There is no standard surveillance system for flat horse-racing in Sweden, so the surveillance camera placement and quality varies between tracks. Thorough investigation of the current monitoring systems used revealed concerns about whether the stewards have enough time to estimate the number of whip strikes per horse. It led to the development of a technical solution that can be used in the supervision of whip use in horse-racing, useful where there are regulations limiting the number of strikes. Current specifications allow the system to send the attributes and number of strikes to the stewards. Stewards are thereby afforded more time to focus on actions that are important to the final result list. The prototype is a whip with force sensors placed on both sides of the cushion pad. The sensors, made of 0.203mm thick polyester, measure an area of 24mm by 275mm and covers the entire padded part. The sensor is connected to a microcontroller that sends information to the steward's office. The whip strike sensor prototype can distinguish between a wave of the arm that leads to no impact and a strike, as the force of each strike impact is recorded. The sensors can be embedded within the body of whips used in a range of equestrian disciplines. The possibility to register the properties of whip strikes will help to safeguard the welfare of horses used in these disciplines and provide information to the equestrian community that could change the way whips are used in training and racing.

Keywords: horse; racing; whip; force; sensor; welfare

36

Development of system for collection of positional based data for horses

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Data gathering is often a crucial part of Equitation Science. This project aimed to develop a tool to aid researchers gathering positional based data of horses. A data-collection system was developed, designed to enable cost-effective data acquisition, storage and presentation. The system includes a GPS-enabled collar for collection of positional data, as well as a platform for presenting the gathered data online. The GPS collar incorporates a microcontroller which allows tracking of horses within one metre. Furthermore, it is possible to extend the capabilities of the device to gather different types of equine data. The data are uploaded to a server and stored in a relational database for access via a graphical user interface using a dedicated website. The interface was developed using commonly practised interaction design methods such as user studies, heuristic evaluation and cognitive walkthroughs to ensure a user-friendly experience. Equitation science experts contributed to the design of the systems software in addition to the design and placement of the collar. The system can be used in Equitation Science projects that require identification of movement patterns of both individual horses as well as groups of horses and will be able to provide measures such as distance and speed of movement. It is able to be easily adapted according to the requirements of specific studies, and provides the possibility to collect objective data from horse's activities by removing the effect of the potentially biased human observer, and might thereby improve the quality of the conclusions in the scientific study.

Keywords: equine; data recording; positioning; GPS; software; welfare

37

Using accelerometers to automate the identification of the standing-rest position in a horse

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Horses spend 4 to 15 h/d in standing-rest. Deviations from normal resting behavior can indicate a multitude of welfare problems. Automating measurement of resting behavior would be helpful for early identification of welfare problems. A proof-of-concept case study was used to investigate if a tri-axial accelerometer could be used to monitor the standing-rest position in horses. Accelerometers (HOBO® Pendant G Data Logger) were positioned on both hind legs of a horse and set to record g-force values for the x-axis (pointing upwards), and z-axis (pointing inwards toward leg) at 1-s intervals. Leg position was filmed for 2-h then scored as standing square (all 4 legs bearing weight), standing-rest (1 hind leg rested and not bearing equal weight), or shuffling (leg in motion) for each 1-s of video and for comparison with accelerometer data. Data were analysed in R^{TM} using a classification Random Forest model. Seventy-five percent of data were used as training for the model and 25% for testing. Overall model accuracy was 95% when both x- and z-axes for both legs were included, and 92% when only the x-axis was utilised. Sensitivity and specificity (calculated using x-axis only), and were good for left leg standing-rest (91.6%, 94.8%), right leg standing-rest (91.4%, 98.3%) and standing square (94.3%, 88.2%), but poor for shuffling (0%, 99.9%). This high level of accuracy for determining when the horse was in a stand-resting position provides the first evidence that an accelerometer using a single axis can reliably measure this aspect of resting behavior in horses.

Keywords: equine; welfare; rest; behavioral monitoring; accelerometer

38

In search of the origin and definition for the term 'kreuz' resp. 'kreuzanspannen' ('back' resp. 'bracing the back') in equestrian parlance: a review

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The terms 'Kreuz' resp. 'Kreuzanspannen' ('back' resp. 'bracing the back') are used frequently. At the same time, they lack a clear definition and are therefore incomprehensible for many horsemen. The aim of the present study was to trace their origin, spread and apparent errors in translation as well as to suggest a definition. For this purpose, a literature search in German, English and French equestrian literature for the terms 'Kreuz/Kreuzanspannen' and related anatomical and biomechanical aspects was conducted. Among the literature investigated, Francois Antoine de Garsault (1741) and Salomon de la Broue's (1593) emerged as the earliest documented use of the term 'back' or its equivalents in other languages. However, the search was further complicated by an abundance of translation errors. For example, in the German translation of Du Paty's (1826) treatise, coccyx and pubis have been interchanged. Notably, the German Equestrian Federation replaced the