

Original Article

What are we losing? Are the personality traits of Italian autochthonous cows different from those of cosmopolitan breeds?

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Supplementary Materials

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Suppl. Table 1. Personality variables included in the study. Each variable is described and the dominion of competence is indicated.

Variable	Descriptions	Dominion
Active	Moves around the barn (e.g., walks, runs)	Extroversion +
Aggressive towards conspecifics	Hostile (e.g., attacks) towards other cows	Neuroticism +
Aggressive towards known people	Reacts hostile and threatening towards familiar people and staff members	Neuroticism +
Aggressive towards unknown people	Reacts hostile and threatening towards unfamiliar people	Neuroticism +
Aggressive towards milker	Reacts hostile and threatening towards milker	Neuroticism +
Calm	Not easily disturbed by changes in the environment	Neuroticism – Dominance –
Cooperative	Is compliant; willingly behaves when asked to do something	Agreeableness +
Curious	Approaches and explores changes in the environment (e.g., enriching and novel objects)	Openness +
Excitable	Overreacts to changes in the environment	Extroversion +
Friendly towards conspecifics	Initiates and seems to seek proximity to other cows	Agreeableness +
Friendly towards milker	Initiates proximity with milker; approaches fence readily and in a friendly manner	Agreeableness +
Friendly towards known people	Initiates proximity with familiar visitors; approaches fence readily and in a friendly manner	Agreeableness +
Friendly towards unknown people	Initiates proximity with unfamiliar visitors (adults, children, male, and females); approaches fence readily and in a friendly manner	Agreeableness +
Dominant	Dominant to conspecifics: In a commanding or elevated position compared with conspecifics	Dominance +
Fearful of conspecifics	Retreats and hides from other cows	Extroversion –
Fearful of known people	Retreats and hides from familiar people and staff members	Extroversion –

Fearful of unknown people	Retreats and hides from unfamiliar staff and visitors	Extroversion –
Fearful of milker	Retreats and hides from keepers milker	Extroversion –
Insecure	Seems easily scared; “jumpy” and fearful in general	Extroversion – Openness –
Playful	Initiates and engages in play behavior (seemingly meaningless, non-aggressive behavior) with objects and/or other cows	Extroversion +
Self-assured	Moves in a seemingly confident, well-co-ordinated, and relaxed manner	Neuroticism –
Smart	Learns quickly to associate certain events and appears to remember for a long time	Openness +
Tense	Shows restraint in movement and posture	Neuroticism
Shy	Reluctant to approach other animals, novel objects, new situations	Extroversion –
Vocal: aggressive	Frequently and readily vocalizes (aggressive vocalizations)	Neuroticism +
Vocal: non-aggressive	Frequently and readily vocalizes (friendly or neutral vocalizations)	Extroversion +

Suppl. Table 2. Descriptive statistics for the five breeds considered and *P*-values for the Kruskal-Wallis test between breeds for all variables.

Sample	N	Min	Max	1 st	Median	3 rd	Kruskal- Wallis
Active							
Brown Swiss	8.00	1.00	3.00	1.00	2.00	3.00	0.001
Holstein Friesian	9.00	3.00	8.00	4.00	6.00	7.00	
Modenese	8.00	1.00	12.00	2.00	4.50	8.25	
Rendena	6.00	1.00	8.00	1.00	1.00	5.50	
Varzese	9.00	6.00	10.00	8.00	9.00	9.00	
Aggressive towards conspecifics							
Brown Swiss	8.00	1.00	3.00	1.00	1.50	2.25	0.007
Holstein Friesian	9.00	1.00	8.00	3.00	4.00	4.00	
Modenese	8.00	1.00	6.00	2.00	2.00	2.00	
Rendena	6.00	1.00	12.00	1.00	1.00	6.25	
Varzese	9.00	1.00	10.00	7.00	7.00	8.00	
Aggressive towards known people							
Brown Swiss	8.00	1.00	1.00	1.00	1.00	1.00	0.125
Holstein Friesian	9.00	1.00	8.00	1.00	1.00	5.00	
Modenese	8.00	1.00	12.00	1.00	1.00	2.50	
Rendena	6.00	1.00	12.00	1.00	1.00	1.00	
Varzese	9.00	1.00	6.00	1.00	2.00	6.00	
Aggressive towards unknown people							
Brown Swiss	8.00	1.00	2.00	1.00	1.00	2.00	0.002
Holstein Friesian	9.00	1.00	4.00	1.00	2.00	3.00	
Modenese	8.00	1.00	12.00	1.00	1.00	2.50	
Rendena	6.00	7.00	12.00	7.00	7.00	7.00	
Varzese	9.00	1.00	11.00	3.00	6.00	7.00	
Aggressive towards keepers (milker)							
Brown Swiss	8.00	1.00	1.00	1.00	1.00	1.00	0.209
Holstein Friesian	9.00	1.00	6.00	1.00	2.00	3.00	
Modenese	8.00	1.00	12.00	1.00	1.00	2.50	
Rendena	6.00	1.00	12.00	1.00	1.00	1.00	
Varzese	9.00	1.00	5.00	1.00	1.00	2.00	
Calm							
Brown Swiss	8.00	1.00	11.00	1.00	5.00	10.00	0.000
Holstein Friesian	9.00	1.00	12.00	7.71	7.71	9.00	
Modenese	8.00	12.00	12.00	12.00	12.00	12.00	
Rendena	6.00	1.00	11.00	11.00	11.00	11.00	
Varzese	9.00	1.00	12.00	3.00	5.00	7.00	

Cooperative							
Brown Swiss	8.00	8.00	12.00	9.00	10.50	12.00	0.055
Holstein Friesian	9.00	7.00	12.00	9.00	9.00	10.00	
Modenese	8.00	7.00	12.00	10.75	12.00	12.00	
Rendena	6.00	1.00	12.00	7.00	9.50	12.00	
Varzese	9.00	1.00	12.00	7.00	7.00	7.00	
Dominant							
Brown Swiss	8.00	1.00	4.00	1.00	1.00	3.00	0.015
Holstein Friesian	9.00	1.00	11.00	3.00	4.00	5.00	
Modenese	8.00	1.00	12.00	1.00	1.00	3.75	
Rendena	6.00	1.00	12.00	7.00	7.00	7.00	
Varzese	9.00	1.00	11.00	1.00	2.00	6.00	
Curious							
Brown Swiss	8.00	6.00	7.00	6.75	7.00	7.00	<0.0001
Holstein Friesian	9.00	6.00	11.00	6.00	7.00	10.00	
Modenese	8.00	1.00	1.00	1.00	1.00	1.00	
Rendena	6.00	7.00	12.00	7.00	7.00	7.00	
Varzese	9.00	7.00	12.00	8.00	10.00	11.00	
Excitable							
Brown Swiss	8.00	1.00	3.00	1.00	1.50	2.00	0.139
Holstein Friesian	9.00	1.00	7.00	2.00	2.00	6.00	
Modenese	8.00	1.00	12.00	1.00	1.00	2.50	
Rendena	6.00	1.00	12.00	2.50	7.00	7.00	
Varzese	9.00	1.00	11.00	2.00	5.00	7.00	
Friendly towards conspecifics							
Brown Swiss	8.00	7.00	10.00	7.00	8.50	10.00	0.284
Holstein Friesian	9.00	1.00	11.00	8.00	9.00	10.00	
Modenese	8.00	1.00	7.00	5.50	7.00	7.00	
Rendena	6.00	1.00	12.00	1.00	4.00	10.75	
Varzese	9.00	1.00	11.00	7.00	7.00	11.00	
Friendly towards keepers (milker)							
Brown Swiss	8.00	10.00	12.00	10.75	11.50	12.00	0.048
Holstein Friesian	9.00	5.00	12.00	5.00	7.00	10.00	
Modenese	8.00	1.00	12.00	5.50	7.00	7.00	
Rendena	6.00	1.00	12.00	7.00	7.00	7.00	
Varzese	9.00	1.00	12.00	6.00	10.00	12.00	
Friendly towards known people							
Brown Swiss	8.00	7.00	12.00	7.00	9.50	12.00	0.000
Holstein Friesian	9.00	3.00	7.00	3.00	6.00	6.00	
Modenese	8.00	1.00	12.00	5.50	7.00	7.00	
Rendena	6.00	1.00	1.00	1.00	1.00	1.00	
Varzese	9.00	1.00	11.00	7.00	8.00	10.00	
Friendly towards unknown people							
Brown Swiss	8.00	1.00	3.00	1.00	1.50	3.00	0.000
Holstein Friesian	9.00	1.00	6.00	1.00	2.00	2.00	
Modenese	8.00	1.00	7.00	5.50	7.00	7.00	
Rendena	6.00	1.00	1.00	1.00	1.00	1.00	
Varzese	9.00	1.00	12.00	2.00	2.00	6.00	
Fearful of conspecifics							
Brown Swiss	8.00	1.00	5.00	1.00	1.50	3.25	0.001
Holstein Friesian	9.00	1.00	6.00	2.00	3.00	4.00	
Modenese	8.00	1.00	12.00	7.00	7.00	8.25	
Rendena	6.00	1.00	12.00	7.00	7.00	7.00	

Varzese	9.00	1.00	6.00	1.00	1.00	3.00	
Fearful of known people							
Brown Swiss	8.00	1.00	2.00	1.00	1.50	2.00	0.045
Holstein Friesian	9.00	1.00	9.00	1.00	2.00	8.00	
Modenese	8.00	1.00	12.00	7.00	7.00	8.25	
Rendena	6.00	1.00	12.00	1.00	4.00	7.00	
Varzese	9.00	1.00	6.00	1.00	2.00	4.00	
Fearful of unknown people							
Brown Swiss	8.00	2.00	7.00	2.00	4.50	7.00	0.001
Holstein Friesian	9.00	1.00	12.00	2.00	5.00	7.00	
Modenese	8.00	7.00	12.00	7.00	7.00	8.25	
Rendena	6.00	12.00	12.00	12.00	12.00	12.00	
Varzese	9.00	1.00	10.00	6.00	7.00	10.00	
Fearful of keepers (milker)							
Brown Swiss	8.00	1.00	3.00	1.00	2.00	3.00	0.248
Holstein Friesian	9.00	1.00	5.00	2.00	2.00	3.00	
Modenese	8.00	1.00	12.00	1.00	1.00	3.75	
Rendena	6.00	1.00	12.00	1.00	1.00	1.00	
Varzese	9.00	1.00	3.00	2.00	2.00	2.00	
Insecure							
Brown Swiss	8.00	1.00	5.00	1.00	1.00	3.00	0.012
Holstein Friesian	9.00	2.00	7.00	3.00	4.00	5.00	
Modenese	8.00	1.00	12.00	1.00	4.00	8.25	
Rendena	6.00	7.00	12.00	7.00	7.00	7.00	
Varzese	9.00	1.00	11.00	3.00	7.00	7.00	
Playful							
Brown Swiss	8.00	3.00	7.00	3.75	5.50	7.00	<0.0001
Holstein Friesian	9.00	1.00	5.00	3.00	4.00	4.00	
Modenese	8.00	1.00	1.00	1.00	1.00	1.00	
Rendena	6.00	1.00	1.00	1.00	1.00	1.00	
Varzese	9.00	2.00	7.00	3.00	6.00	7.00	
Self-assured							
Brown Swiss	8.00	8.00	12.00	9.00	10.50	12.00	<0.0001
Holstein Friesian	9.00	3.00	10.00	7.00	8.00	9.00	
Modenese	8.00	1.00	1.00	1.00	1.00	1.00	
Rendena	6.00	1.00	1.00	1.00	1.00	1.00	
Varzese	9.00	7.00	12.00	7.00	10.00	10.00	
Smart							
Brown Swiss	8.00	10.00	12.00	10.00	11.00	12.00	0.001
Holstein Friesian	9.00	4.00	11.00	6.00	7.00	10.00	
Modenese	8.00	1.00	11.00	1.00	1.00	1.00	
Rendena	6.00	1.00	7.00	7.00	7.00	7.00	
Varzese	9.00	5.00	12.00	5.00	7.00	12.00	
Tense							
Brown Swiss	8.00	1.00	3.00	1.00	2.00	3.00	0.001
Holstein Friesian	9.00	2.00	7.00	2.00	2.00	3.00	
Modenese	8.00	1.00	1.00	1.00	1.00	1.00	
Rendena	6.00	1.00	1.00	1.00	1.00	1.00	
Varzese	9.00	1.00	10.00	1.00	2.00	7.00	
Shy							
Brown Swiss	8.00	1.00	3.00	1.00	2.00	3.00	<0.0001
Holstein Friesian	9.00	1.00	9.00	3.00	5.00	5.00	
Modenese	8.00	7.00	7.00	7.00	7.00	7.00	

Rendena	6.00	12.00	12.00	12.00	12.00	12.00	
Varzese	9.00	1.00	10.00	1.00	5.00	6.00	
Vocal: aggressive							
Brown Swiss	8.00	1.00	2.13	1.00	1.57	2.13	0.003
Holstein Frisian	9.00	2.00	3.00	2.00	2.00	2.13	
Modenese	8.00	1.00	1.00	1.00	1.00	1.00	
Rendena	6.00	1.00	7.00	1.00	1.00	1.00	
Varzese	9.00	1.00	12.00	1.00	1.00	1.00	
Vocal: non-aggressive							
Brown Swiss	8.00	1.00	2.00	1.00	1.50	2.00	0.137
Holstein Frisian	9.00	1.00	6.00	2.00	3.00	4.00	
Modenese	8.00	1.00	2.23	2.23	2.23	2.23	
Rendena	6.00	1.00	7.00	1.00	1.00	1.00	
Varzese	9.00	1.00	10.00	1.00	1.00	1.00	

Suppl. Table 3. Multivariate MFA results for the first five dimensions. Only significant variables are reported.

DIMENSION 1		
QUANTITATIVE		
	Correlation	P value
Insecure	0.79	0
Fearful of conspecifics	0.78	0
Aggressive towards unknown people	0.75	0
Shy	0.75	0
Fearful of known people	0.72	0
Dominant	0.71	0
Aggressive towards keepers (milker)	0.71	0
Excitable	0.70	0
Fearful of unknown people	0.69	0
Fearful of keepers (milker)	0.65	0
Aggressive towards known people	0.59	1.00e-04
Active	0.43	0.0055
Aggressive towards conspecifics	0.41	0.0091
Vocal: non-aggressive	0.31	0.0499
Cooperative	-0.41	0.0079
Friendly towards conspecifics	-0.42	0.0067
Playful	-0.69	0
Self-assured	-0.70	0
Smart	-0.70	0
Friendly towards known people	-0.75	0
Friendly towards keepers (milker)	-0.81	0
QUALITATIVE		
	R2	P value
Breed	0.58	0
Category		
	Estimate	P value
Rendena	2.31	8.00e-04
Brown Swiss	-2.52	1.00e-04
DIMENSION 2		
QUANTITATIVE		
	Correlation	P value
Curious	0.88	0
Aggressive towards conspecifics	0.68	0

Self-assured	0.61	0
Playful	0.51	7.00e-04
Vocal: non-aggressive	0.44	0.0044
Excitable	0.43	0.0054
Active	0.42	0.0063
Tense	0.42	0.0065
Smart	0.40	0.01
Aggressive towards unknown people	0.39	0.014
Vocal: aggressive	0.34	0.0296
Friendly towards unknown people	-0.33	0.0382
Calm	- 0.58	1.00e-04
Cooperative	-0.61	
QUALITATIVE		
	R2	P value
Breed	0.82	0
Category		
	Estimate	P value
Varzese	1.85	0
DIMENSION 3		
QUANTITATIVE		
	Correlation	P value
Active	0.59	1.00e-04
Friendly towards unknown people	0.51	7.00e-04
Aggressive towards conspecifics	0.33	0.0359
Aggressive towards known people	0.31	0.0499
Shy	-0.34	0.0314
QUALITATIVE		
	R2	P value
Breed	0.91	0
Category		
	Estimate	P value
Modenese	1.33	0.0017
Varzese	1.21	0.0023
Rendena	-2.08	0
DIMENSION 4		
QUANTITATIVE		
	Correlation	P value
Fearful of unknown people	0.35	0.0249
Shy	0.35	0.0262
Aggressive towards unknown people	0.33	0.0404
Fearful of keepers (milker)	-0.37	0.0174
QUALITATIVE		
	R2	P value
Breed	0.79	0
Category		
	Estimate	P value
Varzese	1.11	2.00e-04
Holstein Friesian	-1.62	0
DIMENSION 5		
QUANTITATIVE		
	Correlation	P value
Fearful of keepers (milker)	0.46	0.0028
Aggressive towards keepers (milker)	0.34	0.03

QUALITATIVE		
	R2	P value
Breed	0.67	0
Category		
	Estimate	P value
Brown Swiss	1.36	0
Holstein Friesian	-1.12	1.00e-04

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