SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: CA15224
STSM title: Evaluation of printable 3D keel bone models for use in a tactile analogue scale
STSM start and end date: 26.01.2019 – 18.02.2019

Grantee name: Enver Cavusoglu

PURPOSE OF THE STSM:

The aim was to develop and validate the method of using a tactile analogue scale with printable 3D keel bone models in order to improve inter- and intra-observer reliability of palpation of damaged keel bones in laying hens.

DESCRIPTION OF WORK CARRIED OUT DURING THE STSM

Keel bone fractures in laying hens are a highly topical welfare problem due to their likely association with pain and suffering (FAWC 2010, 2013) and their high prevalence, which is affected by breeding, feeding and housing related aspects (Käppeli et al. 2011; Wilkins et al. 2011; Rodenburg et al. 2008; Heerkens et al. 2013; Petrik et al. 2015). Assessing keel bone damage reliably is at the center of all research on this topic. The most commonly used method consists of palpating live hens by running two fingers down the edge of the keel bone feeling for alterations such as s-derivations, bumps, or depressions. More sophisticated and more objective methods like x-rays or CT scans are too expensive or logistically impossible in most cases. However, it is not clear if researchers in different countries assess keel bone deviations and fractures by palpations the same way. This makes comparisons of results from different countries impossible. Visual tagged analogue scales have proven to achieve higher intra- and inter-observer reliabilities than categorical scores. Keel bones are not visible during palpation of live birds so 3 D models of 3 different severity grades of damaged keel bones were used instead of pictures.

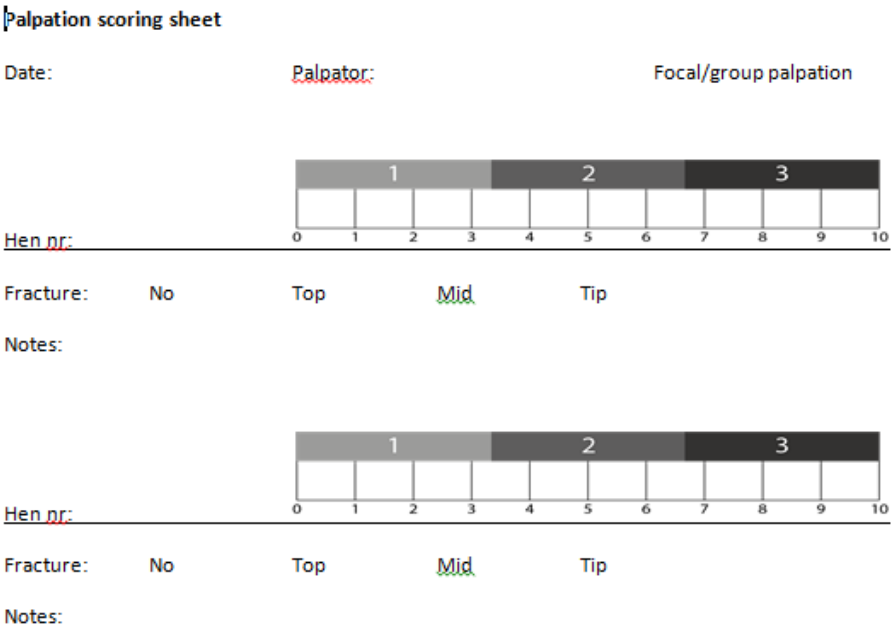
Palpation of the keel bones of the laying hens was taught to me by Sabine Gebhard-Henrich at the first week of STSM. After that, we visited the experimental laying hen farm of the Aviforum, Zollikofen, Switzerland on 4 different days. Each time, 12 birds were caught and palpated twice (with or without the models). When we palpated birds with models, we also palpated the models before each palpation of a bird in order to calibrate ourselves. On each trial, numbered rings were put on the legs of each bird and the numbers were recorded. All in all 50 birds were palpated both by me and Sabine Gebhard-Henrich. After the third palpation day, we moved to another barn in

which there were older birds with more severe keel bone damages.

When we used the 3D models, we developed a scoring sheet and we scored the damages according to the severity of the damage with a 4 scale scoring system. The scores were 0, 1, 2, 3. Score 0 means the birds had no damage and had perfect keel bone, score 1 means the bird had mild keel bone damage, score 2 means the bird had moderate damage, score 3 means the birds had severe damage in keel bone.

When we performed palpation without the models, we used a different scoring method which was explained by Casey-Trott et al (2015) and is called "simplified keel assessment protocol (SKAP)". The palpation with this scoring system was done by defining the existence of fracture and deviation (Fracture yes/no, Deviation yes/no, damage on Tip yes/no).

Data collected on each day were analyzed on the following days. All data were analyzed with the statistical program "R" package "rptR" (Nakagawa and Schielzeth, 2010) .



The palpation scoring sheet

3D Models used in palpation

Palpation of keel bone on live bird

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The results of our study can be seen in tables 1 and 2. According to our results, the reliability values with the models were above 0.6 which is very high value. However, this study should be done with a higher number of observers in order to analyze the inter-observer reliability better.

Table 1. Palpation results with the 3D models

TACTILE ANALOG SCALE					
Date	**Data**	**Palpator**	**R Value (Standard Error)**	**Confidence Interval**	**P Value**
January 28	Inter-observer	Enver-Sabine	0.691 (0.124)	0.472 - 0.794	0.000256
January 30	Intra-observer	Enver	0.908 (0.061)	0.731 – 0.962	0.01
February 1	Inter-observer, Trial 1	Enver-Sabine	0.469 (0.209)	0 – 0.773	0 .000716
February 1	Inter-observer, Trial 2	Enver-Sabine	0.687 (0.165)	0.264 – 0.888	0.000163
February 1	Intra-observer	Enver	0.609 (0.18)	0.085 – 0.831	0.000212
February 1	Intra-observer	Sabine	0.567 (0.205)	0 – 0.797	0.000385
February 5	Inter-observer, Trial l 1	Enver-Sabine	0.781 (0.147)	0.415 – 0.935	0.01
February 5	Inter-observer, Trial l 2	Enver-Sabine	0.652 (0.205)	0.035 – 0.865	0.000305
February 5	Intra-observer	Enver	0.913 (0.082)	0.751 – 0.97)	0.01
February 5	Intra-observer	Sabine	0.889 (0.066)	0.714 – 0.97)	0.01

Table 2. Palpation results without the 3D models

SIMPLIFIED KEEL ASSESSMENT PROTOCOL					
Date	Data	Palpator	R Value (Standard Error)	Confidence Interval	P Value
January 30	Deviation, Intra-observer Rel.	Enver	None had deviation		
January 30	Fracture, Intra-observer Rel.	Enver	0.998 (0.011)	0.946 – 0.998	1.63
January 30	Tip, Intra-observer Rel.	Enver	0.194 (0.227)	0 – 0.855	0.166
February 1	Tip, Intra-observer Rel.	Enver	0.965 (0.151)	0.6 – 0.998	0.0159

February 1	Tip, Intra-observer Rel.	Sabine	0.986 (0.085)	0.767 – 0.998	0.000545
February 1	Tip, Intra-observer Rel.	Enver-Sabine	0.698 (0.29)	0.184 – 0.952	0.00075
February 1	Deviation, Intra-observer Rel.	Enver-Sabine	0.982 (0.088)	0.871 – 0.998	0.000105
February 1	Fracture, Intra-observer Rel.	Enver-Sabine	0.633 (0.285)	0.032 – 0.99	0.00597
February 1	Deviation, Inter-observer Rel. Trial 1	Enver-Sabine	0.261 (0.257)	0 – 0.923	0.194
February 1	Deviation, Inter-observer Rel. Trial l 2	Enver-Sabine	0.491 (0.351)	0 – 0.986	0.083
February 1	Fracture, Inter-observer Rel. Trial 1	Enver-Sabine	0.194 (0.33)	0 – 0.983	0.246
February 1	Fracture, Inter-observer Rel. Trial 2	Enver-Sabine	0.877 (0.265)	0.145 – 0.998	0.00291
February 1	Tip, Inter-observer Rel. Trial	Enver-Sabine	0.285 (0.254)	0 – 0.915	0.179
February 1	Tip, Inter-observer Rel. Trial 2	Enver-Sabine	0.1 (0.172)	0 – 0.52	0.34
Februa **February 5**y	Deviation, Inter-observer Rel. Trial 1	Enver-Sabine	0.1 (0.219)	0 – 0.856	0.34
February 5y	Deviation, Inter-observer Rel. Trial 2	Enver-Sabine	0.491 (0.347)	0 – 0.988	0.083
February 5y	Fracture, Inter-observer Rel. Trial 1	Enver-Sabine	0.965 (0.219)	0 – 0.998	0.0159
February 5y	Fracture, Inter-observer Rel. Trial 2	Enver-Sabine	0.99 (0.041)	0.877 – 0.998	0.00064
February 5y 5	Tip, Inter-observer Rel. Trial 1	Enver-Sabine	0.409 (0.378)	0 – 0.978	0.121
February 5y	Tip, Inter-observer Rel. Trial l 2	Enver-Sabine	0 (0.159)	0 – 0.506	1

FUTURE COLLABORATIONS (if applicable)

I am planning to use the models for palpation of keel bones with more numbers of participants in Turkey. Since I am working at the faculty of Veterinary Medicine in Bursa, Turkey, I am

planning to do this with veterinary students. We (me and Sabine Gebhardt-Henrich) are also planning to use these models in a future training school of the Keel Bone Damage cost action where we will have a greater number of palpators and a bigger data set.

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