Table S1. Description of the four-point scale used to classify the 1680 pig carcasses.
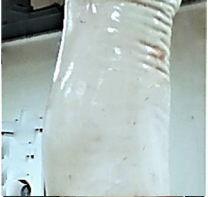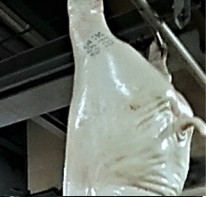
Shoulder	Middle	Rear	Scale	Description
			1	None or a little superficial skin damage
			2	Slight skin damage, with superficial lesions of up to 3 cm length.
			3	Skin damage affecting quality. A clear deep and/or long lesion (> 3 cm) accompanied with superficial damage and circular areas of bruises.
			4	Extreme damage. Long and deep lesions.

Table S2. Associations between the dependent variable of the prevalence of carcasses with rear severe lesions and the independent variables of pen conditions and pre-slaughter events at unloading (T1) and before stunning (T2). Estimate values are reported for the variables showing p-values < 0.10. Data were obtained from 72 batches, each one made of 23/24 heavy pigs, for a total of 1680 crossbred heavy pigs (Duroc × (Landrace × Large White)) slaughtered between January and June 2014 in a commercial abattoir in Northern Italy.

Independent variable	Estimate	p-value
Vehicle		0.701
Deck		0.879
Pen width		0.301
Pen length		0.503
Pen distance from stunning		0.675
Pen area		0.255
Pen stocking density (kg/m^2)		0.330
Pen space allowance		0.245
Falling at T1	0.087	0.074
Slipping at T1		0.618
Turning back at T1		0.473
Reluctance to move at T1		0.159
Overlapping at T1	-0.142	0.049
Jumping at T1		0.223
Huddling at T1		0.119
Vocalization at T1	-0.048	0.019
Panting at T1		0.196
Discoloration at T1		0.832
Shivering at T1		0.823
Lameness at T1	0.314	0.044
Total number of animal events at T1		0.746
Hit with stick at T1		0.382
Hit with plastic tube at T1		0.335
Poke with electric goad at T1		0.446
Shouts at T1		0.334
Hit with rubber stick at T1		0.468
Sawing on the transport deck		0.716
Waiting before unloading	0.058	0.0004
Total number of human-animal events at T1	0.066	0.009
Reluctance to move at T2		0.898
Pushes at T2		0.317
Falling at T2	0.356	0.021
Huddling at T2		0.382
Slipping at T2		0.348
Jumping at T2		0.900
Turning back at T2		0.146
Elimination at T2		0.543
Panting at T2		0.776
Side discoloration at T2		0.170
Ear discoloration at T2	0.071	0.001
Thigh discoloration at T2	0.024	0.066
Back discoloration at T2	0.028	0.009
Total number of animal events at T2	0.092	0.066
Vocalization at T2		0.806
Hit with plastic tube at T2	0.109	0.023
Shouts at T2	0.116	0.014

Table S3. Associations between the dependent variable of the prevalence of carcasses with middle severe lesions and the independent variables of pen conditions and pre-slaughter events at unloading (T1) and before stunning (T2). Estimate values are reported for the variables showing p-values < 0.10. Data were obtained from 72 batches, each one made of 23/24 heavy pigs, for a total of 1680 crossbred heavy pigs (Duroc × (Landrace × Large White)) slaughtered between January and June 2014 in a commercial abattoir in Northern Italy.

Independent variable	Estimate	p-value
Vehicle:		0.240
Deck		0.924
Pen width		0.971
Pen lenght	-0.0058	0.041
Pen distance from stunning		0.585
Pen area		0.737
Pen stocking density (kg/m²)		0.861
Pen space allowance		0.718
Falling at T1	0.102	0.010
Slipping at T1	0.052	0.086
Turning back at T1		0.273
Reluctance to move at T1		0.493
Overlapping at T1	-0.125	0.025
Jumping at T1		0.536
Huddling at T1		0.357
Vocalization at T1		0.120
Panting at T1		0.348
Discoloration at T1	-0.109	0.025
Shivering at T1		0.859
Lameness at T1		0.825
Total number of animal events at T1		0.100
Hit with stick at T1	0.152	0.0002
Hit with plastic tube at T1		0.491
Poke with electric prod at T1		0.457
Hit with rubber stick at T1		0.441
Shouts at T1		0.455
Sawing on the transport deck		
Yes	Ref	
No	-0.547	0.031
Waiting before unloading	0.030	0.040
Total number of human-animal events at T1	0.060	0.005
Reluctance to move at T2		0.980
Pushes at T2		0.327
Falling at T2		0.159
Huddling at T2		0.716
Slipping at T2		0.428
Jumping at T2		0.425
Turning back at T2		0.170
Elimination at T2		0.577
Panting at T2		0.293
Side discoloration at T2	0.029	0.035
Ear discoloration at T2	0.049	0.013
Thigh discoloration at T2	0.020	0.072
Back discoloration at T2	0.026	0.005
Total number of animal events at T2	0.135	0.0009
Vocalization at T2	0.053	0.052
Hit with plastic tube at T2	0.129	0.001

Shouts at T2	0.132	0.0006

Table S4. Associations between the dependent variable of the prevalence of carcasses with shoulder severe lesions and the independent variables of pen conditions and pre-slaughter events at unloading (T1) and before stunning (T2). Estimate values are reported for the variables showing p-values < 0.10. Data were obtained from 72 batches, each one made of 23/24 heavy pigs, for a total of 1680 crossbred heavy pigs (Duroc × (Landrace × Large White)) slaughtered between January and June 2014 in a commercial abattoir in Northern Italy.

Independent variable	Estimate	p-value
Vehicle:		
lorry	ref	
trailer	0.772	0.038
Deck		0.581
Pen width		0.232
Pen length	-0.007	0.085
Pen distance from stunning		0.739
Pen area		0.414
Pen stocking density		0.220
Pen space allowance		0.442
Falling at T1		0.230
Slipping at T1		0.323
Turning back at T1		0.894
Reluctance to move at T1		0.208
Overlapping at T1	-0.145	0.088
Jumping at T1		0.628
Huddling at T1		0.623
Vocalization at T1		0.316
Panting at T1		0.156
Discoloration at T1		0.139
Shivering at T1		0.515
Lameness at T1		0.332
Total number of animal events at T1		0.720
Hit with stick at T1	0.158	0.006
Hit with plastic tube at T1		0.633
Poke with electric prod at T1		0.539
Hit with rubber stick at T1		0.661
Shouts at T1		0.603
Sawing on the transport deck		0.489
Waiting before unloading	0.052	0.014
Total number of human-animal events at T1		0.142
Reluctance to move at T2		0.520
Pushes at T2		0.334
Falling at T2		0.365
Huddling at T2		0.460
Slipping at T2		0.764
Jumping at T2		0.916
Turning back at T2		0.189
Elimination at T2		0.162
Panting at T2		0.370
Side discoloration at T2		0.230
Ear discoloration at T2	0.065	0.013
Thigh discoloration at T2		0.780

Back discoloration at T2		0.100
Total number of animal events at T2	0.123	0.035
Vocalization at T2		0.371
Hit with plastic tube at T2	0.125	0.025
Shouts at T2	0.128	0.019