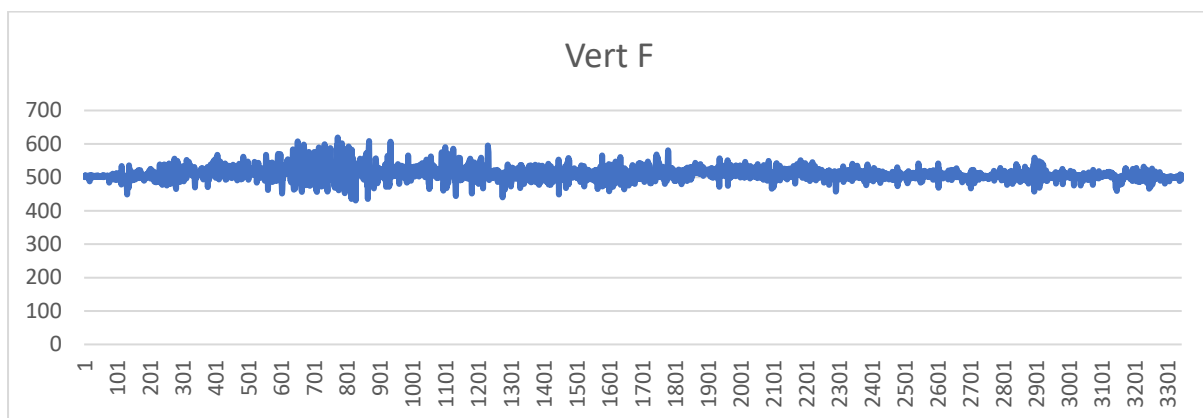


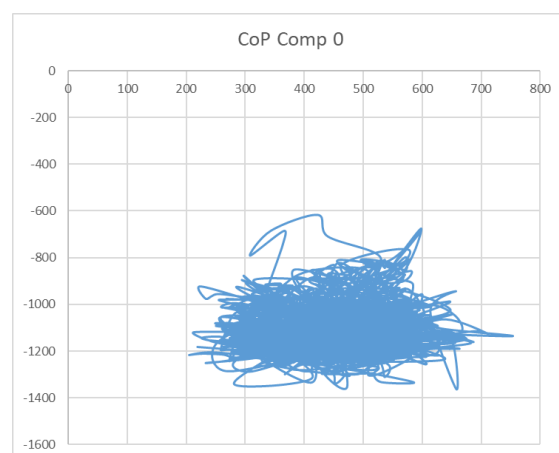
Behavioral and physiological responses of horses to road transport research report

With support from The Equine Trust, I was given the opportunity to participate in an equine transportation research project at Massey University with Dr. Bob Colborne and Prof. Chris Riley. We are looking at the postural and mechanical responses of horses during a float journey, with the aim of evaluating their behavioural responses to movements of the float that might throw them off balance and finding out how much 'work' the horses do during the trip. We are interested in the mechanical energy expended during the journey (vertical work), the horizontal distance travelled by the horses in the form of the small postural adjustments they are constantly making in response to the trailer movements, and the horses behavior during the one-hour trip as analyzed by video.

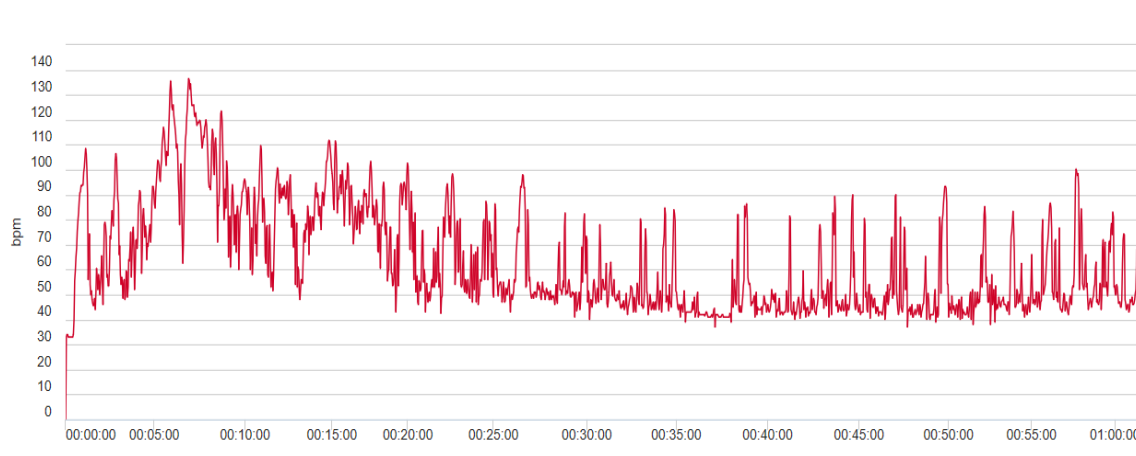
To collect the mechanical data, we put the horses in a float fitted with 24 load cells in the floor; six under each quadrant of the floor. These measured the vertical force exerted by the forelimbs of the horse, and the hind limbs, and when combined give us a representation of the horizontal position of the horse's centre of mass. By collecting the force data from under the pairs of feet, we can see exactly how much the horse moves and shifts its weight horizontally in the float. Using the distance moved and force exerted on the plates we can estimate the mechanical work done by each of the horses over the hour-long journey. The trace below is an example of the vertical force measured for one horse.



The centre of pressure data (CoP) for each pair of limbs also allows the calculation of the position of the total body centre of mass, as shown in the figure to the right. As the trailer moves, and the horse sways front-to-back or side-to-side, the software tracks this sway by recording the varying forces under each foot. In this trace, the horse swayed side-to-side about 400mm and front-to-back about 500mm. In a 1-hour float journey, the horizontal distance travelled by the centre of mass against the floor is about 205m.

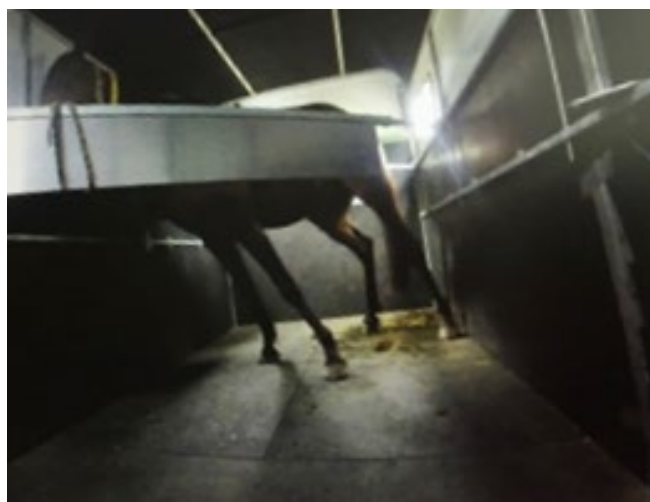


The horses were also fitted with heart rate monitors and a GPS. This will give us an insight into any stress or anxiety the horse is experiencing (which may be seen as an increase in heart rate). The GPS can also be used to see if the response of the horse coincides with a sharp turn or braking, for example. A sample of the heart rate data is shown below. The HR was elevated for the first 20 minutes of the journey, after which it was reduced. There are also many short-term spikes in HR, which may relate to individual events like turning, accelerating or decelerating.



In the video analysis of each trial we used Mangold behavioral analysis software to watch the video of each horse in the float and record its movements, such as ears back, scrambling, falling, resting its rump or hindlimb, flehming, and many more! With the use of an ethogram and other equine behavioral analysis research we can make some inferences into what these behaviors indicate about the comfort of the horses.

It was remarkable to see how much each horse had to balance themselves during the journey – and some were better than others. Here is an example of one of the horses leaning in response to a corner. You can see how it would take a lot of energy to stay upright!



Each horse underwent three 1-hour trailer journeys facing forwards, backwards, and on an angle. Once we have further analysed the data we may be able to suggest which direction is safer or more comfortable for a horse to travel. There are likely to be individual horse differences, for example which method the horse was trained to load in.

It has been eye opening to get an insight into what horses have to go through during a float journey. The combination of video and force plate data, along with heart rate sensors and GPS, has given us a full picture of the horses' reaction to turns, acceleration and deceleration, and bumps in the road.



I believe many horse owners could benefit not only from the conclusions drawn from our research, but further applications the project has unearthed. This could be the start of developing methods to improve the trailer journey for horses. Owners could even put their own horse in the trailer to find out which direction is best suited for their horse.

This research could be the start of decreasing the stress of a trailer journey for horses by utilizing the direction of travel, companionship, and possibly creating a way for the horses to see or predict the movement of the vehicle before the event, thus decreasing stress and injuries experienced during transportation.

Thank you for giving me the opportunity to participate in this research project. I have learned a lot. It is exciting to see where this research could lead and I now have a much better understanding of ways to improve equine welfare during transportation. I look forward to passing on my newfound knowledge.

Thank you,
Brooke Gordon, BVSc 4