HOFMAG

Proven benefits in treating equine musculoskeletal pain with Hofmag

A dissertation research project
by Andrea Good, BSc (Hons) Vet Phys

Establishing the effects of high intensity PEMF, Hofmag, on the musculoskeletal pain in horses

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Andrea Good is a Veterinary Physiotherapist and horse owner, based in the UK. With hands-on experience of how injury, tight, stiff muscles, decreased flexibility and range of motion can affect horses, Andrea knows the importance, both personally and professionally, of the right treatment.

As part of her extensive studies, Andrea loaned a high intensity PEMF machine from Hofmag to use in a study to establish its effects on musculoskeletal pain in horses. There was no funding for this study by Hofmag and Andrea has no affiliation with the company and can, therefore, be considered independent. The only contribution given by Hofmag was the advice to use the machine during the study for 30 minutes a day, for 5 consecutive days, in order to measure the therapeutic effect in a short space of time.

The study was conducted as a blinded, randomised control trial (RCT). RCTs are considered the gold standard when attempting to establish the efficacy of an applied intervention with no selection bias and a robust, statistically significant outcome.

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22 horses were included in total. There were 9 in the control group, and 13 in the treatment group. The horses represented a broad range of ages (4 to 25 years old), breeds and sex. Some were field kept and some were part stabled. All were in regular work defined as being active for 2 to 5 days each week. This is reflective of the typical demographic seen in the veterinary physiotherapy field. Throughout the trial, they were kept under the same living and working conditions as their normal lives before the study.

None were classified as lame but all were experiencing some level of musculoskeletal pain. However, they were all confirmed by their primary care vet as having no major prior pathology and none were on any medication. Owners were asked to abstain from giving any other musculoskeletal therapy throughout the duration of the study unless directed by the primary care vet, in which case, they would've been removed from the study.

The blinded assessor, who was qualified in equine massage and rehabilitation, was not privy to which horse was allocated to which treatment group. On day zero they conducted four assessments for each horse.

Following this, the horses in the treatment group received the prescribed treatment of 30 minutes daily for 5 consecutive days, while the control group received no treatment. There was no set protocol on what area of the horse was treated, rather treatment was focussed on the areas each particular horse needed help with.

On day 6, the same blinded assessor returned to retake outcome measurements. To avoid bias, the assessor was not privy to the outcome measures and scores from day zero when conducting the assessments on day 6.

The blinded assessor (who was not privy to which horse was allocated which treatment group) conducted four assessments for each horse. Following this, the horses in the treatment group received the prescribed treatment of 30 minutes daily for five consecutive days
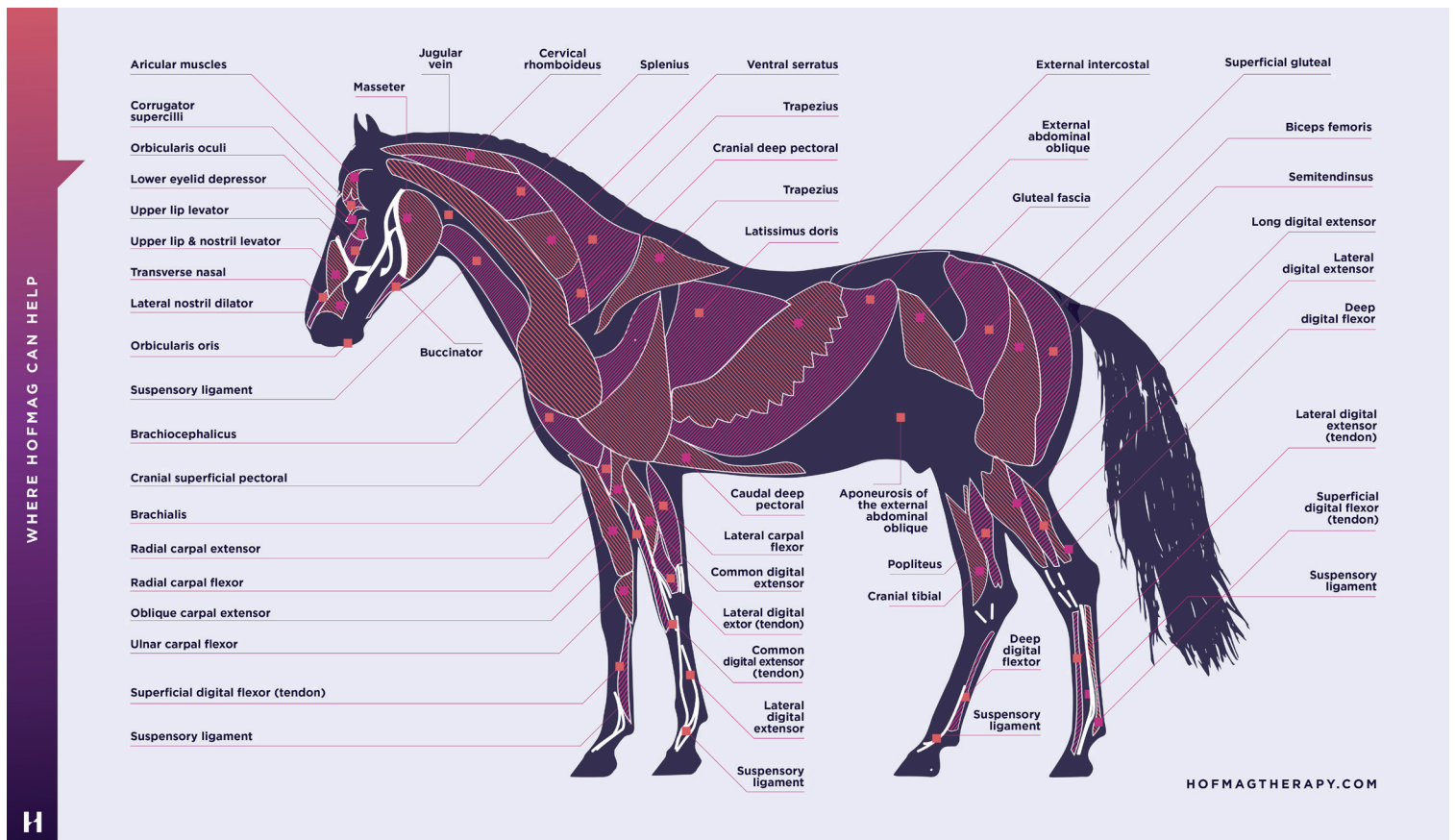
The four outcome measures

Four assessments were used to assess outcomes on each horse on day zero, and the same four were carried out on day six – muscle palpation, limb passive range of motion (PROM), spinal PROM and mechanical noiceceptive threshold (MNT).

In each assessment, the scores from each horse were added up to give a whole horse calculation for each individual.

Muscle palpation

The blinded assessor performed a detailed muscular assessment on all superficial muscles bilaterally and graded them on a scale of 0-5 according to tone.

Aricular muscles
Corrugator supercilli
Orbicularis oculi
Lower eyelid depressor
Upper lip levator
Upper lip & nostril levator
Transverse nasal
Lateral nostril dilator
Orbicularis oris
Buccinator
Suspensory ligament
Brachiocephalicus
Cranial superficial pectoral
Brachialis
Radial carpal extensor
Radial carpal flexor
Oblique carpal extensor
Ulnar carpal flexor
Superficial digital flexor (tendon)
Suspensory ligament

Masseter
Jugular vein
Cervical rhomboideus
Splenius
Ventral serratus
Trapezius
Cranial deep pectoral
Trapezius
Latissimus doris

External intercostal
External abdominal oblique
Gluteal fascia

Superficial gluteal
Biceps femoris
Semitendinsus
Long digital extensor
Lateral digital extensor
Deep digital flexor
Lateral digital extensor (tendon)
Superficial digital flexor (tendon)
Suspensory ligament

Caudal deep pectoral
Lateral carpal flexor
Common digital extensor
Lateral digital extor (tendon)
Common digital extensor (tendon)
Lateral digital extensor
Suspensory ligament

Aponeurosis of the external abdominal oblique
Popliteus
Cranial tibial
Deep digital flextor
Suspensory ligament

WHERE HOFMAG CAN HELP

Limb PROM

An assessment to observe restrictions in limb flexion, protraction, retraction and palpable soft tissue restrictions in the scapular (shoulder), grading them on a scale from 0 to 3.

Spinal PROM

An assessment to measure restrictions in lateral flexion at each specified vertebral landmark, including C1 to C5 and T9 to T18, grading them on a scale from 0 to 3.

MNT

A pressure algometer was applied to 10 soft tissue and boney landmarks, bilaterally to determine the minimum pressure required to induce a pain behaviour or response.

This test is considered an objective or semi objective assessment. While the three previous assessments are subject to the professional opinion of the assessor, MNT gives a quantifiable force reading but is still subject to human interpretation of behaviour. Tolerance to pressure is typically lower when applied to a bruised or injured area compared to a healthy area.

Four assessments were used to assess outcomes on each horse on day zero, and the same four were carried out on day 6, muscle palpation, limb passive range of motion (PROM), spinal PROM and mechanical noiceceptive threshold (MNT)

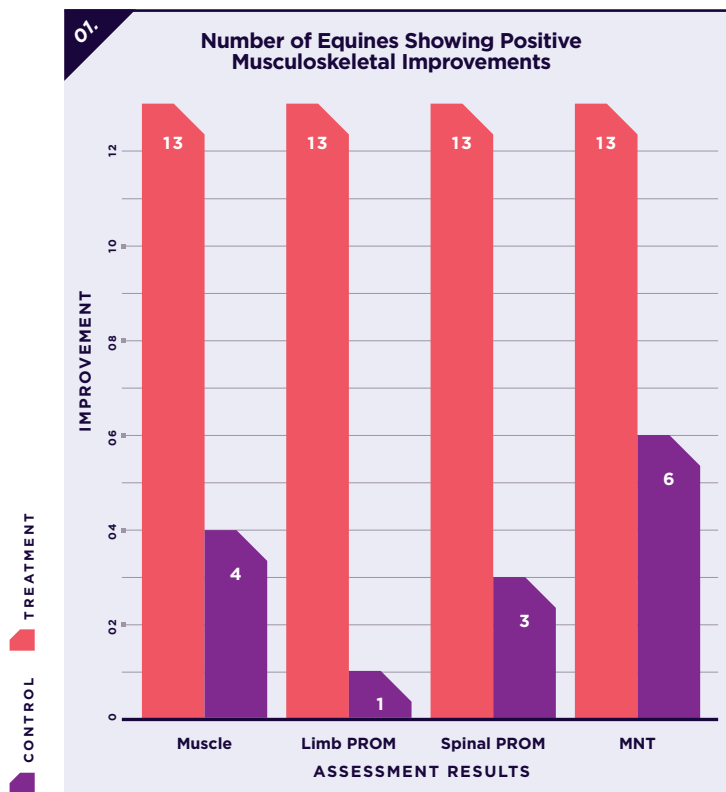# Significant positive results in the entire treatment group

The only horses to improve in all four assessment categories were those in the treatment group.

Some horses from the control group did improve in some areas but this improvement was generally marginal by comparison and likely to be explained by confounding variables. For example, being ridden on day zero or day six, the assessment days, wearing a poorly fitting saddle, or chance.

What is a P Value?

In scientific studies, the P value is a measure of probability. It's the number used to describe how likely it is that the changes that have been observed would have occurred by random chance. A P value of less than 0.05 is generally considered to be clinically significant.

P=0.05 means 95% confidence.

01.

Number of Equines Showing Positive Musculoskeletal Improvements

IMPROVEMENT

Muscle	Limb PROM	Spinal PROM	MNT
13	13	13	13
4	1	3	6

ASSESSMENT RESULTS

TREATMENT

CONTROL

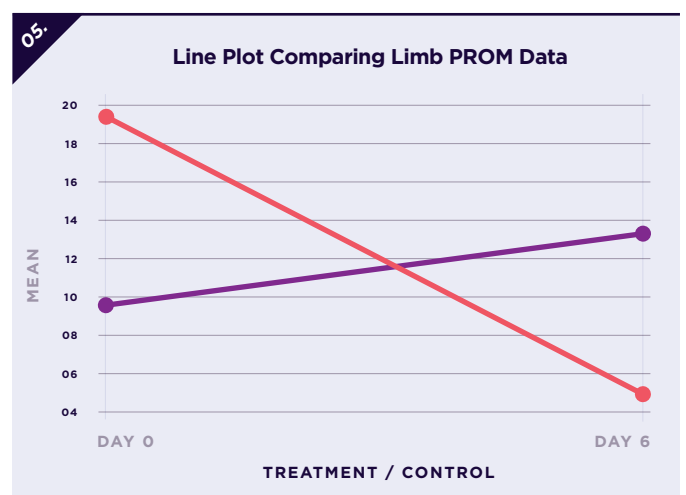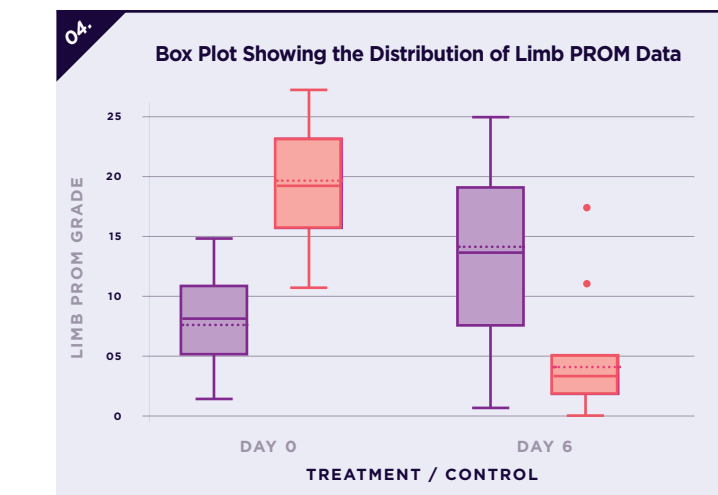**The only horses to improve in all four assessment categories were those in the treatment group**

The improvements in the treatment group are statistically significant and the team were able to return an overall P value of P=<0.001.
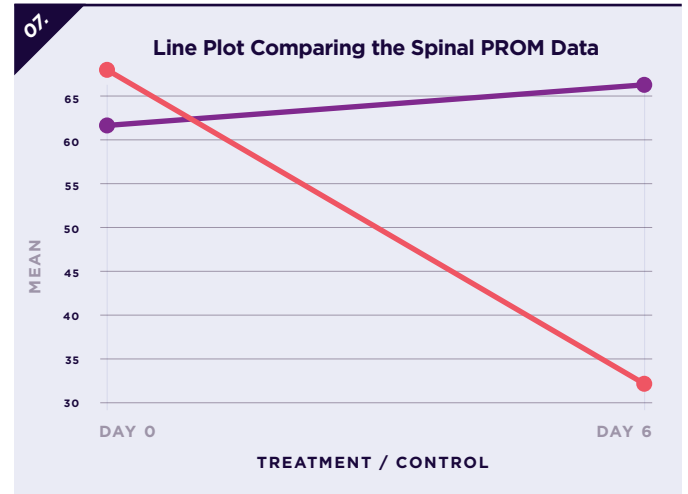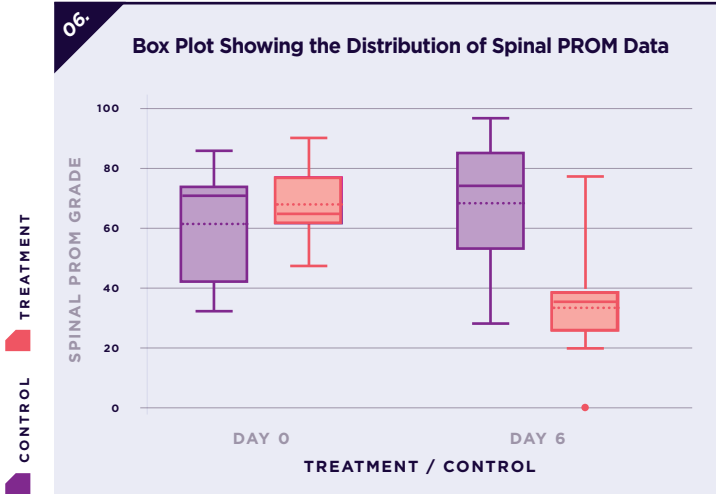
Digging deeper into the results

The muscle palpation box plot shows that there was no significant difference between the control group and the treatment group on day zero. This confirms adequate randomisation within the study. For example, the worst horses were not chosen for the treatment group. The line graph shows a significant decrease in scores after treatment, indicating that muscle tone had improved.

02. **Box Plot Showing the Distribution of Muscle Data**


03. **Line Plot Comparing Muscle Data**
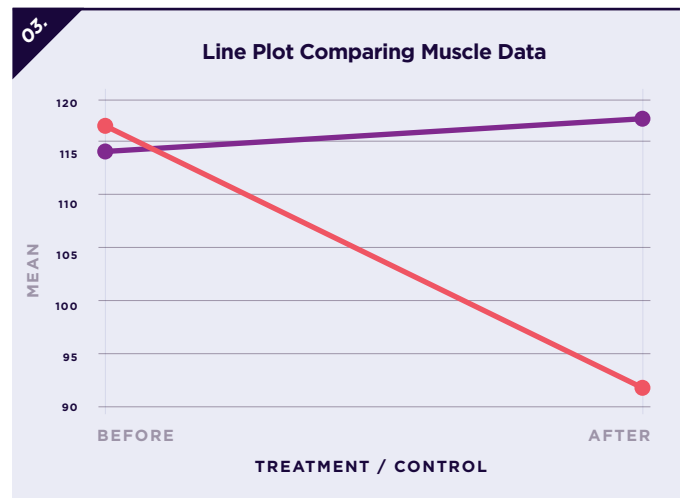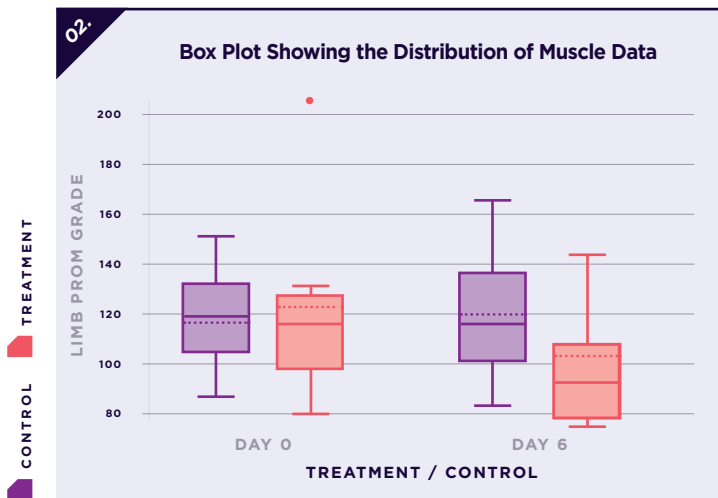
The limb PROM and spinal PROM control groups demonstrate a marginal increase in scores, indicating confounding variables or chance. However, the treatment group in both demonstrated a decrease in scores, by over half. Again, demonstrating a significantly positive response.

04. **Box Plot Showing the Distribution of Limb PROM Data**

05. **Line Plot Comparing Limb PROM Data**

Box Plot Showing the Distribution of Spinal PROM Data
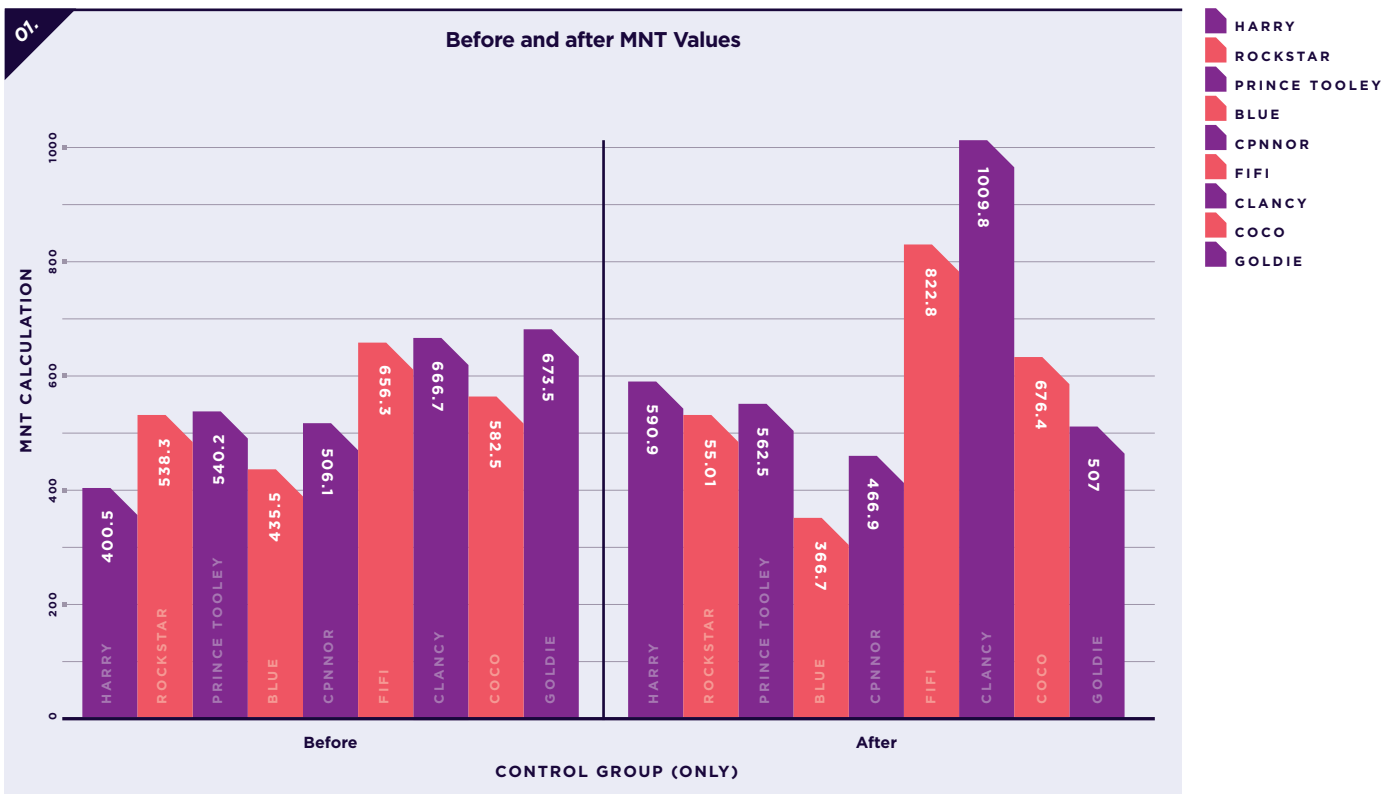

Line Plot Comparing the Spinal PROM Data

For the first three assessments a decrease in scores indicated a positive response. In the case of the pressure algometer used to measure MNT, an increase in scores indicated a positive outcome measurement.

Both the control group and the treatment group demonstrated an increase. However, this increase is marginal in the control group compared to a significant increase in the treatment group. Confounding variables and chance will play a part in this.

Box Plot Showing MNT Value Data

Line Graph Showing Te Mean MNT Values
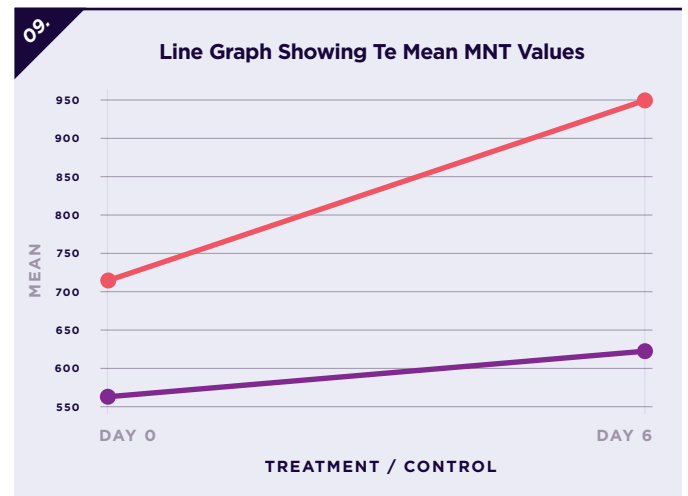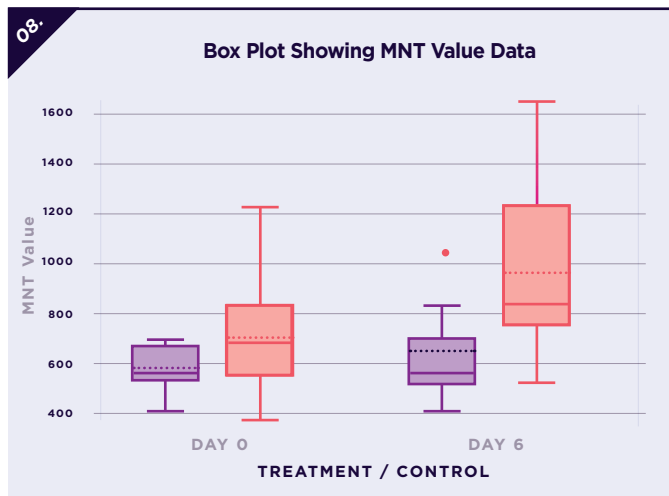
There is an additional need to consider the conditions in this assessment. Two horses (Fifi and Clancy) in the control group were initially assessed on day zero in cold, wet conditions and then assessed again on day six in dry, sunny conditions. Pressure algometry results can be affected by ambient temperature. That is, tolerance to a noxious stimuli will be lowered in poor weather conditions, explaining this marginal increase in scores in the control group.

Before and after MNT Values

CONTROL GROUP (ONLY)

Legend: HARRY, ROCKSTAR, PRINCE TOOLEY, BLUE, CPNNOR, FIFI, CLANCY, COCO, GOLDIE

Before values: HARRY 400.5, ROCKSTAR 538.3, PRINCE TOOLEY 540.2, BLUE 435.5, CPNNOR 506.1, FIFI 656.3, CLANCY 666.7, COCO 582.5, GOLDIE 673.5

After values: HARRY 590.9, ROCKSTAR 55.01, PRINCE TOOLEY 562.5, BLUE 366.7, CPNNOR 466.9, FIFI 822.8, CLANCY 1009.8, COCO 676.4, GOLDIE 507

A P value of less than P=0.05 was returned for all four assessments. In particular, the limb and spinal PROM assessments returned a P value of less than P=<0.001. In other words, there is a less than a 0.1% chance that the changes observed were down to anything other than the treatment by the Hofmag device.

This means a clinically significant result in all four assessments.

Individual Statistical Results

Assessment	P value
Muscle Palpation	P=0.003
Limb PROM	P=<0.001
Spinal PROM	P=<0.001
MNT	P=0.032

The improvements in the treatment group are statistically significant and the team were able to return an overall P value of P=<0.001

Treating equine musculoskeletal pain with PEMF

In conclusion, it can be said, scientifically, that the Hofmag device has a significantly positive effect on musculoskeletal pain in horses in terms of muscle tone, limb and spinal passive range of movement and pain modulation in horses.

The findings support the previous studies performed on humans that found that PEMF had a positive effect on muscle tone and pain.

For practitioners, this means confidence in the use of high intensity PEMF. An increase in active range of motion (how much the animal is choosing to move their limbs and body of their own accord) will naturally follow an improvement in limb and spinal passive range of motion.

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Recovery & Rehabilitation

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