“Impact of human-animal interactions on health & productivity of farm animals”

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The human-animal relationship

Farm animals can be frequently and intensively "handled" by humans and research has shown that these human-animal interactions can have **profound effects** on the behaviour and stress physiology of these animals.

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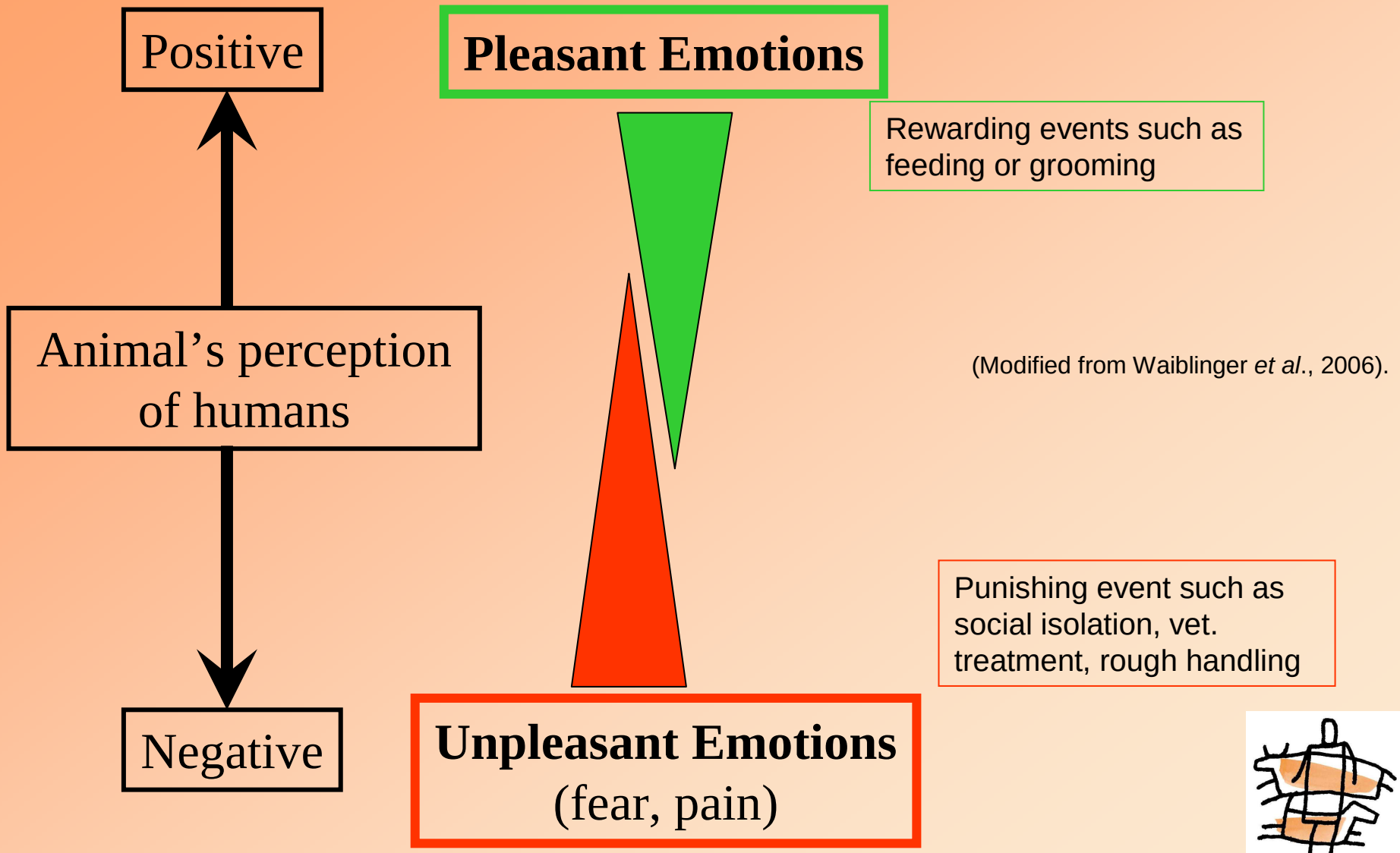
Emotional dimensions affecting the animal's response to humans



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Our research

Our research has focused on the **fear response** of farm animals to humans, one dimension of the animal's 'perception' of humans.

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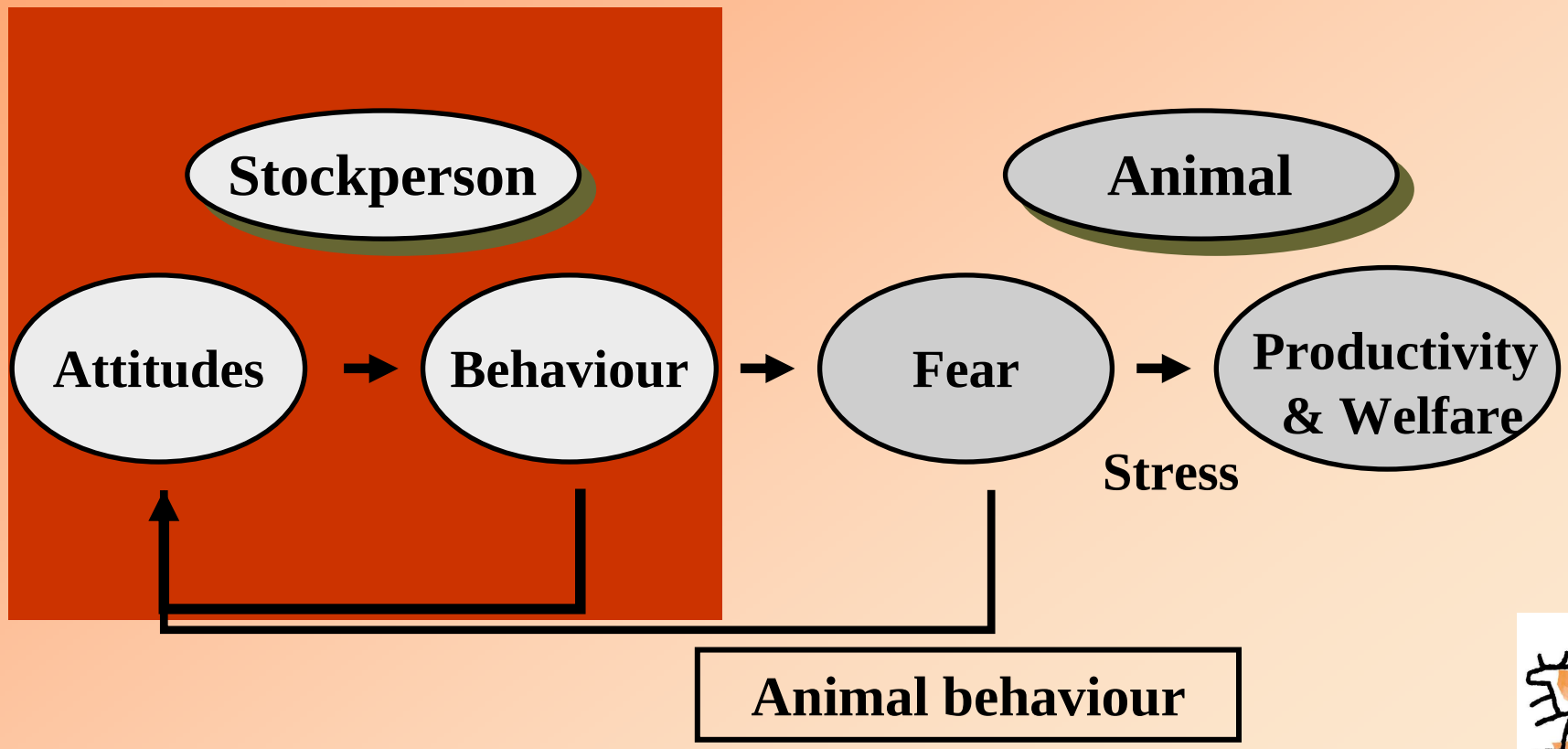
A model of human-animal interactions in the livestock industries



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Fear

- Is a powerful emotional state
- Is a normal, adaptive response, developed to protect the individual from injury
- It normally gives rise to defensive behaviour or escape and activation of the autonomic nervous system and the neuroendocrine system.

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Fear

- Fear of humans can be assessed on the basis of the behavioural response of the animal to an experimenter in a standard test.
- For example,
  - avoidance response to an approaching experimenter, or
  - approach behaviour to a stationary experimenter.

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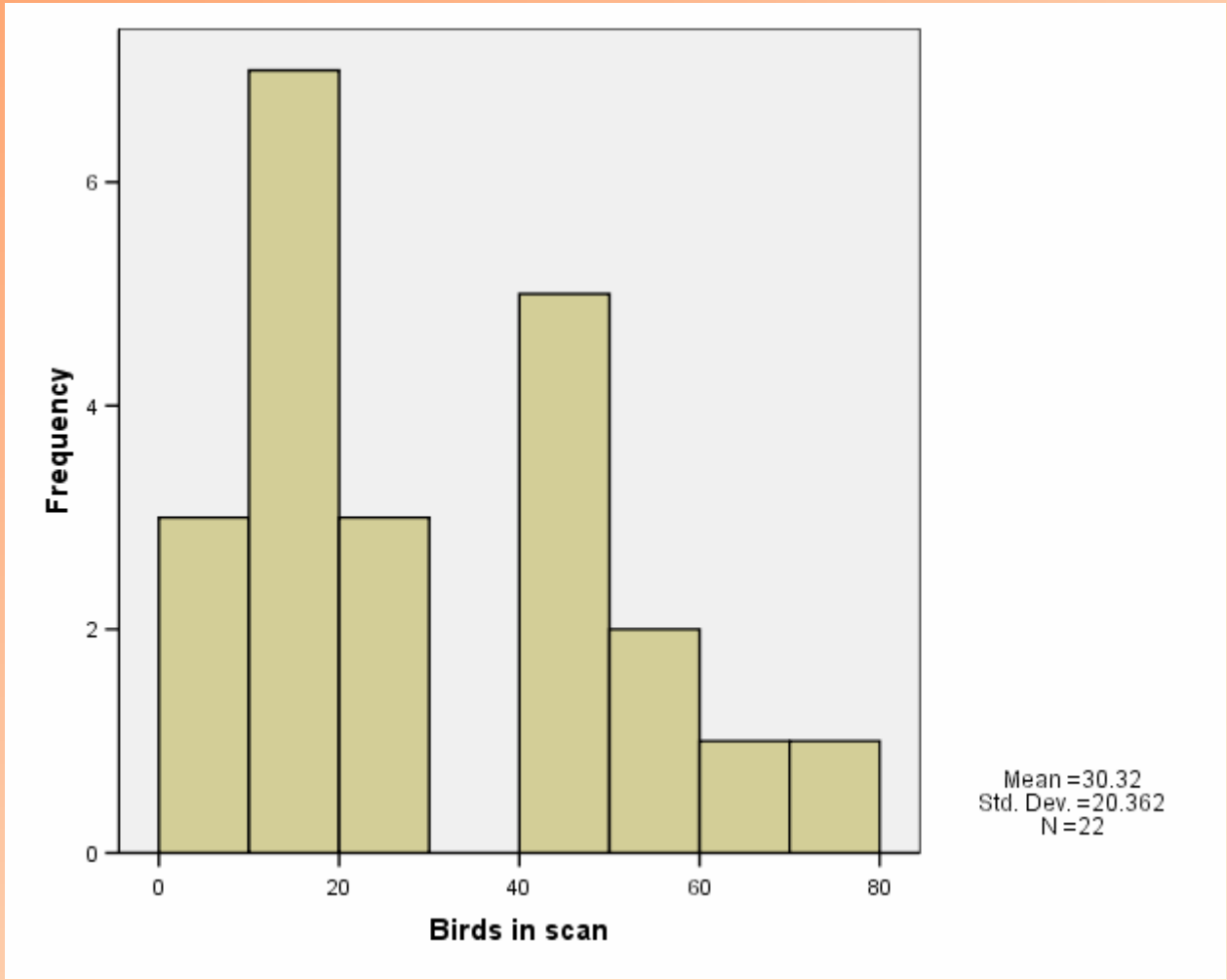
Distribution in fear responses in broiler chickens

Variable - number of birds within 0.5m of experimenter per observational scan



(From Hemsworth & Coleman, 1998)

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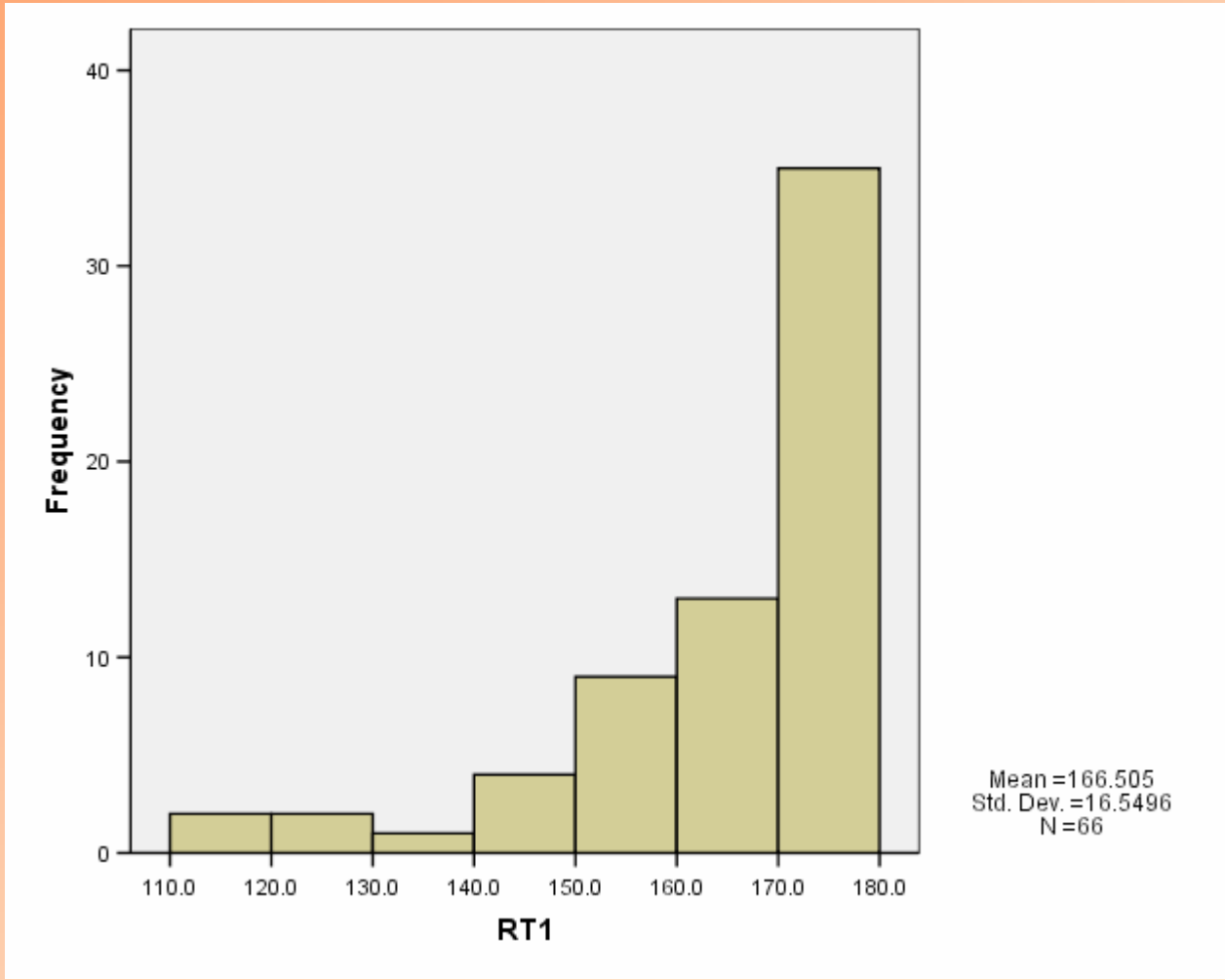
Distribution in fear responses in dairy cows

Variable - time to closely approach human (s)



(From Hemsworth *et al.*, 2000).

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Evidence of this model of the human-animal relationship in agriculture

This presentation will consider the following:

1. Animal fear and productivity relationships
2. Stockperson behaviour and animal fear relationships
3. Stockperson attitude and behaviour relationships
4. Opprtunities to improve human-animal relationships.

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1. Animal fear – productivity relationships

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Animal fear – productivity relationships

- Consistent negative relationships, based on farm averages, between **fear of human and productivity** found in studies in the dairy, pig and poultry industries.

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Correlations between fear of humans and animal productivity

		Fear & Productivity
Pigs		
	Hemsworth *et al* (1981b)	-0.51*
	Hemsworth *et al* (1989)	-0.55*
	Hemsworth *et al* (1994c)	-0.01
Dairy cows		
	Breuer *et al* (2000)	-0.46*
	Hemsworth *et al* (2000)	-0.27
Meat chickens		
	Hemsworth *et al* (1994a)	-0.57**
	Cransberg (1996)	-0.10
	Hemsworth *et al* (1996)	-0.39
Laying hens		
	Barnett *et al* (1992)	-0.58**

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Handling and productivity

- Handling studies, particularly on pigs, have consistently shown that handling treatments that elicit high levels of fear adversely affect animal productivity.
- A number of these handling studies implicate stress in the deleterious effects of aversive handling on animal productivity.

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Handling and productivity of pigs

Experiment	-ve handling	P value
Hemsworth et al. (1981)		
Growth rate	⇓	**0.05**
Gonyou et al. (1986)		
Growth rate	⇓	**0.05**
Hemsworth et al. (1986)		
Pregnancy rate	⇓	**0.05**
Hemsworth et al. (1987)		
Growth rate	⇓	**0.05**
Hemsworth & Barnett (1991)		
Growth rate	⇓	**NS**
Hemsworth et al. (1996)		
Growth rate	⇓	**0.05**

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Handling and the productivity & stress physiology of dairy cows

Variables	Handling	
	-ve	+ve
Milk yield (kg/day)	16.7[a]	18.0[b]
Flight distance (m)	4.74[b]	1.96[a]
Lameness (%)	48%[b]	6%[a]

From Breuer (2000)

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Animal fear & stress

- High levels of fear of humans can induce chronic stress
- This is likely to be the mechanism whereby fear reduces animal productivity.

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Handling and stress physiology of pigs

Experiment	-ve handling	P value
Hemsworth et al. (1981)		
Basal cortisol	⇑	**0.05**
Gonyou et al. (1986)		
Adrenal glands	⇑	**0.05**
Hemsworth et al. (1986)		
Basal cortisol	⇑	**0.05**
Hemsworth et al. (1987)		
Basal cortisol	⇑	**0.01**
Hemsworth & Barnett (1991)		
Basal cortsiol	⇑	**NS**
Hemsworth et al. (1996)		
Adrenal glands	⇑	**0.01**

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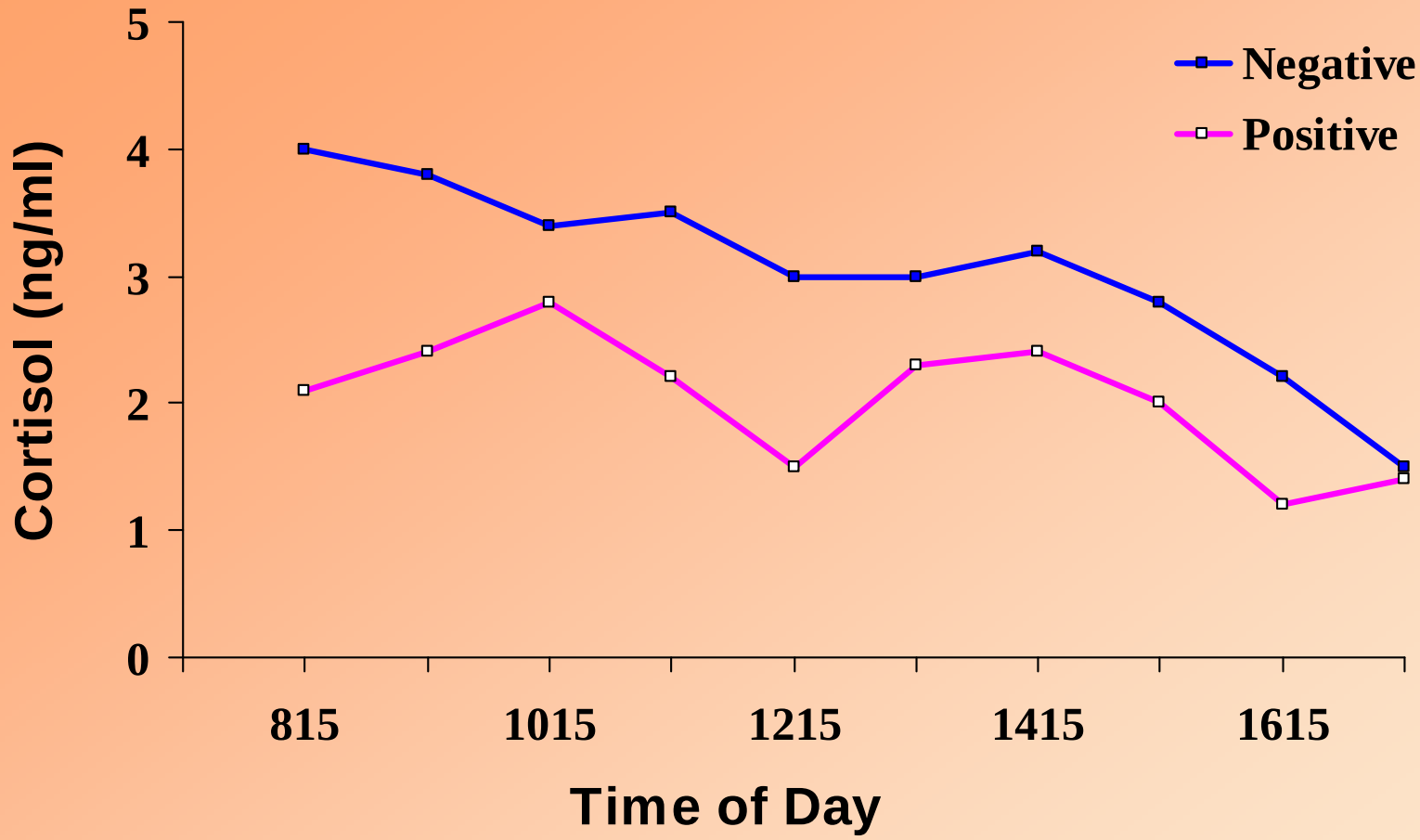

Basal plasma cortisol (free) concentrations of gilts handled positively or negatively (Hemsworth *et al.*, 1981)

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Handling, growth & stress physiology of growing pigs

Variables	Handling Treatment			
	+ve	Control	Inconsistent	-ve
Time to interact with human (s)	10 [a]	92 [b]	175 [c]	160 [c]
Growth rate (g/day)	455[b]	458[b]	420[ab]	404[b]
Basal cortisol (ng/ml)	1.6[x]	1.7[x]	2.6[y]	2.5[y]

From Hemsworth et al. (1987)

Handling, productivity, fear & stress physiology of laying hens

Variables	Handling treatments	
	Minimal	Additional
Times in front of cage (mean/bird)	1.22^{y}	2.12^{x}
Hen-day egg production (%)	83.1^{b}	89.4^{a}
Corticosterone concentration (nmol/l)	11.7^{b}	7.9^{a}

From Barnett et al. (1994)

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Animal fear, stress & health

- While there has been little research conducted on animal health, a limited number of studies indicate the potential impact of human-animal relationships on animal health.
- Furthermore, stress elicited by fear has implications for animal health because of the close relationship between stress and illness (Moberg, 2000).

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Handling, growth & health of chickens

Social environment	FCE	Antibody response*	
		HA line	LA line
Socialized	0.320[b]	8.4[c]	4.9[a]
Ignored	0.261[a]	7.7[b]	5.0[a]
Hassled	0.278[a]	7.0[a]	5.5[a]

From Gross and Siegel (1981)

FCE – weight gain/feed consumed
[#]air sac lesions
* antibody response to sheep RBC

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Handling, growth & health of chickens

Socialized at 1-8 wks	FCE	Response to *E coli* Lesions[#]	Deaths	Antibody titres*
No	0.240[a]	60[b]	31[b]	5.4[a]
Yes	0.298[b]	44[a]	6[a]	7.0[b]

From Gross and Siegel (1981)

FCE – weight gain/feed consumed
[#]air sac lesions in response to *E coli* challenge
* antibody response to canine RBC

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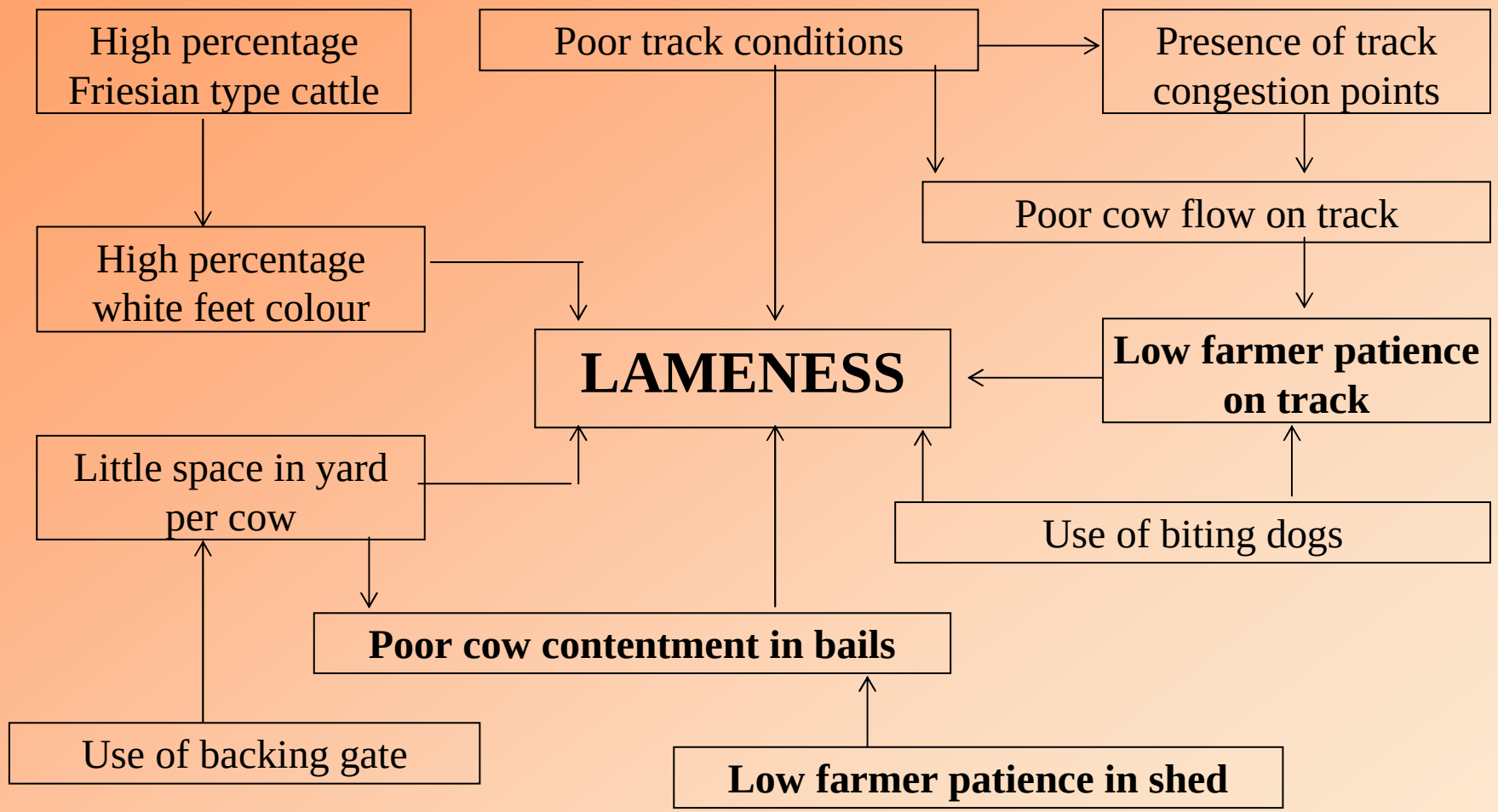

Fig. Management factors and lameness (Chesterton *et al*., 1989).

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Handling and the productivity & stress physiology of dairy cows

Variables	Handling	
	-ve	+ve
Flight distance (m)	4.74[b]	1.96[a]
Milk yield (kg/day)	16.7[a]	18.0[b]
Lameness (%)	48%[b]	6%[a]

From Breuer (2000)

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Handling, productivity & meat quality of veal calves

Variables	Handling		P value
	Control	+ve	
Growth rate (kg/day)	1.21	1.19	0.50
Calves with ulcers (%)	36.4[b]	0.0[a]	0.05
Glycogenic potential (µmol/g)	154.1[a]	172.6[c]	0.03

From Lensink *et al*. (2000)

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Handling, behaviour & stress physiology of calves

Variables	Stockperson Behaviour		P value
	+ve	-ve	
Incidents at:			
- unloading	0.60	0.67	0.60
- lairage	0.79[a]	1.15[b]	0.007
Heart rate (bpm) at:			
- unloading	185.6[a]	193.0[b]	0.03
- lairage (+ 5 min)	147.8[a]	149.2[b]	0.63

From Lensink *et al*. (2001a)

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Animal fear, stress & health

- In a study of the relationships between stockperson characteristics and the behaviour, health and productivity of veal calves, Lensink *et al*. (2001b) found that the behaviour of the stockperson was an important predictor of calf mortality.

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Fear, activation of the HPA axis and animal fitness:

The chronic activation of the HPA axis comes at a physiological cost such as:

- decreased metabolic efficiency (catabolic effects of ACTH and corticosteroids – eg gluconeogenesis),
- reduced reproductive performance,
- impaired immunity and
- morbidity and mortality.

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2. Stockperson behaviour- animal fear relationships

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Studying stockperson behaviour

Measure frequency of behaviour

- **–ve behaviour** - slaps, hits, shouting, fast speed of movement, unexpected movement, etc.

- **+ve behaviour** - pats, talking, hand resting on back of animal, slow and deliberate movement, etc.

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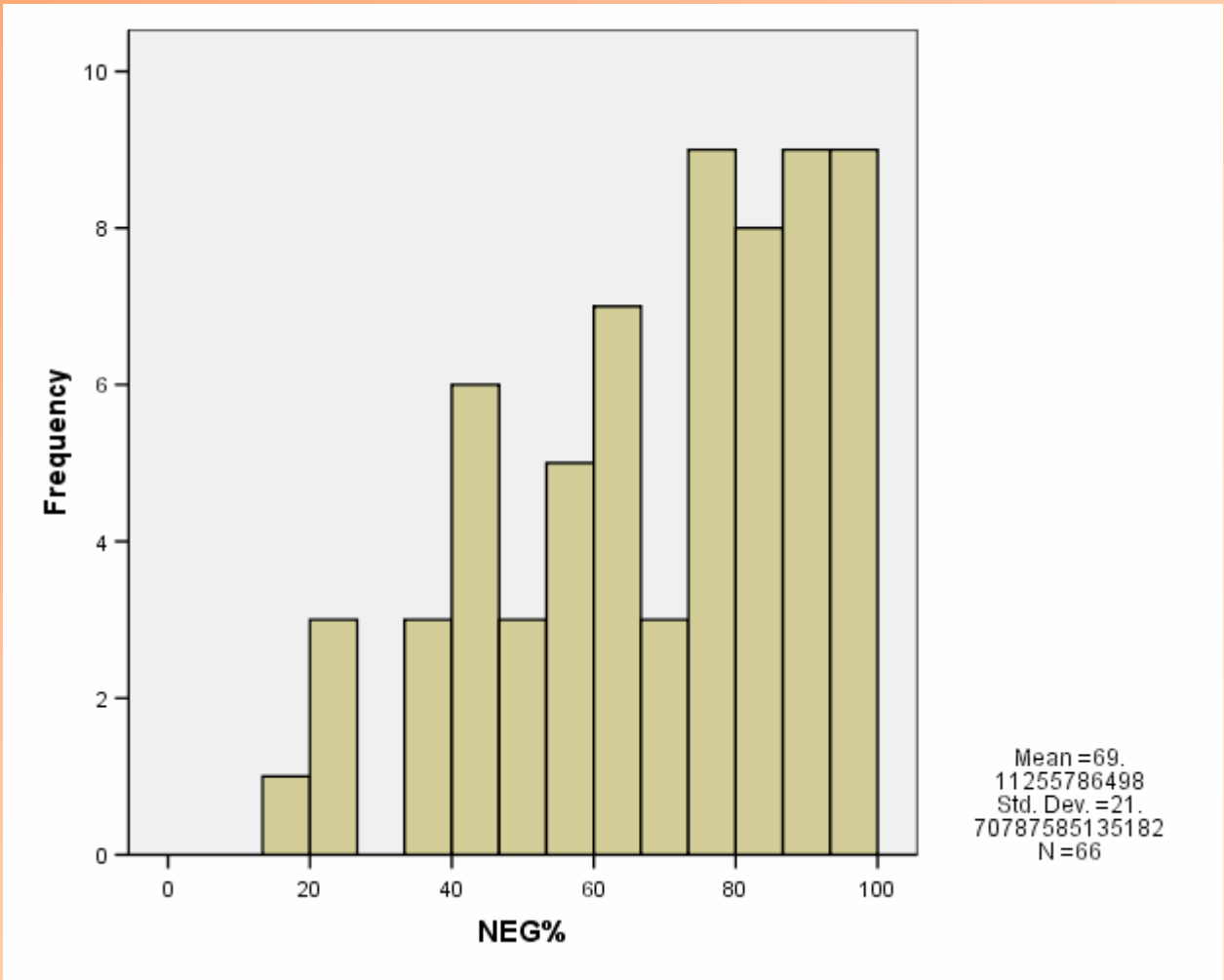
Distribution in stockperson behaviour

Variable is negative behaviour used in handling cows



(From Hemsworth *et al.*, 2000).

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Correlations between stockperson behaviour & fear of humans

	-ve Behaviour & Fear
Pigs	
Hemsworth et al (1989)	0.45*
Hemsworth et al (1994)	0.01
Coleman et al (2000)	0.40*
Dairy cows	
Breuer et al (2000)	0.31
Hemsworth et al (2000)	0.32**
Waiblinger et al (2002)	0.40**
Meat chickens	
Cransberg (1996)	0.43*
Hemsworth et al (1996)	0.32

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3. Stockperson attitude – behaviour relationships

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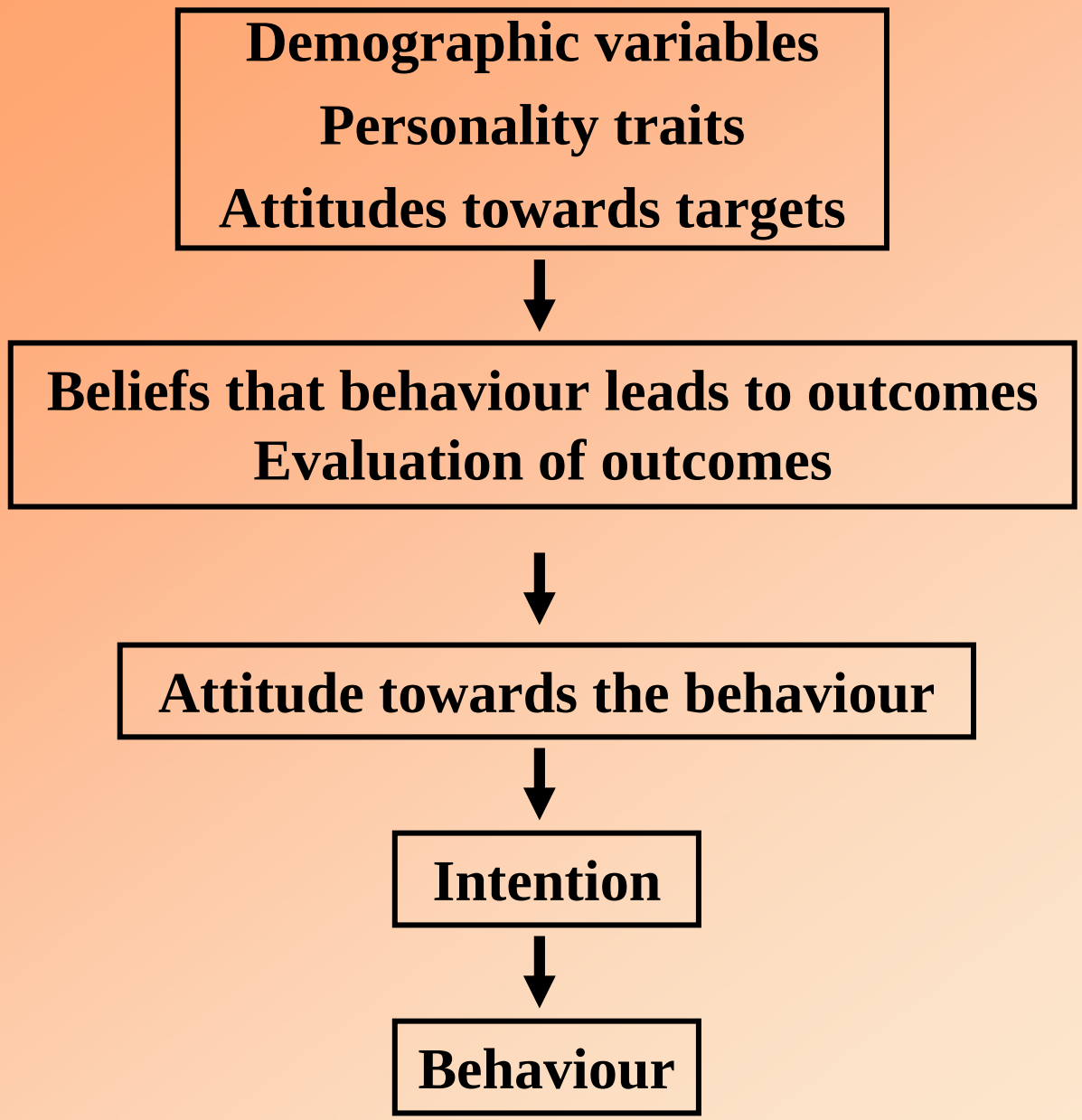

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Studying stockperson attitudes

Measure attitudes

- Attitude questionnaires were used to obtain information on the **behavioural beliefs** of stockpeople about interacting with their farm animals.

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Correlations between stockperson attitudes & behaviour

+ve Beliefs about Effort & -ve Behaviour

Pig industry

Hemsworth et al (1989)	-0.47*
Hemsworth et al (1994c)	-0.12
Coleman et al (1996)	-0.10

Dairy industry

Breuer et al (2000)	-0.50**
Hemsworth et al (2000)	-0.36*
Waiblinger et al. (2002)#	-0.50**

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Correlations between stockperson attitudes & behaviour

+ve Beliefs about Petting & -ve Behaviour

Pig industry	
Hemsworth et al (1989)	-0.61**
Hemsworth et al (1994c)	-0.55**
Coleman et al (1996)	-0.20
Dairy industry	
Breuer et al (2000)	-0.50**
Hemsworth et al (2000)	-0.47**
Waiblinger et al. (2002)	-0.35

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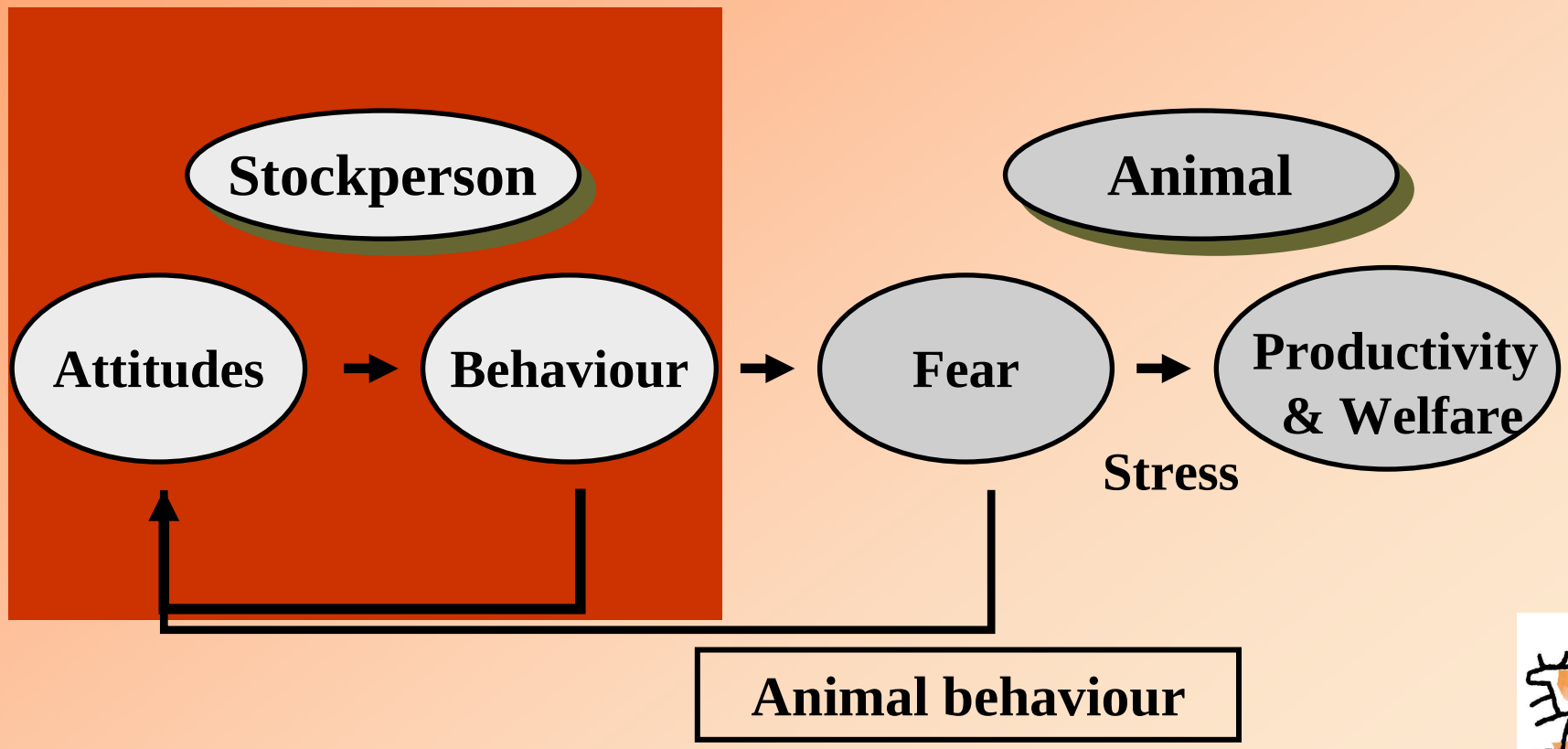
A model of human-animal interactions in the livestock industries



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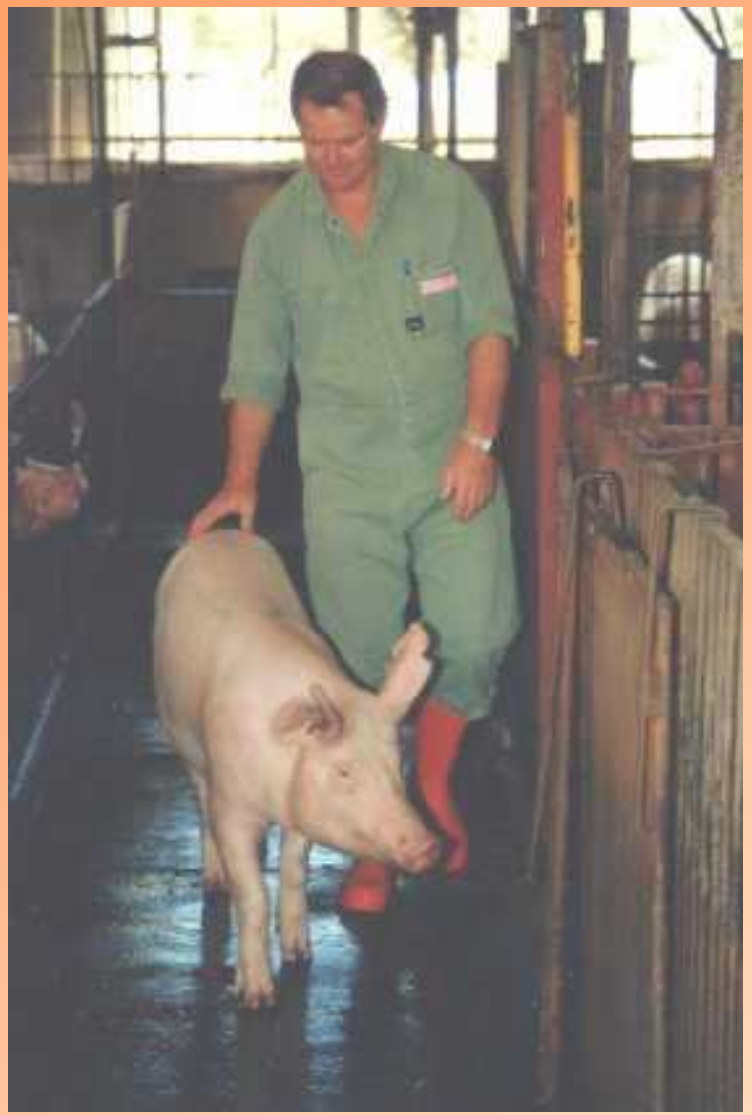

Conclusion

- **Understanding stockperson behaviour and the key attitudes** underpinning these, appears to be the key to manipulating these human-animal interactions to improve animal welfare, health and productivity.
- Some of these attitudes and behaviours in commercial situations may not be intuitively obvious.

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4. Opportunities to improve human-animal relationships

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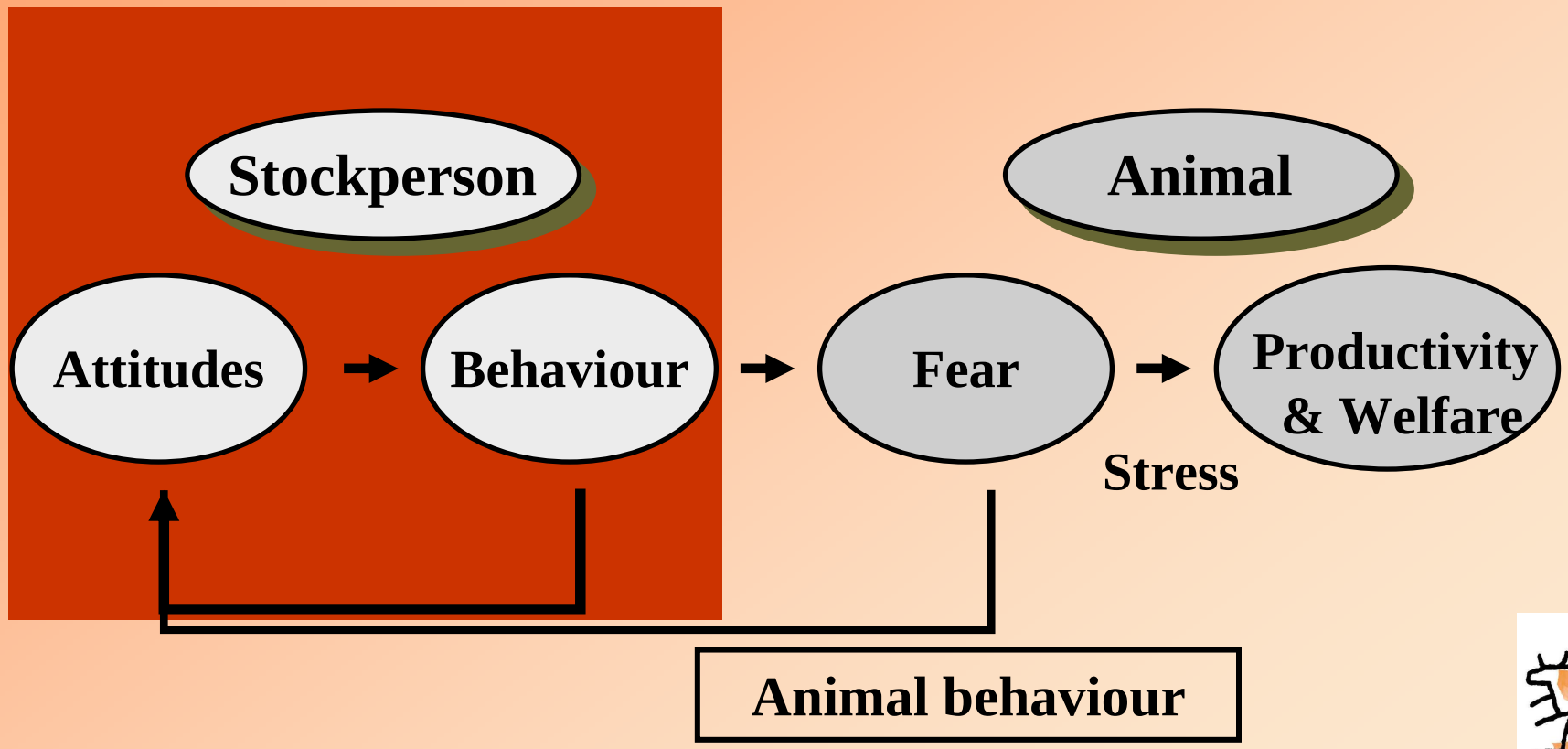

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Opportunities to improve human-animal interactions

The sequential relationships between stockperson attitude and behaviour and animal fear, welfare and productivity demonstrate the opportunities to improve animal welfare and productivity through appropriate:

- **training stockpeople**
- **selection of stockpeople.**

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Cognitive-behavioural training

- To change the behaviour of stockpeople towards farm animals ultimately requires:
  - targeting the **beliefs** that underlie the behaviour,
  - targeting the **behaviour** in question, and
- then maintaining these changed beliefs and behaviour.

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Intervention studies – establishing causality and validating training in the livestock industries

Two treatments imposed:

- **Intervention -** cognitive-behavioural intervention procedure, targeting key stockperson attitudes and behaviour
- **Control -** no intervention was attempted.

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Measurements

- **Stockperson attitudes -** behavioural beliefs about handling animals.
- **Stockperson behaviours -** number and percentage of negative tactile behaviours.
- **Fear of humans -** behavioural response to humans.
- **Animal productivity**.

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Analysis of Covariance

Variables	Treatments		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^{x}	13.97
Forceful -ve behaviour (%)	12.2^{y}	2.4^{x}	7.47

From Hemsworth et al. (2002)

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Analysis of Covariance

Variables	Treatments		LSD
	Control	Interv.	(P=0.05)
Cow behaviour			
Flight distance (m)	4.5^{b}	4.2^{a}	0.33

From Hemsworth et al. (2002)

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Analysis of Covariance

Variable	Means		
	Control	Interv.	P value
Milk yield (l/cow/mo)	551	580	0.02
Protein (kg/cow/mo)	17.7	18.5	0.03
Fat (kg/cow/mo)	22.8	23.8	0.04
Milk cell count (,000)	241	224	0.38

Hemsworth et al. (2002)

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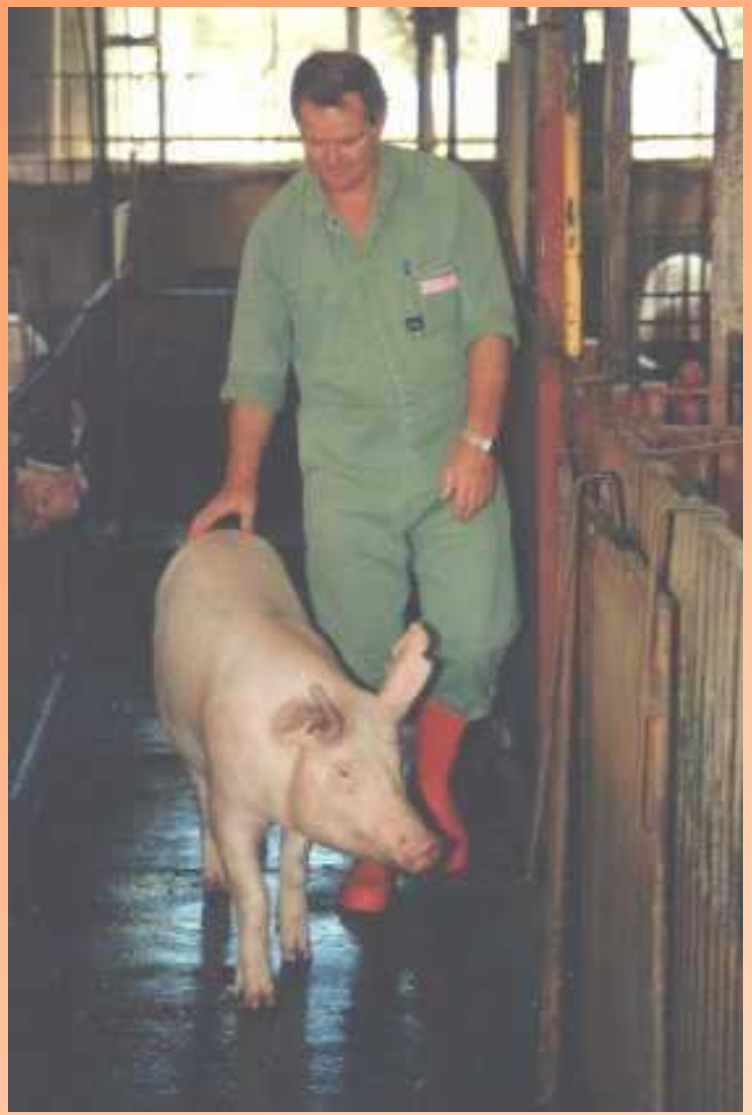

Conclusion

- **Understanding stockperson behaviour and the key attitudes** underpinning these, may provide opportunities to improve human-animal interactions.
- Indeed, research has shown that targeting these key attitudes and behaviour may improve animal welfare, health and productivity in those situations in which animal fear imposes severe limits.

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Training programs available

- Pig stockpeople
- Dairy stockpeople
- Pig stockpeople at abattoirs

- Transport drivers
- Sheep and cattle stockpeople at abattoirs

- EU 6th Framework Sub-project 3 “Minimising Handling Stress”: Prototype training packages for cattle, pigs & laying hens.

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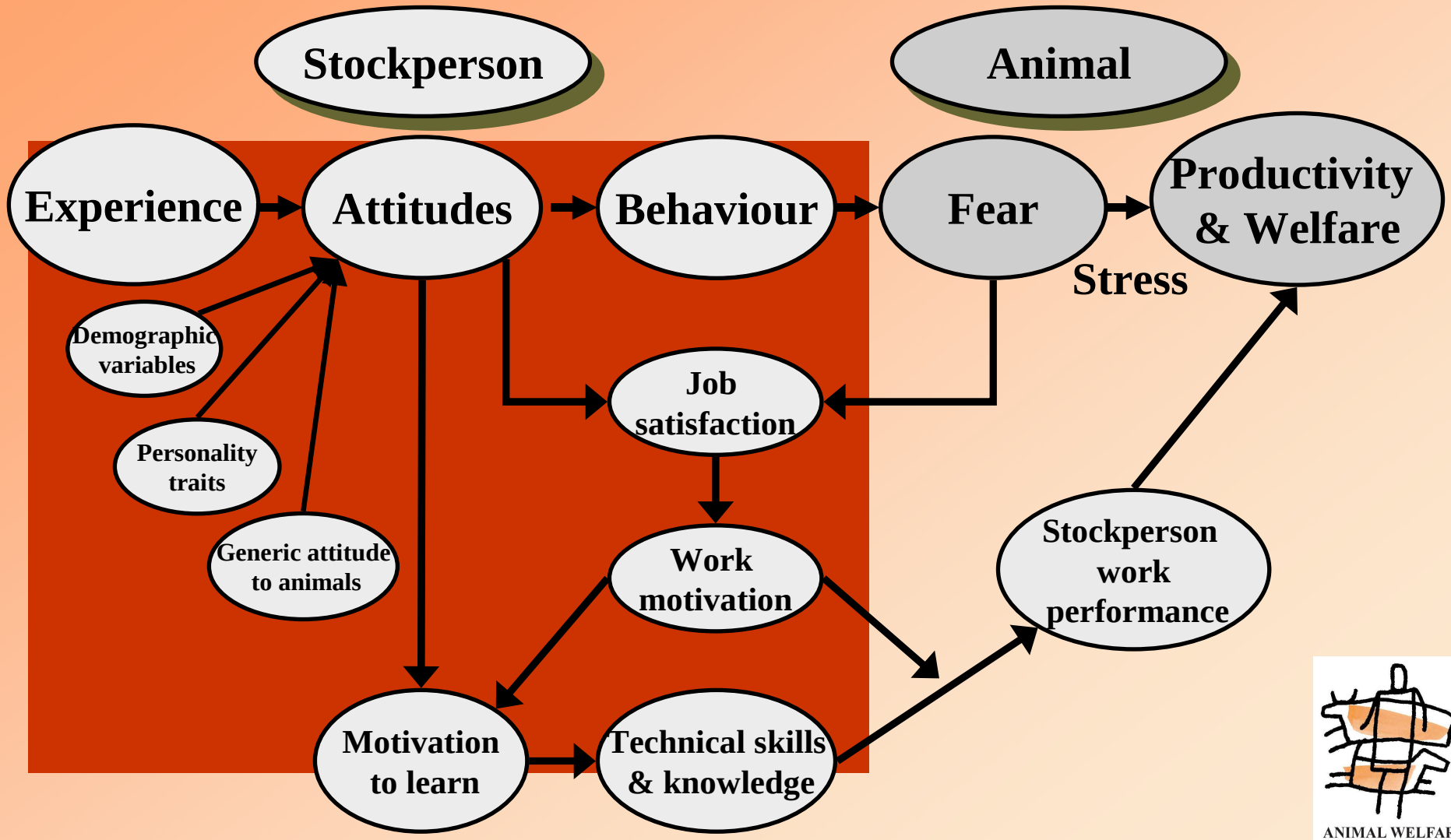
A model of human-animal interactions in the livestock industries



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Thank you!

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