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An initial investigation into the effects of The Equine Transeva Technique (pulsating current electrotherapy) on the equine *Gluteus superficialis*

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### Abstract

The Equine Transeva Technique (ETT), is a novel electrotherapy, which utilises pulsating current electrotherapy to target sensory and motor neurons. The technique may facilitate increased circulation and correction of musculoskeletal issues and injuries, such as tendon and ligament tears and muscle atrophy. Despite the importance of understanding the impact of ETT on horses, no current scientific research exists in this area. This preliminary study investigated the effects of ETT on the musculoskeletal system of the horse, specifically within the *Gluteus superficialis* (GS). Using surface electromyography, muscle workload was measured in 11 sound and healthy horses of varying breeds and disciplines within the inclusion criteria. Integrated electromyography (iEMG) calculated the percentage change in maximal contractions before and after ETT treatment during one minute trials at 30 second intervals. An ANCOVA determined if these constituted significant changes (Bonferroni adjusted alpha:  $P \leq 0.02$ ). Significant differences in muscle workload were found on the left side between pre and post treatment readings across trials ( $P \leq 0.02$ ), however no significant changes occurred for the right side. The majority of horses (82%;  $n=9$ ) experienced bilateral changes, with 78% of these ( $n=7$ ) exhibiting a negative change in muscle workload recorded from the pre treatment condition, which may indicate muscular relaxation. The results suggest ETT may have some effect on muscle workload in the athletic horse, however further research is needed to confirm the effects observed. Future studies should include randomising the side which is treated first, a larger sample size, expansion of temporal variables and consideration of a longitudinal study to determine if these trends accrue over multiple maintenance-purposed treatments.

Keywords: Electromyography, Equine Therapy, Equestrian Sport, Neuromuscular Physiology

No conflicts of interest apply to this work.

## 1 Introduction

2 The Equine Transeva Technique (ETT) is a method of electrotherapy utilising a high voltage  
3 current which is used to treat various musculoskeletal issues and injuries, such as muscle atrophy  
4 and pathology within the tendons and ligaments in humans (Arnold, 2016). This technique was  
5 first used in horses in the 1980s and is becoming more widespread as an adjunct treatment to  
6 maintain the current level of performance in the equine athlete, however this is not evidenced in  
7 scientific literature; despite the use of ETT within equestrianism, limited studies have investigated  
8 the short and long-term impact of the technique. The ETT machine produces twin peak  
9 monophasic waveforms that are reported to stimulate the sensory and motor neurons within soft  
10 tissue structures and in turn facilitate increased circulation (Arnold, 2016). The modality is thought  
11 to allow a higher voltage to be used compared to models such as Transcutaneous Electrical Nerve  
12 Simulation (TENS), which is believed to produce a more forceful current, however this is also  
13 currently unfounded due to the lack of research into ETT. Cyclic contraction and rest periods target  
14 sensory and motor neurons, communicating with the brain and spinal cord, to react via the motor  
15 circuits, which are responsible for locomotion (Kanning et al., 2010; Sandoval et al., 2010).

16 An ETT treatment consists of an electrical impulse emitted by ETT through the positively charged  
17 hand piece, creating rhythmic muscular contractions with the aim of normalising muscular tone.  
18 The use of ETT in a rehabilitation programme is similar to other electrotherapy methods in that  
19 the treatment is concentrated around the identified lesion or injury (Tabor et al., 2020). When  
20 muscle deteriorates, or wastage occurs such as that seen in muscle pathologies (Tabor and  
21 Williams, 2018) it is commonly associated with a decreased cross-sectional area (Kouw et al.,  
22 2019; Mukund and Subramaniam, 2020) and in humans, this has been correlated with pain (Hides  
23 et al., 1996). The presence of pain can alter movement patterns and induce loss of performance  
24 (Scheven, 2010). While electrotherapy can be useful in such cases, the presence of pain should  
25 always be evaluated by a veterinarian prior to treatment to identify indications or contraindications  
26 present (Adair and Phillips, 2018).

27 Evidence surrounding therapies for equine musculoskeletal conditions, including altered muscular  
28 function and muscle atrophy is limited, however translation of research that has been conducted  
29 on human subjects can assist clinical reasoning when selecting appropriate interventions for  
30 treatment in horses (Tabor, 2018). Current knowledge of ETT is sparse, with little known about  
31 the precise mechanics of ETT or how the technique impacts muscle physiology. Previous case  
32 studies on South African racehorses have reported that ETT is successful in treating soft tissue  
33 injuries, including muscle, tendon and ligament lesions (Arnold, 2016). Because this has not been  
34 objectively validated, there is a need for investigation surrounding how this therapeutic method  
35 impacts the musculoskeletal structures. With the spread of the technique and its arrival into the  
36 equine electrotherapy market, this investigation focused on identifying what effect, if any, the  
37 technique has on one of the main hindlimb locomotor muscles responsible for power generation  
38 and contractile force (Leisson, Jaakma and Seene, 2008).

39 This study aimed to evaluate if ETT increases motor neuron activity in the horse and determine  
40 the duration of any effects observed, using integrated electromyography (iEMG). We hypothesised  
41 that the muscular workload would vary substantially between horses, but that changes would occur  
42 between pre and post treatment trials.

43

44 **Methods**

45 Ethical approval for the study was granted by the Hartpury Ethics Committee.

46 *Subject Criteria*

47 Data were collected from 11 horses (mean age:  $10.8 \pm 3.1$  years, mean height:  $164.4 \pm 4.1$ cm, sex:  
48 6 mares, 5 geldings, of various breed). Horses included met strict inclusion and exclusion criteria  
49 in order to increase the validity and reliability of results within subjects (Table 1) (Nankervis et  
50 al., 2015). This allowed increased accuracy in comparison of horses due to similar fitness levels  
51 and body composition (Huber et al., 2011). The horses had no clinical signs of pain and consent  
52 for participation was gained as required by the UK Veterinary Surgeons Act (Exemptions) Order  
53 2015. Horses were previously habituated to the ETT technique having undergone a minimum of  
54 one ETT treatment in the last 12 months, but not within the six weeks prior to this study  
55 (Petropoulos et al., 2014).

56

57 Table 1: Inclusion and exclusion criteria for participants

Inclusion	Exclusion
Minimum of 1 ETT treatment in the last 12 months, but not within the 6 weeks prior to the study	Pain or lameness
Sound/Pain free	Significant muscular atrophy in hindquarters
152.4-182.9cm in height	No exposure to ETT in last 12 months
Mare or Gelding	Any previous neurological diagnoses
7-20 years of age (ideal 10-15)	Not in regular exercise (less than 3 sessions per week)
In regular exercise (minimum 3x/week)	Less than 152.4cm or over 182.9cm in height
	Less than 7 years of age or over 20 years of age

58

59 *Subject Preparation*

60 Horses were restrained with a halter and either placed into secure cross ties or tied in an enclosed  
61 stable depending on which method was used in the horse's normal environment (Jonckheer-  
62 Sheehy and Houpt, 2015) (Myers, 2005). The horse was required to be standing square, with a  
63 neutral head and neck position (Alvarez et al., 2006). In order to prevent factors that may influence  
64 muscle movement, stimuli around the horse i.e. distracting sounds and peers were removed as  
65 much as possible (von Borstel et al., 2010). The practitioner stood at the caudal end of the horse  
66 and the researcher stood at the cranial end of the horse during data collection trials to monitor any  
67 movement that might compromise the data. A single researcher placed one surface  
68 electromyography sensor (sEMG), to minimise variance of placement, using the *tuber coxae*, *tuber*  
69 *sacrale* and *tuber ischii* as bony landmarks to locate the belly of the left and right GS (Williams et  
70 al., 2013). A chalk outline of the muscle was then drawn based on anatomical landmarks in relation  
71 to the belly of the muscle to ensure correct placement (Zaneb et al., 2009). The determined sensor  
72 location was shaved to 0 mm hair length using a disposable razor, and a 70% isopropyl alcohol  
73 skin wash was applied with a cotton pad to the shaved area and allowed to evaporate before

74 attaching the sensors (De Luca et al., 2010; Williams, 2018). The sensor was aligned with the  
75 muscle fibre direction, positioning the arrow towards the hock (Zsoldos et al., 2018) and secured  
76 using the system's own adhesive backing. All sEMG data collection and analysis were conducted  
77 in line with Surface Electromyography for the Non-Invasive Assessment of Muscles (SENIAM)  
78 guidelines (SENIAM, 2020).

#### 79 *Data Collection Trials*

80 Data were collected using one sensor on each GS from the Delsys, Trigno™ sEMG system  
81 (Boston, MA, USA). An initial bilateral sEMG reading, lasting 60 seconds, was recorded to  
82 ascertain each horse's pre treatment muscle activity allowing data to be normalised to the  
83 maximum contraction (Hanon et al., 2005). This was repeated with a 30 second break in between  
84 each trial to gain a total of three 60 second trials and if the horse moved prior to the 60 second  
85 mark, the timer was restarted in order to form the true static baseline. The horse then underwent a  
86 15-minute ETT treatment on the left hindquarter with the sensors remaining *in situ* for the duration  
87 of the treatment to achieve a prompt recording immediately following treatment (Figure 1). The  
88 practitioner moved the hand piece, which served as the electrode, over the area. As per the ETT  
89 equipment requirements, and completion of an electrical circuit and thus conductivity, was  
90 established via a second electrode at the withers (a metal plate underneath a by a saline soaked  
91 towel). A saline wash was applied to the area of treatment (GS) however this was avoided in the  
92 region of the sEMG sensor. A trial recording was then taken from the left sensor immediately after  
93 the treatment, giving the therapist a 15 second countdown to remove the machine and immediately  
94 begin the sEMG recording (Williams et al., 2013). Two additional left side trials were conducted  
95 with 30 second intervals between 60 second recordings. An identical process was then conducted  
96 on the right GS including treatment and data collection trials.

97 Figure 1: Experiment set up during treatment between pre-treatment and post-treatment trials. In this  
98 image, the therapist is treating the hindquarter with the handheld device which is connected to the metal  
99 plate on the wither; the sEMG sensor can be seen above the practitioner's hand.

#### 100 *Data Processing*

101 The raw EMG traces were exported into Delsys EMG Works™ Version 4.3.2 for analysis. An  
102 initial bandpass filter embedded in the processing software ([www.delsys.com/emgworks](http://www.delsys.com/emgworks)) was  
103 applied to the data to remove noise (5-420Hz) which could alter the processing and analysis (De  
104 Luca et al., 2010). Any trials not reaching 60 seconds or having clear abnormalities as detailed in  
105 the inclusion criteria (Table 2) were securely discarded (Walker et al., 2014). Visual assessment  
106 identified the first eight consecutive peaks representing the onset and offset of muscle activity, and  
107 these were isolated and quantified, an approach which has been validated by Zsoldos et al (2010)  
108 for the purpose of identifying muscle activity within repeated measures. To allow for further  
109 comparison between trials, integration of the full wave rectified signal (iEMG) was performed to  
110 determine the percentage of difference to maxima for contractions (Hug, 2011; Delsys®, 2013).  
111 The same process was then repeated for post treatment trials, (Hug, 2011). Amplitude minima,  
112 amplitude maxima and amplitude mean of the first eight peaks of each trial were measured and  
113 recorded in MS Excel 2019 (Microsoft, Redmond, WA, USA) prior to statistical analysis.  
114 Median±IQR and the percentage change from pre to post treatment trials GS were calculated.

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Table 2: Data inclusion and exclusion criteria

Data Inclusion Criteria	Data Exclusion Criteria
Horse standing square during collection	Hind legs uneven during collection
Neutral head and neck positioning during collection	Head and neck position elevated or drastically lowered
60 seconds of recorded data for each trial	Movement during collection
	Electrode not flush with skin or adhesive comes loose during or immediately after collection
	Horse exhibits anxious behaviour during collection

121

### 122 *Statistical Analysis*

123 Data were analysed using Statistics for Social Scientists (SPSS, Version 26; Chicago, IL, USA).  
124 Data met non-parametric assumptions in a Kolmogorov-Smirnov test ( $P \leq 0.05$ ) (Liang, Fu and  
125 Wang, 2019; Yilmaz, 2019) therefore a series of Wilcoxon Signed Rank analyses determined if  
126 significant differences occurred from pre-treatment (PreTx) to post-treatment (PostTx) values in  
127 peak iEMG contractions, for individual horses and across the cohort (van Doorn et al., 2020). Due  
128 to the potential for type I errors or false positives, given the sample size and repeated trials, a post  
129 hoc Bonferroni correction was applied resulting in a revised significance of  $P \leq 0.02$  (Chan et al.,  
130 2020). The Bonferroni adjustment was required due to aspects such as discipline, age and sex that  
131 cause an inherent variability between horses (North and Hoffman, 2017; Vermeulen et al., 2017).  
132 Reliability between trials was assessed using Cronbach's Alpha (de Vet et al., 2017). Friedman's  
133 analysis with post hoc Wilcoxon Signed rank analyses tested if differences occurred between trials  
134 across the cohort (significance:  $P < 0.05$ ) (Lopez-Vazquez and Hochsztain, 2019).

### 135 **Results**

136 Across the cohort, a reduction in muscle workload and maximum contraction occurred in (GS)  
137 responses after treatment (PostTx) (Left:  $1.41 \pm 0.02\%$ ; Right:  $0.09 \pm 0.2\%$ ); these changes were  
138 statistically significant on the left side (ANCOVA:  $P \geq 0.02$ ). Reliability of repeated measurements  
139 within horses and across the cohort was poor (Cronbach's Alpha coefficient: 0.33;  $P \leq 0.02$ ). All  
140 data below are presented as medians  $\pm$  interquartile range (IQR) unless otherwise stated.

#### 141 *Cohort Results*

142 Across the cohort, horses recorded a reduction in normalised maximum dynamic contraction  
143 PostTx ( $0.02 \pm 5.81\%$ ) compared to PreTX trials, however this was only found to be significant on  
144 the left side ( $P \leq 0.02$ ). Across the cohort, 64% of horses ( $n=7$ ) exhibited a decrease in muscle motor  
145 neuron activity (MNA) from PreTx to PostTx trials on the left GS (PreTx:  $9.52 \pm 0.76$ ; PostTx:  
146  $6.83 \pm 2.04$ ). This percentage increased for the right GS, where 73% of horses recorded a decrease  
147 ( $n=8$ ; PreTx:  $9.82 \pm 0.55$ ; PostTx:  $9.65 \pm 0.54$ ). The reported changes were bilateral in 82% of the  
148 horses ( $n=9$ ), with 78% of these ( $n=7$ ) exhibiting a negative change (Table 3). It should be noted  
149 that a high degree of variability was observed in muscle MNA, both within and between horses  
150 across the cohort, in the PreTx and PostTx trials.

151 Table 3: The mean percentage of difference in muscular workload within each horse from PreTx  
152 to PostTx trials. Laterality or handedness of difference in magnitude shows intra-horse side  
153 differences.

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#### 154 *Individual Horses*

155 GS MNA decreased sequentially across the three trials or decreased by trial three from pre  
156 treatment readings in all horses except horses four and six. This reduction occurred across all other  
157 subjects, but the magnitude of responses varied based on the individual (Table 3, Figure 2). A  
158 pattern of differences in muscle MNA occurred between each PostTx trial: Trial 1:  $9.62 \pm 3.11$ ;  
159 Trial 2:  $8.23 \pm 2.38$ , a 14.4% reduction from trial one; Trial 3:  $4.75 \pm 3.85$ , a 42% reduction from  
160 trial two and a 51% reduction from trial one. Irrespective of these trends, there was no significant  
161 difference between the trials (Friedman's:  $P > 0.05$ ).

#### 162 *Intra-Subject Trends*

163 Variation in stimulated muscle activity was observed across horses, with the majority of horses  
164 demonstrating a larger change on one side compared to the other. Horse one presented with the  
165 largest negative change out of the cohort from pre-treatment (PreTx) to post treatment (PostTx) on  
166 the right GS (5.81%) (Figure 2) and horse five exhibited the largest negative change on the left GS  
167 at 5.55%, however in this case the right side change was marginal at 0.03% (Table 1, Figure 2).  
168 Horse two showed the smallest percentage change on the right GS at 0.02%, but the left GS was  
169 the second highest negative change at 3.63% (Figure 2). While the majority of MNA percentage  
170 changes were bilaterally negative, in 64% of horses ( $n=7$ ) one side differences were marginal  
171 ( $\leq 0.04\%$ ) and the other side experienced  $> 2\%$  change (Table 1). Horse 11 was unique in that it  
172 showed nearly identical negative changes bilaterally, with the left presenting a -2.76% difference  
173 and the right a -2.9% difference from PreTx to PostTx. Horses 6 and 9 were the only individuals  
174 to both present bilateral positive changes (Table 3, Figure 2).

175 Figure 2: Median Amplitudes PreTx and PostTx for horses one, two, five, six, nine and eleven.

176

177

#### 178 **Discussion**

179 Significant differences in muscle MNA were only identified on the left side between pre and post  
180 ETT treatment, however an overall trend for reduced MNA post treatment was observed. The  
181 primary proposition for this unilateral response is that the left side was treated first across the  
182 cohort, and the ETT may have had contralateral effects, leading to a smaller measured change  
183 within the right side (Minetto et al., 2018). Research has identified that contralateral exercise  
184 improved range of motion, which can be justified within the bilateral fascial connections (Fermin  
185 et al., 2018). This link may explain why the left side, which was treated first, showed significance  
186 after the Bonferroni adjustment and the right side did not if the effect of the treatment crosses the  
187 sagittal plane via the fascia (Scott and Swenston, 2009). Simultaneous measurement of both left  
188 and right hand sides of muscles would be beneficial in future studies to identify the full influence  
189 of the treatment.

190 While statistical significance has provided a universal framework for researchers, when analysing  
191 determinants of performance, small changes can translate to functional differences being observed,

192 despite no significant differences being recorded (Quintana, 2018). Therefore although  
193 significance differences in MNA were not present in all parts of this sample, the descriptive  
194 differences observed could be indicative of functional changes occurring in the muscle in response  
195 to ETT accordance representing minimum clinically important differences (MCID) (Copay et al.,  
196 2007; Ruhdorfer, Wirth and Eckstein, 2015) and contributing to overall performance gains within  
197 the context of marginal gains theory (Quintana, 2018). The determinants of MCID are subjective,  
198 patient led responses which identify the smallest change that is considered worthwhile (Torrens,  
199 Guirro and Santana, 2016; Sedaghat, 2019). Due to the subjective nature of this measure, it is not  
200 possible to determine this in the horse apart from the view of the owner or rider, however it is a  
201 consideration in evaluating the controversial correlation between statistical significance and  
202 functional improvement (Guzik et al., 2019; Okoroha et al., 2019).

### 203 *Marginal Gains Theory*

204 The marginal gains theory postulates that improvements in individual areas by just 1% can  
205 accumulate to a large improvement in performance (Hall, James and Marsden, 2012). Therefore  
206 with this approach, change may still be meaningful when unaccompanied by a significant visible  
207 outcome, as consistency comes from the aggregation of multiple marginal gains (Durrand,  
208 Batterham and Danjoux, 2014). This method has been widely accepted in biomedical science,  
209 relating marginal gains to enhanced recovery after an operation (Fleming et al., 2016; Khuddus,  
210 Truesdell and Kirtane, 2020; Leng and Mariano, 2020).

211 Within this study, the horses underwent a full body treatment after data collection, but for the  
212 purposes of this study, only data from the GS was recorded. With significant effects being seen on  
213 the left side, marginal gains may be achieved through each treatment with the ETT; the aggregated  
214 effect in multiple muscles may result an improvement in functionality and overall performance  
215 (Nierenberg et al., 2015; Chapman et al., 2016; Liyanage, 2017). The majority of horses exhibited  
216 marginal changes in GS muscle MNA, either unilaterally or bilaterally within one 15 minute ETT  
217 treatment. The GS is only one muscle in a large interlinked system in the horse, it is possible that  
218 this change among multiple muscles produced during a full body treatment may contribute to  
219 functional changes (Leisson, Jaakma and Seene, 2008).

220

### 221 *Trends Observed*

222 One of the objectives in this study was to identify whether changes produced by the ETT were  
223 sustained for more than 60 seconds post treatment. PostTx trials recorded reductions in GS MNA  
224 lasting into trial three, which began at three minutes PostTx; however these decreases were not  
225 found to be significantly different to PreTx values. The time period used here may not have been  
226 sufficient to provide a full picture of the effect of treatment, thus future research with a longer  
227 observation may exhibit effects lasting for more than four minutes as well as long term impact  
228 needed to substantiate beneficial results of treatment (Pool and Laubscher, 2016). A trend of right-  
229 side laterality was observed in the subjects who competed in polo, who had greater changes in  
230 maximal contraction PostTX in the right GS, consistent with the common side of the rider's swing  
231 and the unilateral compensation and fitness (Brydon, 2016).

### 232 *Rehabilitation Versus Maintenance*



233 Within this study all horses were required to have no clinical signs of pain and the participants  
234 were certified by the veterinarian to not be undergoing therapy for rehabilitation purposes which  
235 may have impacted the results (Khalilzadeh and Tasci, 2017). Treatment for the purpose of  
236 maintenance is likely to be used to sustain current performance capabilities, thus horses are already  
237 at an appropriate level of fitness and functionality (Goff, 2016; Tabor, 2018). While this may be  
238 true, the effect of high intensity exercise as seen in training and competition of the equine athlete  
239 often results in muscle fibre damage and associated soreness in the muscle (Hedayatpour, Izanloo  
240 and Falla, 2018). This may be observed in the changes seen in individuals who had just completed  
241 their competition season at the time of data collection, along with those who had been treated every  
242 six weeks for the past 12 months where only minor adjustments were needed.

#### 243 *Limitations*

244 Due to the external nature of sEMG there was variability between each animal, as exhibited by the  
245 poor results of the Cronbach's alpha (32.8%). This may result from the reduced reliability seen in  
246 EMG when used outside of temporal measures (Lowery, Stoykov and Kuiken, 2003; Felici, 2006).  
247 Factors that influence sEMG signal acquisition include body fat percentage, which may alter the  
248 ability of the signal to reach and return from the muscle effectively, giving skewed results (Felici,  
249 2006; Williams, 2018). Similarly, the fitness level and muscle fibre type are important  
250 considerations due to their individuality and influence on recruitment patterns and neuromuscular  
251 connectivity (George and Williams, 2013; Williams, 2018). Within the demographics of the horses  
252 included, there are differences in each of these factors such as muscle fibre type variations due to  
253 differences in disciplines (McLean and McGreevy, 2010; Williams, 2018). Equine and human  
254 research has shown that EMG signals are highly individual (Patterson-Kane and Firth, 2009;  
255 Williams et al., 2014; Williams, 2018), therefore a within-subjects design was applied, with each  
256 subject acting as their own control (pre-Tx reading) and data collected within a single session to  
257 limit their influence on the results. The methods used optimised data quality (Felici, 2006),  
258 however it should be acknowledged that the use of one sensor on each muscle gives only a single  
259 snapshot of a limited cross section of muscle fibres. With the large size of the GS, the sensor must  
260 be placed with awareness of topographical specificity in order to avoid cross talk from other  
261 muscles and tendinous insertions (Williams, 2018). Although using only one sensor may have been  
262 a disadvantage, sEMG sensors do allow observation of more motor units than needle methods  
263 (Wijnberg et al., 2003). The goal of measuring changes in horses during maintenance treatments  
264 may have introduced a limitation due to the effect size likely being smaller and more difficult to  
265 identify than in a rehabilitation setting (Khalilzadeh and Tasci, 2017). The possible impact of  
266 laterality may suggest that randomising the order of treatment would yield more consistent results,  
267 whereas this study treated the left GS first on every individual. If laterality and contralateral effects  
268 were controlled for, differential effects from those observed in this study may be observed.

#### 269 **Conclusion**

270 A reduction in motor neuron activity of the GS was found in 82% of horses after ETT treatment,  
271 however these changes were only significant on the left side. Due to this, the primary suggestion  
272 for future research is to randomise the side on which the treatment session begins and to assess the  
273 impact bilaterally throughout the entire duration of data collection. Future research should also  
274 consider the timeline of data collection in an effort to ascertain whether there are long term benefits  
275 and how long the effects of treatment are maintained in the muscle. It may be useful to narrow the  
276 participant criteria to further control for limiting factors such as discipline, timing of data collection

277 in reference to competition season, and body fat percentage. While inferences may be made as to  
278 how these data reflect the impact on the GS, further work studying the effects of ETT must consider  
279 the skeletal system as a whole.

final draft

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**Figure Legend:**

Figure 1-Page 3: Experiment set up during treatment between pre-treatment and post-treatment trials. In this image, the therapist is treating the hindquarter with the handheld device which is connected to the metal plate on the wither; the sEMG sensor can be seen above the practitioner's hand.

Figure 2- Page 6: Median Amplitudes PreTx and PostTx for horses one, two, five, six, nine and eleven.

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