

Subjective measures of temperament are influenced by sire and are associated with feed efficiency traits in adult Merino wethers

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Improving feed efficiency can reduce the feed costs of a sheep enterprise and increase overall profitability (Jackson *et al.*, 2014). Despite this, genetic improvement of sheep has traditionally focused on increasing the amount of product per animal with comparatively little emphasis on selection for traits that reduce costs. Previous work investigating feed efficiency has focused mainly on young growing sheep and there is little published work investigating mechanisms underpinning differences in feed efficiency in adults (Blumer *et al.*, 2016). Based on the relationships between temperament and the concentration of cortisol (Rice *et al.*, 2015), and feed efficiency and cortisol (Knott *et al.*, 2010), we predict that more feed efficient sheep will be more docile.

Merino wethers ($n = 320$) sourced from 15 different sires were housed in individual pens in an undercover animal house. They were offered feed at 100% of predicted maintenance requirement for 35 days and then randomly allocated to receive feed either *ad libitum* or at 60% maintenance for a following 35 days. Feed intake was measured daily and they were weighed twice per week. Feed efficiency was measured as residual feed intake (RFI) and residual liveweight change (RLWC), in *ad libitum* animals. Temperament was measured by assessing avoidance behaviours, categorised as chute score (Grandin, 1993) and exit score (Vetters *et al.*, 2013). The relationships between feed efficiency and average temperament traits was analysed using a general mixed linear model in SAS where exit score and chute score were used as the dependent variables, sire was used as a fixed effect and then RFI and RLWC were included as individual covariates.

Residual feed intake did not differ significantly between sire groups (-1.35 ± 0.63 MJ ME/day to 0.84 ± 0.66 MJ ME/day), however when offered feed *ad libitum* RLWC did differ between sire groups (-40 ± 20 g/day to 40 ± 20 g/day; $p < 0.05$). Average chute score did not differ significantly between sire groups (1.9 ± 0.21 to 2.7 ± 0.18) however exit score did differ significantly between sire groups (2.7 ± 0.13 to 3.3 ± 0.13 ; $p < 0.05$). There was a significant positive relationship between RLWC and exit score ($p < 0.05$). Sires that had progeny with a lower exit score (more docile) had a decreased RLWC (less feed efficient; Fig. 1).

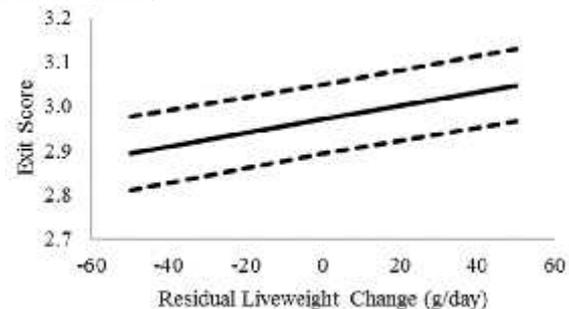


Figure 1: Relationship between residual liveweight change and average exit score of Merino wethers ($n = 160$) from 15 sires fed *ad libitum*.

Our hypothesis that more feed efficient wethers would be more docile was not supported, to the contrary, more feed efficient wethers, as measured by RLWC, were less docile, based on exit score. This result was unexpected however we are unable to compare to other studies as to the best of our knowledge this is the first paper to report a relationship between RWLC and temperament traits. We found no relationship between RFI and temperament when measured as chute or exit score, this is consistent with Herd *et al.*, (2019) who reported a negative correlation between RFI and temperament when measured as flight score. The presence of a relationship between exit score and RLWC demonstrates a relationship between temperament and some aspect of feed efficiency. Further work is required to confirm the relationship between RWLC and exit score and understand the physiological basis for the relationship.

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