

Relationship between body condition score, locomotion and longevity in Polish Holstein-Friesian cows

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OBJECTIVE

The relations between longevity and the recently implemented body condition score (BCS) and locomotion (LOC) evaluations were examined using the Weibull proportional hazard model

CONCLUSIONS

Intermediate BCS scores – favorable in relation to longevity
Low locomotion scores – negative effect on longevity

MATERIAL AND METHODS

Locomotion (LOC)

characterizing the use of legs and feet, length and direction of the step scored from 1 to 9:

- 1-3 severe abduction (deviation from a straight line) and short stride
- 4-6 slight abduction and medium stride
- 7-9 no abduction and long stride

Body condition score (BCS)

characterizing the covering of fat over the tail head and rump scored from 1 to 9:

- 1-3 poor
- 4-6 intermediate
- 7-9 grossly fat

World Holstein Friesian Federation (WHFF)

Longevity

True longevity (TL) – number of days from first calving to culling (uncensored records) or last test day (censored records)

Functional longevity (FL) – TL corrected for within-herd-year-season phenotypic production of a cow

- BCS scores for 146,441 cows
- LOC scores for 70,797 cows from free-stall herds
- level of censoring 51%
- mean TL
1086 days for uncensored records
952 days for right censored records

Data from the SYMLEK Polish National Recording System provided by the Polish Federation of Cattle Breeders and Dairy Farmers

Weibull proportional hazard model

TL $h(t) = h_0(t) * \exp[hys(t) + age + ys(t) + ls(t) + hsize(t) + BCS/LOC]$

FL $h(t) = h_0(t) * \exp[hys(t) + age + ys(t) + ls(t) + hsize(t) + fat(t) + prot(t) + BCS/LOC]$

t – time from first calving to culling or censoring, h(t) – hazard function for a cow at time t, h₀(t) – Weibull baseline hazard function

Random effect: hys – herd-year-season. **Fixed effects:** age – age at first calving, ys – year-season, ls – lactation number x stage of lactation, hsize – herd size variation, fat, prot – fat and protein production levels, BCS/LSCS – BCS or LOC score.

Estimation. Survival Kit v6.06 was used (Ducrocq V., Sölkner J., Mészáros G., 2010)

- significance of effects determined based on the likelihood ratio test
- solutions expressed as relative risks of culling (RRC)

RESULTS

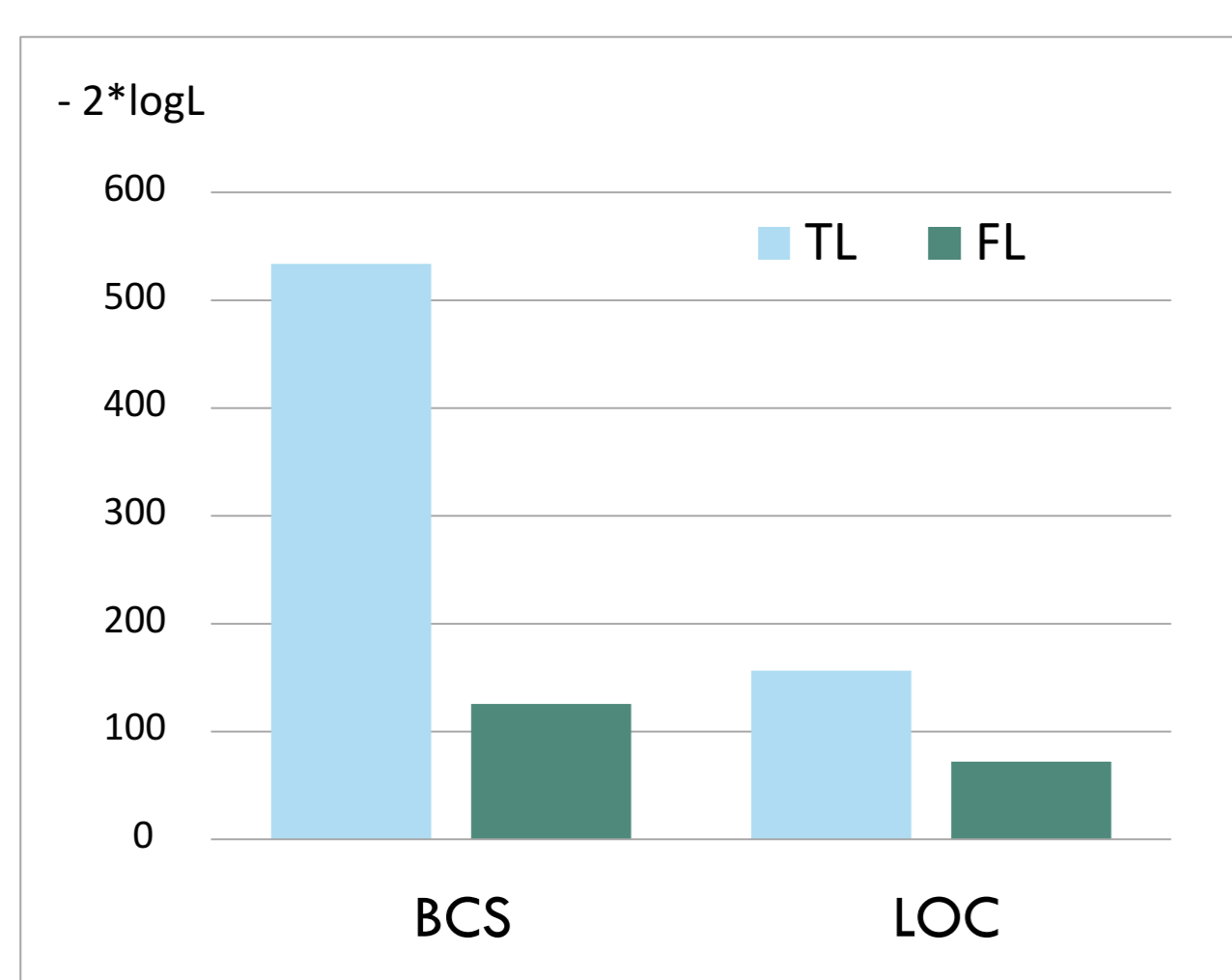


Figure 1. Likelihood ratio tests

Likelihood ratio tests (Fig. 1)

- highly significant effects of BCS and LOC on risk of culling
- stronger effect on TL than on FL for both BCS and LOC
- impact of BCS greater than that of LOC

Relative Risk of Culling (RRC)

BCS

- intermediate optimum (score 5) for true and functional longevity (Fig. 2)
- Cows with low BCS were 3 times (for TL) and 1.6 times (for FL) more likely to be culled than cows with average score 5
- Cows with high BCS were 1.7 (for TL) and 1.3 (for FL) times more likely to be culled than cows with average score

Locomotion

- low scores associated with the highest risk of culling (Fig. 3)
- TL: RRC decreased more than twice with locomotion score increasing from 1 to 5; further score increases almost did not change RRC
- FL: RRC was lowest for intermediate LOC score 6; cows with low score had up to a 40% worse chance to survive as compared to cows with the optimal score, and a 20% worse chance as compared to cows with the highest score

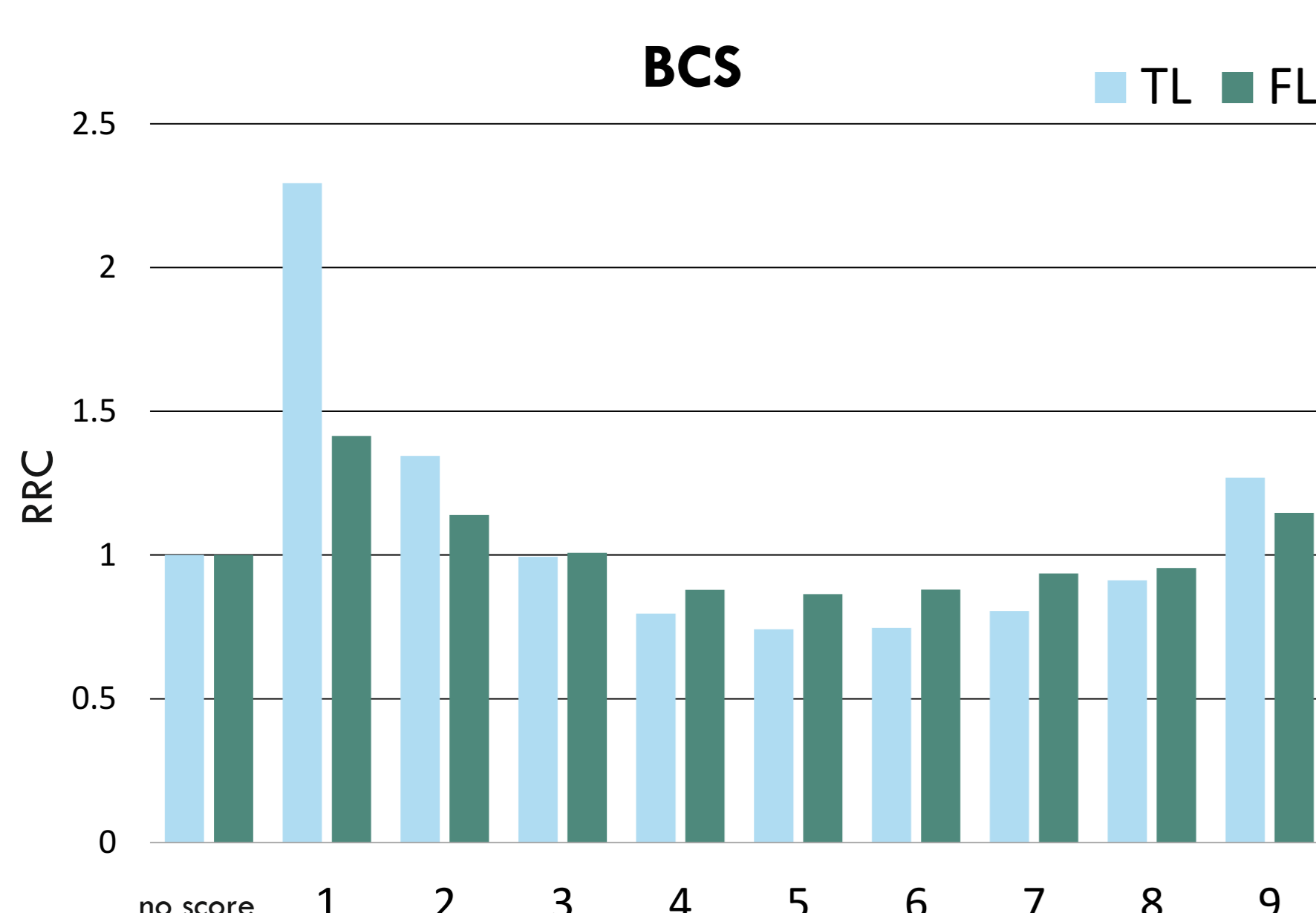


Figure 2. Relative risk of culling by BCS score

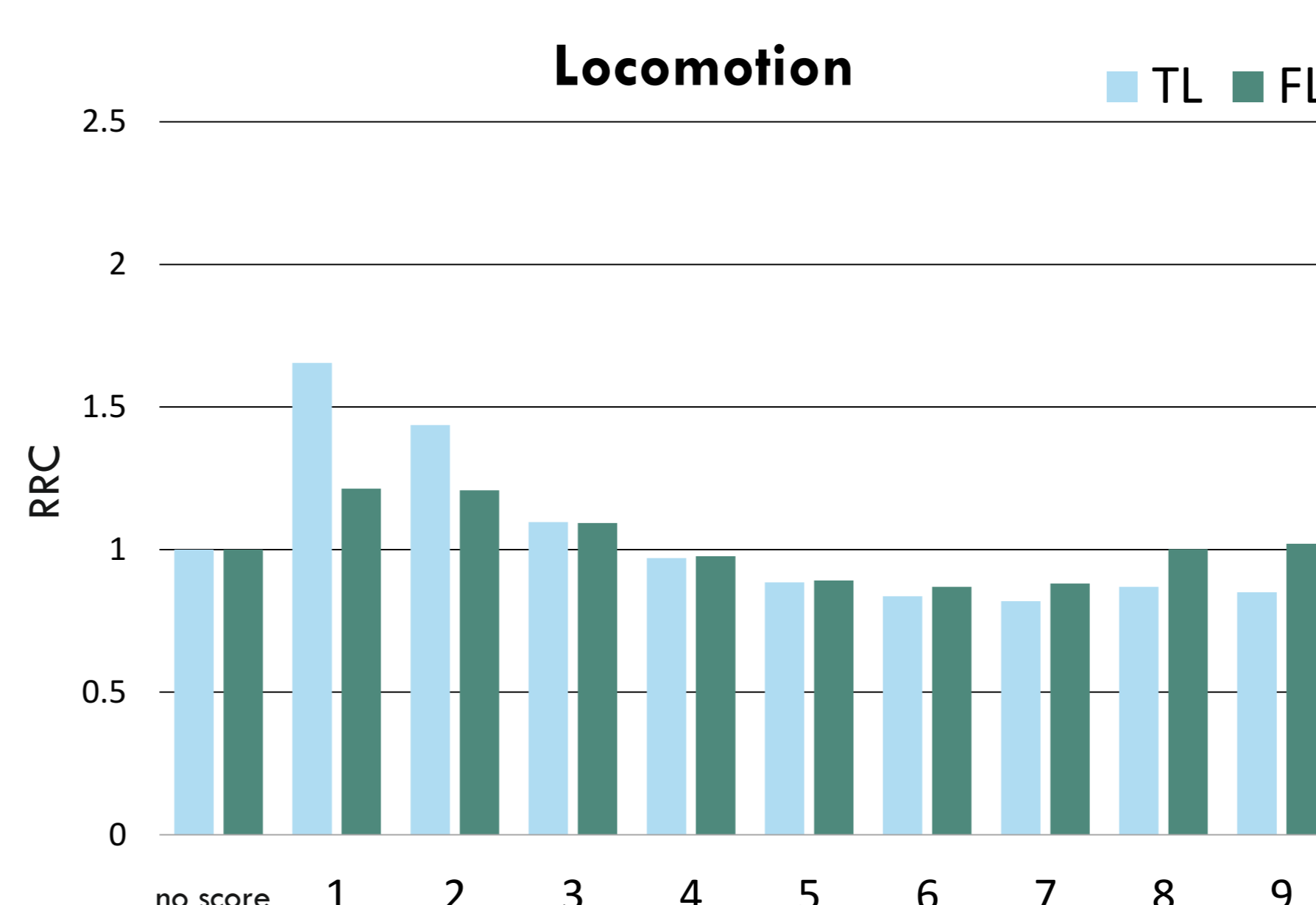


Figure 3. Relative risk of culling by locomotion score