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Associations between sheep farmer attitudes, beliefs, emotions and personality, and their barriers to uptake of best practice: The example of footrot

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ABSTRACT

There is interest in understanding how farmers' behaviour influences their management of livestock. We extend the theory of planned behaviour with farmers attitudes, beliefs, emotions and personality to investigate how these are associated with management of livestock disease using the example of footrot (FR) in sheep.

In May 2013 a one-year retrospective questionnaire was sent to 4000 sheep farmers in England, requesting data on lameness prevalence, management of footrot, farm/flock descriptors, and farmer-orientated themes: barriers to treating footrot, opinions and knowledge of footrot, relating to other people and personality. Principal component analysis (PCA) was used to make composite variables from explanatory variables and latent class (LC) analysis was used to subgroup farmers, based on nine managements of FR. Associations between LC and composite variables were investigated using multinomial logistic regression. Negative binomial regression was used to investigate associations between the proportion of lame sheep and composite and personality variables.

The useable response rate was 32% and 97% of farmers reported having lame sheep; the geometric mean prevalence of lameness (GMPL) was 3.7% (95% CI 3.51%–3.86%).

Participants grouped into three latent classes; LC1 (best practice—treat FR within 3 days of sheep becoming lame; use injectable and topical antibiotics; avoid foot trimming), 11% farmers), LC2 (slow to act, 57%) and LC3 (slow to act, delayed culling, 32%), with GMPL 2.95%, 3.60% and 4.10% respectively.

Farmers who reported the production cycle as a barrier to treating sheep with FR were more likely to be in LC2 (RRR 1.36) than LC1. Negative emotions towards FR were associated with higher risk of being in LC2 (RRR 1.39) than LC1. Knowledge of preventing FR spread was associated with a lower risk of being in LC2 (RRR 0.46) or LC3 (RRR 0.34) than LC1. Knowledge about FR transmission was associated with a lower risk of being in LC3 (RRR 0.64) than LC1.

An increased risk of lameness was associated with the production cycle being a barrier to treating sheep with FR (IRR 1.13), negative emotions towards FR (IRR 1.13) and feelings of hopelessness towards FR (IRR 1.20). Conscientiousness (IRR 0.95) and understanding the importance of active control of lameness (IRR 0.76) were associated with reduced risk of lameness.

We conclude that emotions and personality are associated with differences in farmer management of FR and prevalence of lameness. Further understanding how personality and emotions influence change in behaviour is key to increasing uptake of new information.

1. Introduction

There is increasing interest in understanding farmer behaviour with respect to management of their livestock. Whilst farmers are likely to be interested in making profits (Gasson et al., 1993) and

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increasing production (Ploeg, 1993), farmers are not simply rational profit maximisers and are likely to have emotional reactions to their animals that also influence decision making (Bigras-Poulin et al., 1985). Thus, rural sociologists have applied theories like the theory of reasoned action (TRA) (Fishbein and Ajzen, 1975) and its extension, the theory of planned behaviour (TPB) (Ajzen, 1991) to understand farmers' decisions and explain variability in the health and welfare of the animals in their care (Hemsworth et al., 1989; Willock et al., 1999; Garforth et al., 2006; Jansen et al., 2009; Kauppinen et al., 2012). Whilst useful, such models still focus on rational processes around attitudes and beliefs. In this paper we extend these to look at a wider spectrum of emotional factors such as the type and extent of specific emotional responses such as sadness or anger expressed by farmers' to their animals' disease, the Big-5 personality factors (Goldberg, 1993) and trait empathy (Davis, 1983). These have all been shown to have strong effects on human decision-making (Damasio et al., 1996; Bechara et al., 1997; Loewenstein et al., 2001; Dolan, 2002; De Martino et al., 2006; Ferguson et al., 2009) and influence decisions across a wide range of human activity; relationships, health, employment, medical decision making etc. but to date have not been explored in a livestock context (Hunter and Hunter, 1984; Ferguson et al., 2003; Roberts et al., 2007; Ferguson, 2013; Molloy et al., 2014).

According to the TPB, the best predictor of behaviour is a person's intention to act, and empirical evidence supports this (Webb and Sheeran, 2006). Intention to act is predicted by attitudes towards a behaviour (whether the behaviour is viewed as desirable or not), subjective norms (whether significant others think it is worth pursuing or not), perceived behavioural control (the ability to perform the behaviour), perception of resources and opportunities to perform, or obstacles to avoid, a behaviour. Using TPB alone to predict behaviour, however, oversimplifies the complexities of decision-making. For example, the key role of emotional processing and personality are overlooked. Here we examine traits (feelings in general) of empathy and normal human personality as well as more process oriented indices of emotions that focus on how the farmer feels about their flock.

There is now a substantive body of evidence to support the central and crucial role of such emotional experiences and processes (both positive and negative) in human decision making (Damasio et al., 1996; Bechara et al., 1997; Loewenstein et al., 2001; Dolan, 2002; De Martino et al., 2006; Ferguson et al., 2009). Theoretical models show that traits act to influence how such emotional processes operate to influence final decisions (Ferguson et al., 2011; Ferguson, 2013). Thus a person who is high in empathy is more likely to feel compassion towards an individual and act to help them (Batson, 2014; Ferguson, 2015). Empathy has been studied in relation to farmer behaviour previously (Kielland et al., 2010). These authors reported that farmers who perceive that animals feel pain as humans do have greater empathy towards their cattle and better welfare outcomes on their farms. Here we extend this to general traits of empathy. Trait empathy can be split fundamentally into cognitive empathy that includes perspective taking (imagining how the other is feeling) and affective empathy (feeling for the target) (Davis, 1983; Ferguson, 2015) and we explore whether these two traits differentially predict animal welfare using the example of footrot in sheep.

The dominant conceptualization of human personality is based on five broad domains in terms of degrees of extraversion (high scores equate to outgoing and sensation seeking), agreeableness (high scores equate altruism and caring), conscientiousness (high scores equate to hardworking and being methodical), emotional stability (high scores equate to being calm) and openness to experiences (high scores equate to being artistic and seeking out new cultures) (Gosling et al., 2003). In the literature, conscientiousness is consistently the strongest positive predictor of performance across a wide number of domains (Salgado, 1997; Bogg and Roberts, 2004), and we hypothesise that it should be the case here. Agreeableness may influence emotions of compassion and caring towards an animal and thus may also predict positive animal health. We examine these within the context of footrot. Identifying traits associated with good practice has implications for interventions because modern personality theory (Roberts and Jackson, 2008), supported by a substantial body of evidence shows that personality traits can change both over time and in response to environmental challenges and specific training (Caspi et al., 2005; Roberts et al., 2013; Hudson and Fraley, 2015).

Lameness is a major welfare concern for both sheep farmers and veterinarians (Fitzpatrick et al., 2006; Goddard et al., 2006; Morgan-Davies et al., 2006). In 2004 the global period prevalence of lameness in England was 10.6% (Kaler and Green, 2008), with more than 90% of lameness attributed to footrot. Footrot is an infectious disease caused by *Dichelobacter nodosus* (Witcomb et al., 2015). It has two clinical presentations, inflammation of the interdigital skin of the foot (interdigital dermatitis) and separation of the hoof horn from the underlying tissue (severe footrot). From the 1950s–1990s prevention of footrot focused on whole flock managements such as quarantine of new and diseased sheep, routine foot trimming and foot bathing and vaccination (e.g. Morgan, 1987). More recently, research has indicated that prompt treatment of individual sheep lame with footrot with parenteral and topical antibiotics without foot trimming reduces the duration of disease (Kaler et al., 2010a,b; Wassink et al., 2010), reduces recurrence (Kaler et al., 2010b), protects flock mates (Green et al., 2007) and so reduces the incidence and prevalence of lameness. Whole flock managements of quarantine (Wassink et al., 2004; Winter et al., 2015) and vaccination (Winter et al., 2015) are also associated with a lower prevalence of footrot. In contrast, routine foot trimming and foot bathing are associated with a higher prevalence of footrot (Wassink et al., 2005; Green et al., 2007; Kaler and Green, 2008; King, 2013; Winter et al., 2015).

In 2013 a questionnaire was sent to 4000 English sheep farmers. The questionnaire focused on management of footrot and attitudes and emotions towards lameness and footrot and farmer personality traits. From analysis of 1260 respondents, management factors associated with a lower prevalence of lameness included quarantine of incoming sheep for >3 weeks, recognising very mild lameness in sheep (locomotion score 1 Kaler et al., 2009), treating lame sheep within 3 days, treating the first lame sheep in a group compared with treating when >5 sheep were lame, vaccination against footrot and selecting replacements from never lame ewes. Factors associated with a higher prevalence of lameness were feet bleeding at routine foot trimming and difficulty catching individual lame sheep. Factors associated with lower prevalence of lameness in the sub model on treatment of footrot were using parenteral and topical antibacterials and avoiding foot trimming. From the submodel on culling, waiting until ewes were persistently lame before culling was associated with higher prevalence of lameness (Winter et al., 2015).

In this paper we analyse further data on attitudes, beliefs, emotions and personality together with management of footrot from the farmers who responded to the 2013 questionnaire (Winter et al., 2015). The objectives of this study were to test whether we can identify sub-groups of farmers who apply footrot management activities differently and to test the hypothesis that farmer personality, emotions, empathy and attitudes and beliefs about footrot are associated with different approaches to management of footrot and consequently to the prevalence of lameness.

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