) reported that a stockperson's personality was related to behaviour of the cows and milk yield of the herd: In 28 one-person herds, the highest-yielding herds were those where the stockpeople were introverted and confident and where the cows were most willing to enter the milking parlour and were less restless in the presence of the stockperson. However, the strongest predictors of the stockperson's behaviour have been found to be the stockperson's attitudes (Hemsworth *et al.*, 1989; 1994; Coleman *et al.*, 1998). Variables, such as confidence, introversion and empathy, may modulate the manner in which a stockperson's beliefs, behaviour and their consequences are established (Ajzen and Fishbein, 1980). Nevertheless, it has yet to be determined whether such variables would independently contribute to fear, welfare and productivity in farm animals or would act by modulating attitudes and beliefs as Ajzen and Fishbein (1980) have proposed. For example, personality may affect the way in which the stockperson responds to problem situations with animals, and may therefore modify the stockperson's beliefs about the animals.

It is possible that the stockperson's attitudes may influence other important human factors affecting the work performance of the stockperson. For example, it is possible that the attitude of the stockperson towards the animal may affect such characteristics as work ethic, motivation to learn new skills and knowledge about the animal and job satisfaction, which in turn may affect work performance. For example, if the stockperson's attitude towards the farm animal is poor, the stockperson's commitment to the surveillance of and the attendance to production and welfare problems facing the animal is likely to deteriorate. Thus, the attitudinal and behavioural profiles of the stockperson may have marked effects on animal productivity and welfare both via fear of humans by the animal and via work performance of the stockperson. In fact, research in the Australian pig industry (Coleman *et al.*, 1998) has indicated clear relationships between the stockperson's attitudes and job-related variables. In particular, the willingness of stockpeople to attend training courses in their own time was correlated with attitudes. Job enjoyment and opinions about working conditions showed a similar relationship with attitudes. Thus, the stockperson's attitudes may indeed be related to aspects of work apart from handling of pigs and these possible interrelationships are depicted in Figure 1. Therefore, in order to manipulate these human-animal relationships, it is obviously important to improve our understanding of the interrelationships between the stockperson's attitude, stockperson's behaviour and other variables including job-related variables.

Figure 1. Interrelationships between stockperson attitudes and other job-related characteristics.



Training programme to improve the attitudinal and behavioural profiles of stockpeople.

It is important to realise that training stockpeople to improve human-animal interactions involves behaviour modification rather than mere skills training. Most of the training that is relevant to livestock farming involves the transfer of new technical knowledge to the farm. Such a transfer may relate to new knowledge about nutrition, housing, husbandry, etc. However, when this new knowledge involves stockpeople learning to behave in different ways, transferring this knowledge requires that they change the beliefs that underpin their behaviour and then change the behaviour itself. This task of changing behaviour is generally a greater challenge than knowledge acquisition.

The findings reported so far provide an understanding of the ways in which stockpeople impact on the welfare and productivity of pigs under their care. Because the key human factor is attitudes to pigs and working with pigs, there is an opportunity to change these attitudes to produce lasting improvements in stockperson behaviour. An important psychological principle that can be applied in any attitude and behaviour change program is cognitive-behavioural reciprocity. This derives from Bandura's (2001) social cognitive theory based on the idea that people learn by observing others, act accordingly, reflect on the outcomes and adapt their cognitions and behaviours as a result. Behavioural modification techniques, which have been successfully used to modify human behaviour in non-agricultural areas, involve retraining people in terms of their behaviour as well as changing their attitudes and beliefs. There is substantial evidence to show that training that uses the Theory of Planned Behaviour to target relevant attitudes and behaviour is effective (Steinmetz, *et al.*, 2016). Because of the reciprocal relationship between the attitudes and behaviour of the stockperson and the equally strong relationships between the stockperson's attitude and behaviour on the one hand and the fear and reproductive performance of pigs (Hemsworth *et al.*, 1989), any behavioural modification procedure needs to target both the attitudes and behaviour of stockpeople.

Hemsworth *et al.* (1994) and Coleman *et al.* (2000) applied these principles by studying whether or not it is possible to improve the attitudinal and behavioural profiles of stockpeople towards pigs and whether any such changes reduced the level of fear and productivity of their pigs. The first study was carried out at 25 commercial farms and the second at a large commercial farm with five separate breeding units. Farms or units were allocated to either a modification treatment, in which a training programme, designed to improve the attitude and behaviour of stockpeople towards breeding pigs, was introduced or to a Control treatment, where no training was introduced. Details of this cognitive-behavioural intervention programme, which forms the basis of this computerised package, are discussed later in this paper. It was found in the Hemsworth *et al.* (1994) study that the training programme resulted in substantial improvements in the attitude and behaviour of stockpeople and a marked reduction in the level of fear of humans by pigs compared to Control farms. Furthermore, there was a 7% improvement in the reproductive performance of the pigs at the Modification farms compared to the Control farms. The results from this study are summarised in Table 1.

Table 1. The effects of cognitive-behavioural training on stockperson and sow variables (n=25 farms)

	Change following Training (relative to Control)	P value
Stockperson attitudes		
+ve Beliefs about 'petting'	15% ↑	0.05
Stockperson behaviour		
-ve (%)	31% ↓	0.01
Sow behaviour		
Time near experimenter (s)	40% ↑	0.05
Sow productivity		
Piglets/sow/year	7% ↑	0.10

From Hemsworth *et al.*, (1994)

In the second study (Coleman *et al.*, 2000), conducted at a large commercial piggery, similar results were obtained (Table 2). Therefore these results, together with the results on the adverse effects of increasing the level of fear in experimental pigs, indicate that fear of humans by pigs may be an integral component in the pathway(s) in which human factors, such as attitude and behaviour, affect animal productivity and welfare.

Table 2. The effects of cognitive-behavioural training on stockperson and sow variables in a large commercial farm.

Variables	Treatment		LSD
	Control	Interv.	(P=0.05)
Stockperson attitude			
"Petting" subscale	19.6[b]	23.6[a]	3.37
"Effort" subscale	38.2[b]	42.1[a]	4.07
Stockperson behaviour			
-ve behaviour (%)	77.1[y]	47.3[z]	13.97
Forceful -ve			
behaviour (%)	12.2[y]	2.4[z]	7.47

There is some limited evidence of attitude-behaviour relationships in stockpeople handling pigs prior to slaughter at abattoirs. Coleman *et al.*, (2003) found that stockpeople who felt under pressure to keep up with the killing chain, and who believed that it is important to move the pigs as quickly as possible, tended to be less likely to use the electric goad when it was turned off, that is, as a relatively benign aid to move animals, than did those who believed it is not important to move the pigs quickly. Furthermore, the belief that the way in which pigs are handled when waiting to be slaughtered does not affect their behaviour was associated with high use of the electric goad when it was turned on, that is, as a deliberate aversive stimulus to the pigs. Furthermore, there is evidence that the increased use of negative interactions such as prods with an electric goad was associated with prods with increases post-slaughter in plasma lactate concentrations and ham lightness (Hemsworth *et al.*, 2002). In an unpublished report, Hemsworth and Coleman (2002) found that the number of the highly negative behaviours (mainly electric prods) used in moving pigs from the forcing pen to the stunning area significantly decreased following training using a similar a cognitive behavioural training program as that used by Hemsworth *et al.*, (1994) and Coleman *et al.*, (2000).

Prohand: a multimedia training program

The intervention or training procedure that has been successfully used to modify the attitude and behaviour of stockpeople in the pig industry has been incorporated into the training program, called 'ProHand' (abbreviation for professional handling). Prohand is a multimedia training program that is capable of being used on a local computer or on-line. Multimedia training has been found to be the most effective method for delivering training to pig stockpeople (Coleman *et al.*, 2001). It comprises several components:

1. **Information used to target the beliefs and attitudes of stockpeople.**

   This component of the training procedure aimed to improve the stockperson's attitude towards pigs, particularly attitude towards handling pigs, by providing stockpeople with specific factual information that may affect their beliefs about pigs. Some of the information presented in this component included the ease with which pigs can and should be handled, the sensitivity of pigs to the range of

negative behaviours used by stockpeople (and their sensitivity to stressors in general), and the adverse effects of these negative behaviours on the pigs' fear of humans, which in turn, through a stress response, can interfere with the pigs' productivity, welfare and ease of handling. In addition, information was provided on how beliefs, attitudes and habits are formed and recommendations were provided on how changes in the attitude and behaviour of stockpeople can be achieved and maintained in commercial settings.

2. **Information used to target the behaviour of stockpeople.**

   This component of the training procedure aimed to educate stockpeople on how to behave towards pigs in order to minimise the pigs' fear of humans. Some of the information presented in this component included the results of research on commercial pigs showing

   2.1. High levels of fear of humans were best predicted when the classification of negative behaviours included forceful kicks, hits and use of battery-operated prodders and also the less intuitively obvious behaviours such as moderate slaps, prods and kicks.

   2.2. Fear of humans in pigs can be reduced by decreasing the number of negative behaviours used by stockpeople when handling pigs and replacing these with positive behaviours .

   2.3. The situation when it is appropriate for stockpeople to use negative behaviours and those situations when it is appropriate for stockpeople to use positive behaviours.

   2.4. Recognising fear in pigs.

   2.5. The behavioural profiles of good and poor handlers in the industry.

In the study by Hemsworth *et al.* (1994), the behavioural modification procedure used direct teaching techniques to show actual relationships between stockperson attitude, stockperson behaviour, pig behaviour and pig performance. These relationships were demonstrated in the training program with the use of video footage of stockpeople and pigs, together with discussion of recent findings. Furthermore, recommendations on maintaining attitudinal and behavioural change, particularly in the long term and when under pressure, were provided. These techniques were augmented by additional audio-visual material that was used at a later date by stockpeople for revision, self-testing and self-help.

An evaluation of the perceived benefits of Prohand was conducted by Pope *et al.*, (2010). Prohand was delivered to 190 pig stockpeople and 81 participants completed a questionnaire to assess their opinions on the value of the program (Table 3). The majority of respondents strongly believed they had improved their routine pig handling techniques and reduced the incidence of routine "negative" handling since completing ProHand training. A smaller majority of respondents believed their pigs were easier to work with and their working conditions had improved ("*Less physical effort is now required to complete pig handling tasks*") since adoption of ProHand pig handling principles.

Table 3: t tests of participant feedback. Questions were scored on a 5-point scale. The scoring direction is indicated in the table. Scores were compared against 3 as the neutral point.

	t	df	Sig. 2-tailed)	Mean Difference
Improved handling techniques from Prohand - High score positive	14.75	80.00	.00	1.13
Reduced negative handling following prohand - high score positive	14.58	80.00	.00	1.12
Other staff don't change - high score agree	-1.39	79.00	.17	-.17
There was nothing wrong to begin with - high score agree	-.56	78.00	.58	-.06
Staffing, time issues - high score disagree agree	-6.27	80.00	.00	-.76
Improved working conditions - high score agree	8.52	75.00	.00	.70
No benefits seen - high score agree	-4.25	77.00	.00	-.39
Working with pigs easier - high score agree	5.98	72.00	.00	.48
Our truck driver has said our pigs are easier to load and unload these days	.00	70.00	1.00	.00
We have less staff turnover on the farm now	-.86	76.00	.39	-.12

Conclusion

Human-animal interactions can have profound effects on the behaviour, productivity and welfare of commercial pigs. As a result of a chronic stress response, high levels of fear of humans can depress both the welfare and performance of pigs. Furthermore, in situations in which animals are fearful of humans and thus the attitude and behaviour of the stockperson towards the animals are likely to be negative, the stockperson's commitment to the surveillance of and the attendance to production and welfare issues can be questioned. Training procedures which target the attitude and behaviour of stockpeople currently offer considerable opportunity to improve both pig productivity and welfare.

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