THE EFFECTS OF SWEDISH MASSAGE ON PERFORMANCE HORSES IN SOUTH AFRICA

J. BADENHORST, P.J. FOURIE & M. VOSLOO
CENTRAL UNIVERSITY OF TECHNOLOGY, FREE STATE

Abstract

A somatologist receives skilled training in different alternative therapies, as well as the well-being of the entire body. Massages on equine athletes, may not only broaden the horse-loving somatologist's specialising field, but might improve the horses' performance and well-being by using massages, as a warm up/cool down routine. The objective of the research was to investigate the effects of Swedish massage on the performance ability of competitive horses. Swedish massages were applied on thirty horses, from various breeds, representing three disciplines namely Dressage (n=10), Endurance (n=10) and Saddlebred (n=10). Each horse received ten massage treatments over a period of five weeks. The horses' performance improvement was measured to analyse their flexibility, muscle injury and relaxation before and after the massages. Although the blood parameters for muscle injury, aspartate aminotransferase (AST) and creatine kinase (CK) did not respond to the Swedish massage, the results indicated that the treatments resulted in significant ($P<0.05$) lower heart rates, as well as improved flexibility of the horses' necks, backs and shoulders. Human athletes benefit from Swedish massage to enhance their performance ability. Equine athletes have similar ailments as humans and then the possibility exists that equine athletes may benefit as human athletes. This then can be aligned with the somatologists scope of practice and broaden their working field.

Keywords: Somatologist, equine athlete, relaxation, Dressage, Endurance

1. INTRODUCTION

Swedish massage focuses on improving circulation of blood and lymph and relaxing superficial muscles (French 2017). Deep tissue massage is a dedicated set of techniques incorporating a slow, consistent, firm pressure focused on reaching the larger layers of muscle and tissue deep under the skin and surface muscles and fascia (connective tissues). (Canfield 2013).

The Swedish massage manipulations of Per Henrik Ling, often referred to as the father of Swedish massage, have been taught and performed for over two centuries. Swedish massage has been and is still used by massage therapists, amongst other manual therapists and health care workers around the world (Weerapong, Hume and Kolt 2005). Massage manipulations are skilfully performed in different ways, either by the therapist's hands or by mechanical means (Casanelia and Stelfox 2010). Swedish massage consists of a specific set of massage movements: effleurage, or sliding movements;

petrissage, or kneading movements; friction, or rubbing; vibration and percussion. It traditionally also includes passive and active joint movements - stretching and bending joints with the assistance of the massage therapist (French 2017). Each movement plays a specific role in the Swedish massage sequence. The sequence begins with long steady strokes releasing build-up tension, stimulating the nervous system and increasing blood circulation. It is designed to interrupt the cycle of stress and internalised muscle tension by energising the body and stimulating circulation. The goal of a Swedish massage is relaxation, rehabilitation and a sense of well-being and inner peace (Canfield 2013). Therapeutic massage, such as Swedish massage, has been used to support the general effects of physiotherapy massage. Physiotherapy massage can be used for the preparation of athletes for competitions, and in-between competitions. It assists in the recovery from competitions, rather than treating specific problems (Weerapong et al. 2005). Relieving physical and psychological ailments to improve their performance, human athletes visit a physiotherapist or a somatologist for therapeutic massage therapies.

An equine athlete may, in a similar way to a human athlete, benefit from Swedish massage performed by a somatologist as a therapeutic massage therapy. The performance horse is an equine athlete used for competitions such as dressage, endurance racing, polo, showjumping, etc. Attaining optimal individual performance within the equestrian discipline, the performance horse must be in peak condition and possess the correct psychological state (Booth 2009). As an athlete, the performance horse might experience muscle soreness, pain and fatigue, but the horse is unable to verbalise pain or fatigue, which could influence the horse's performance ability. The equine athlete also uses various muscles to perform specific movements related to the discipline of competing (Hall, Huws, White, Taylor, Owen, and Mcgreevy 2013). Known effects of massaging a horse are improvement of the horse's performance by treating and preventing muscle tension which can lead to a muscle injury; and relaxation, which can lead to better concentration during training sessions, as the horse can concentrate on the manoeuvre rather than on discomfort or pain. Competitive horsemen/women want to have a fit and healthy horse in order to perform optimally, thus increasing the resale value of the horse. Performance progression may be influenced by a muscle injury, poor flexibility and nervous horse. A Swedish massage performed on the equine athlete may relieve discomfort and pain by improving flexibility of muscle and promote relaxation. (Hourdebaigt 2007).

Swedish massage, amongst others, is studied by the somatologist which provide them with the knowledge to perform these specialised massages on human clients (Vosloo 2009). The somatology industry is an opposing profession, and with a broadened specialization field the somatologist may have a competitive advantage. The results obtained may be a golden opportunity for the horse loving somatologist to broaden their specialization

field by catering for the horse's well-being, which can be aligned with somatologists' current interest of catering for the human's well-being. The research question that arises is whether Swedish massage may have an effect on the performance ability of competitive horses.

2. MATERIALS AND METHODS

The study was conducted at pre-determined stable yards in the Bloemfontein area. The majority of the stable yards were situated in the Groenvlei area, whilst one stable yard was situated in Bainsvlei, and another in Mimosa Park. A non-blinded, multi-site experimental design that was exploratory in nature was used to identify the effects of Swedish massage on the performance horse. The study analysis has followed a mixed-method approach by collecting and analysing qualitative and quantitative research data. Qualitative research was conducted through the practical performance of Swedish massage on the horses, whereas quantitative data was collected from the horse owners/trainers/riders through pre- and post-intervention questionnaires. The pre- and post-intervention questionnaires were informed and compiled after a literature review was conducted. The type of questions displayed in the pre- and post-intervention questionnaire were open-ended questions (Denscombe 2007).

2.1 Animals

Dressage, Endurance and Saddlebred horses were selected due to the diverse riding skills required in the three disciplines (Sly 2001). Dressage is defined as more flat work, and precision riding, whilst Endurance riding encompasses riding for long hours over long distances. Saddlebred horses are popular show horses, and are classified by smooth riding and sure-footedness, and they can be three- or five-gaited horses. The Saddlebred horse can perform a highly elevated walk, trot and canter, as well as two artificial four-beat gaits, namely high stepping gait and extremely fast track gait. The Free State Horse Society, Endurance Horse Society and Saddlebred Horse Society were contacted electronically and telephonically by the researcher in order to obtain lists of registered members of the identified disciplines for the study. All performance horses, irrespective of the discipline, need to be registered with a professional body, thus by utilising the lists obtained from the different societies all horses adhered to the same standards. The different lists of performance horses obtained were scrutinised, and through a stratified random sampling method, ten horses from each discipline that adhered to the inclusion and exclusion criteria were selected (n=30).

2.2 Measurements

A week before the first Swedish massage treatment, a veterinarian assessed the vital life signs of all horses. The horse's performance may be aligned with poor flexibility, muscle injury and nervous horse. The flexibility of the horses' muscles was determined by the measurement of the over-reach distance, and the back, neck and shoulder range of motion of each horse. All flexibility measurements were conducted by performing the stretches freely and not through forced stretches - thus active stretches. The first flexibility measurement from all four areas was conducted before the first Swedish massage treatment, and the second measurement was conducted after the tenth Swedish massage treatment. Exactly the same methods for both of the flexibility measurements were used.

The neck flexibility was measured by performing neck stretches and measuring the distance between each horse's shoulders and head. The beginning of the measuring tape was placed in the middle of the Masseter muscle, aligned with the ear attachment. The end of the measuring tape was placed in the middle of the shoulder blade, aligned with the withers. The same measurement was done for the left and right side of the neck (Hourdebaigt 2007).

The shoulder flexibility was measured by means of straightening the front leg and extending the front limb to the maximum lifting height, thus until resistance was achieved. The beginning of the measuring tape was placed behind the horse's carpus, and the end of the measurement was placed on the ground. The same measurement was done on the left and right front leg (Ettl 2002).

Each horse's back flexibility was measured by performing a carrot back stretch, and observing the distance the horse could stretch its back by placing the horse's head between its front legs. The further the horse's nose reaches past the carpus, the more flexible the horse's back is (Ettl 2002). The effectiveness of the measurements was identified by using a Likert scale created by the researcher.

The horses' over-reach distance was measured whilst the groom walked each horse on a leach, and the researcher observed the placement of the horse's front hoof and hind hoof tracks made in the sand. The over-reach distance measurement is identified by measuring the over-reach distance of the hind hoof track past the front hoof track on the ground. The track made on the ground was measured from the middle of the frog cleft of the front hoof track to the middle of the frog cleft of the hind hoof track with a measuring tape. The same measurements were done for the left and right over-reach distances (Palmer 2012).

Blood samples (n=30) were drawn from the jugular vein (maximum of five millimetres) prior to the first, before the seventh and after the tenth Swedish massage treatment by a veterinarian. The blood samples were tested for aspartate aminotransferase (AST) and creatine kinase (CK) by Pathcare Vet Lab. These samples were tested for AST and CK in order to determine any indication of a muscle injury in the horses (Garlinghouse and Fleming 2000). The units of measurement for both enzymes AST and CK is IU/L. Serum Aspartate aminotransferase (AST) measurements were done within sample stability time, using the Beckman Coulter AST kinetic enzyme colorimetric assay based on recommendations of the International Federation for Clinical Chemistry (IFCC) on a Beckman AU480 instrument. The analytical range of the assay is based on linear enzyme activity of 3 – 1000 IU/L, with a total imprecision (CV%) of less than 4.23% for this assay. Serum Creatine kinase (CK) kinetic enzyme colorimetric assay based on recommendations of the International Federation for Clinical Chemistry (IFCC) on a Beckman AU480 instrument. The analytical range of the assay is based on linear enzyme activity of 10 – 2000 IU/L, with a total imprecision (CV%) of less than 4.55% for this assay.

2.3 Treatments

A pre-intervention questionnaire was provided to each horse owner / trainer / rider prior the first treatment. Horses were massaged twice per week for five weeks at the same time each day, for 40 minutes (Hourdebaigt 2007). Swedish massage movements mostly consisted of stroking and kneading movements and stretching of the muscles afterwards. Each horse's heart rate was observed before and after treatment, while the behaviour and relaxation signs were observed during the Swedish massage treatment, and both were recorded on the treatment record card. A post-intervention questionnaire was provided to the horse's owner / trainer / rider.

2.4 Data analysis

Data from the data collection sheets, as well as the data gathered from the pre- and post-intervention questionnaires, were captured by the researcher in a Microsoft ® Excel spreadsheet. Any further analysis was done by a statistician using SAS Version 9.2. Descriptive statistics, namely frequencies and percentages, were calculated for categorical data. Means and standard deviations or medians and percentiles were calculated for numerical data. Most of the data analysis was reproduced with the median values due to the skewness of data displayed when the mean values were used.

3. RESULTS AND DISCUSSION

The demographic information was recorded through the use of the pre-intervention questionnaire. Demographic information recorded indicated that some horses were stabled in a stable by day or night, while others were kept in

a paddock during the day or night. Furthermore, the average age for the different horse breeds from all three disciplines were 9.46 years. Training and competing schedules differ for each discipline. The training territory ranged from sandy arenas to hard ground. The horses different age ranges did not influence the performance ability because all the horses were in their peak performance years. The training territory may influence performance ability because the impact on the muscles is more on hard ground than on sandy arenas.

In this section the pre- and post-intervention results for each flexibility area will be displayed and discussed. The four areas that were included in the flexibility measurements are the neck, shoulders, back and hindquarter areas of the horses, as mentioned earlier. The pre-flexibility measurement was taken before the first treatment, and the post-flexibility measurement after the tenth treatment. Flexibility can be defined as lack of tightness in a muscle (Frick 2010).

3.1 Flexibility measurement results

Firstly, the median neck flexibility measurements, both on the left and right side of the horse, are displayed in Figure 3.1 for each of the three disciplines. It is important to note that an improvement in the flexibility of the neck is marked by a decrease in the measured distances. The nature of the method used to measure the neck flexibility indicates an improvement in flexibility when the horse is able to bent its neck with a shorter distance, thus meaning the horse can bend its neck closer to its body. The pre-value for each discipline was taken before the first Swedish massage, and the post-value was taken after the tenth massage. A significant difference ($P<0.05$) were indicated by all the neck measurements of all three disciplines, except the left neck measurement of the Dressage horses.

Comparing the three disciplines, it was evident that the Saddlebred horses have shown the greatest improvement in the neck area. This can be due to the Saddlebred horses' neck muscles working exceptionally hard during riding in order to maintain their frame of a high-held neck and head position.

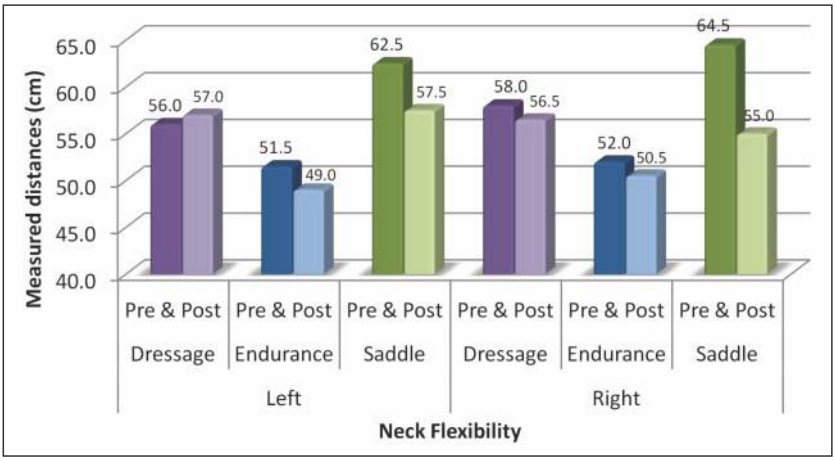

Figure 3.1 Median flexibility measurements of the neck zone pre and post intervention (n = 30)

The horse's neck muscles are already tensed without it being ridden due to the horse's heavy head and neck. During horse riding, the horse rider uses the horse's neck as a "steering wheel", therefore the weight from the horse's head is shifted from side to side, influencing the balance of the horse and the neck muscle may compensate to support opposing muscles. This may cause tension in the horse's neck, which may lead to poor flexibility and poor performance (Dausend 2005). When the left and right side of the neck in Figure 3.1 is compared in the specific disciplines, there are notable differences in the left and right side measurements, which can be an indication of the neck muscles compensating to support the opposing muscles. The improvement in the measurements may indicate that Swedish massage may promote flexibility, minimising compensating muscles.

Flexibility or suppleness and strength are two important components for the ability of muscles to perform (Ettl 2002). Speed and proper performance is dependent on muscular strength and suppleness. When a horse is ridden either running in a straight line or performing delicate lateral movements, the muscle demands a certain amount of suppleness for rapid stride turnover. Suppleness involves rapid change of limb position or rapid change of direction. In order to achieve these rapid movements of the limbs, the muscle requires mobility in the tissues surrounding the joints. The suppler the muscle is, the greater the ability of the horse to perform certain manoeuvres. Elasticity or flexibility of the muscles, tendons and ligaments allows not only for controlled, quick movements, but also for the avoidance of pulling a muscle (Porter 1998).

Good flexibility of the neck muscles increases the horse's athletic ability, balance and suppleness (Ettl 2002). A professional horseman, Dunning

(2014) states that good flexibility causes versatility, and versatility results in an obedient horse. An obedient horse handles easier and also learns new training techniques easier. Figure 3.2 follows

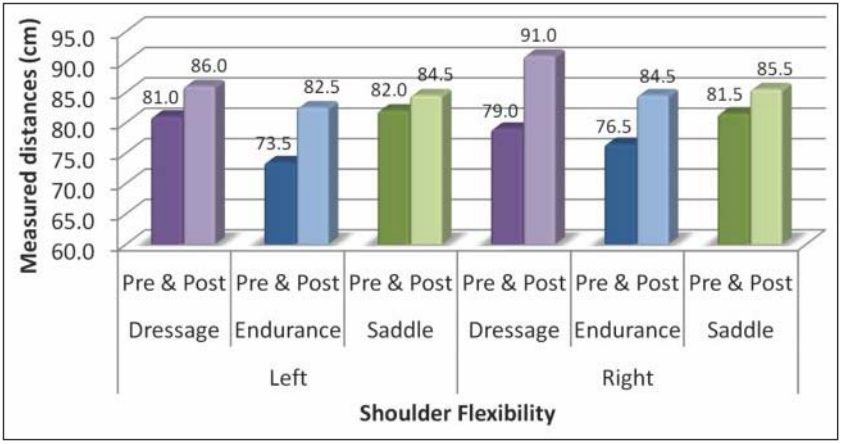

Figure 3.2 Median flexibility measurements of the shoulder zone pre and post intervention (n = 30)

Secondly, the median shoulder flexibility measurements, both for the left and right side of the horse, are displayed in Figure 3.2 for each of the three disciplines. Here an increase in the measurement indicates an improvement in the flexibility of the shoulder. When comparing the median values within each discipline, all categories, except the left side of Dressage horses, showed a significant improvement ($P < 0.05$) in the flexibility of the shoulder. No significant differences ($P > 0.05$) between the disciplines were observed when the median differences were compared. This may be an indication that all the disciplines experience the same degree of tension in the forelimbs or shoulder area. According to the results all three disciplines experience equal forelimb strain due to the nature of all three disciplines' manoeuvres. The approximately 40% of the horse's body weight is carried by the forelimbs thus without any riding the forelimbs already experience strain. During training/riding, in the three disciplines, even more strain may be forced on the forelimbs, regardless of the nature of the manoeuvres aligned with the discipline. Thus, the forelimbs experience equal strain during riding in the three disciplines.

When a rider climbs onto the horse and requires a certain frame from the horse without any warm-up, and forces the head, neck or shoulders into a fixed shape, it may result in irreversible muscle tension. A tensed muscle may have lack in range of motion, leading to poor performance. Tension limits muscle movement, interferes with performance cause severe pain, reduced flexibility and tender trigger points (Jacobs 2014).

Relieving muscle tension may enhance the range of motion of the joints. Improved range of motion enables the horse to perform the rider's requested aids more effectively, thus enhancing the horse's performance ability. In studies it was indicated that an improvement in range of motion may be primarily the result of muscle relaxation (Frick 2010). By performing a massage in order to improve tensed muscles of the shoulder, the limb's range of motion may be improved, entitling the horse to perform different movements better.

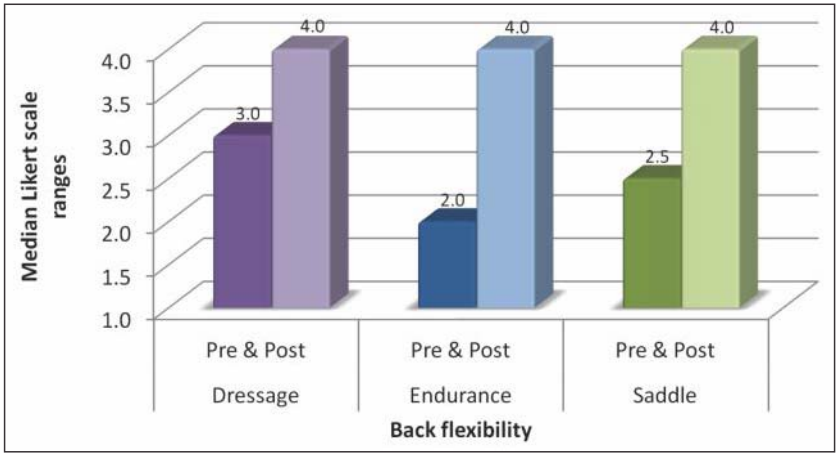

Figure 3.3 Median flexibility measurements of the back zone pre and post intervention (n = 30)

For the third area (back of the horse), the median flexibility measurements are displayed in Figure 3.3 for each of the three disciplines. Here an increase in the Likert scale measurement indicates an improvement in the flexibility of the back. All three disciplines showed a significant improvement ($P < 0.05$) between the median pre- and post-intervention measurements. The notable improvement in the flexibility of the horses' back muscles may be due to the fact that their back muscles are the origin for most forelimb and hindquarter muscles. Thus, when the horse uses its forelimbs and hindquarters for movement, it places a great amount of tension on the back muscles. Tension in the back muscles may lead to discomfort symptoms in the forelimbs as well as the hindquarters. The back muscles of the horse work exceptionally hard. Furthermore, the saddle is placed on the horse's back muscles, which can lead to tightness in the back muscles. The horse's back muscles are in need of relaxation and proper flexibility due to the mentioned influencing factors, which may be linked to the notable improvement in back flexibility after the Swedish massages. No significant differences ($P > 0.05$) between the three disciplines were observed when comparing the median differences. This may be an indication that the horses' muscles work equally hard in all three disciplines. All three disciplines require a saddle during competitive riding.

This may be the reason for no significant difference between the three disciplines

Improvement in back flexibility through the application of Swedish massage will result in a more enthusiastic horse and minimise discomfort felt in the back muscle during riding. Swedish massage enhances the blood circulation, thus warming the muscles, which leads to balanced functioning of the muscles and improved flexibility. A flexible back will enhance the horse's overall movement and promote enthusiastic involvement during training. (Ettl 2002).

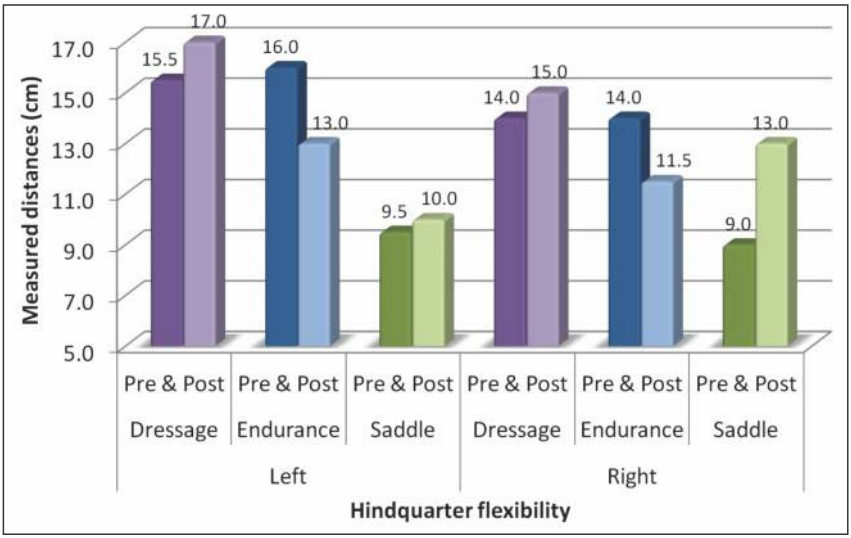

Figure 3.4 Median flexibility measurements of the hindquarter zone pre and post intervention (n = 30)

Lastly, the median hindquarter flexibility measurements, both on the left and right side of the horse, are displayed in Figure 3.4 for each of the three disciplines. Here an increase in the measurement indicates an improvement in the flexibility of the hindquarter. The pre-value for each discipline was taken before the first Swedish massage, and the post-value was taken after the tenth massage. Although not significant ($P > 0.05$), it is interesting to note that both the left and right side of the Endurance horses showed a decrease in their flexibility. No significant differences ($P > 0.05$) were observed within or between the disciplines. The hindquarters are the power of the horse's body and during riding, in all three disciplines, the hindquarters is engaged to produce power. Thus the hindquarters may benefit more from a deep tissue massage rather than Swedish massage. (Palmer 2012).

During the study lighter pressured Swedish massages were performed on the hindquarters, which might have led to the decrease in flexibility. This might

contradict literature which stated that light pressure also influences the bulky hindquarters. However, it has to be mentioned that seven of the Endurance horses involved in the research study participated in the Fauresmith endurance ride during the research study, which placed a tremendous amount of strain on the horses' muscles. This might be linked to the results that were obtained.

3.2 Blood sample results

Multiple ranges between pre-, middle- and post-values for each blood sample are indicated in Table 3.1. The effect of Swedish massage on the blood samples drawn, aspartate aminotransferase (AST) and creatine kinase (CK) for the three disciplines are also indicated.

Table 3.1 The effect (mean ± standard deviation) of Swedish massage on aspartate aminotransferase (AST) and creatine kinase (CK) levels for the three disciplines

PARAMETER	PRE-BLOOD TEST (n=10)	MIDDLE-BLOOD TEST (n=10)	POST-BLOOD TEST (n=10)
Dressage			
AST	298.00 ± 103.72[a]	272.70 ± 44.40[a]	275.50 ± 32.90[a]
CK	240.50 ± 162.82[a]	222.30 ± 86.34[a]	202.10 ± 30.37[a]
Endurance			
AST	322.60 ± 115.66[a]	287.40 ± 66.62[a]	330.89 ± 88.75[a]
CK	221.10±54.14[a]	177.60±34.56[a]	565.78±1119.63[a]
Saddlebred			
AST	251.60 ± 51.52[a]	228.30 ± 43.31[a]	262.20 ± 59.52[a]
CK	175.30 ± 27.83[a]	165.70 ± 39.69[a]	189.70 ± 57.50[a]

Means with different letters within the same row differ significantly: P<0.05
[AST= aspartate aminotransferase; CK= creatine kinase; Pre=before first massage; Middle=before 7th treatment; Post=after 10th treatment]

There was no significant difference (P>0.05) in the comparison of the pre-, middle- and post- blood sample results. Muscle enzymes, aspartate aminotransferase (AST) and creatine kinase (CK), help to indicate the presence of muscle injury or disease and the severity and progression thereof. A muscle injury may show elevated levels of AST and CK enzymes. A muscle injury may be linked with poor performance in competitive horses because they do not perform sound (term used for smooth movements during riding without signs of discomfort) movements. The blood sampling before the commencement of the Swedish massage treatments were done to indicate

any muscle injury occurrence. The results from the sampling indicated normal levels of AST and CK which may reveal that no horses had a muscle injury before the treatment started. Furthermore, the middle blood sampling results did not significantly improve from the pre blood sampling. This may reveal that no injury to the muscles has occurred due to the Swedish massage treatments. The post blood sampling results also indicated no significant improvement from the previous two blood sampling results. This may be indicative that Swedish massage do not influence the muscle by causing a muscle injury. Observing the blood chemistry of these enzymes together with the observation of other clinical signs such as lameness, pain or dark urine, help the veterinarian to identify the severity of possible muscle damage that might have occurred.

Important considerations for the examination of these blood chemistry enzymes are taking blood samples before, during or after exercise, and determining whether any other stressful events (an unplanned gallop, recent vaccinations, a long outride) may have contributed to the blood chemistry results. Very high enzyme blood chemistry results after a long outride are not necessarily an indication of muscle damage. The horse's muscles might have been over-trained as a result of poor fitness (Garlinghouse and Fleming 2000).

Creatine kinase is a muscle enzyme produced during exercise. Prolonged endurance exercise has shown an increase in CK levels without any clinical signs of muscle damage. Normal CK levels are between 0-175iu/l, and muscle exhaustion may cause higher levels which peak two to three hours after insult. Increased CK levels may return to normal after three days (Pavord and Pavord 2004).

Aspartate aminotransferase is an enzyme released by both skeletal and cardiac muscles, as well as the liver, as a result of protein metabolism. Normal AST levels are between 0-300iu/l. Muscle exhaustion causes high levels of AST which may peak 24 to 36 hours after insult. Increased AST levels persist in serum for two to three weeks (Pavord and Pavord 2004). As with CK, AST levels may also rise after prolonged exercise without any indication of muscle damage. AST levels rise slower than CK levels and remain in the blood for a longer period. Elevated AST levels in a horse with normal CK levels may indicate that the horse was exposed to intense muscular stress sometime during the previous week (Garlinghouse and Fleming 2000). Thus, AST and CK serums alone are not a sufficient indication of muscular health (Larson 2012).

The non-significant difference ($P>0.05$) might be due to the fact that the Saddlebred horses' muscles were over-trained the day or even week before the blood sampling was done. Insufficient research has been done on the effect of Swedish massage on these muscle enzymes. These enzymes are an indication of the muscular health of the horse, and possible occurrences of

diseases such as liver damage. It is therefore difficult to determine the exact effect that Swedish massage has had on the horses' AST and CK levels. Swedish massage is the most effective in promoting relaxation, and not in improving the health of the muscle, like deep tissue massage. On the other hand, it is evident that Swedish massage does not negatively influence the horse's muscular health. The enzymes AST and CK were sampled in this study to indicate possible lowering of AST and CK levels, which could be an indication of muscle health improvement due to the Swedish massages. According to the results obtained there was no correlation with these expected results and Swedish massage.

3.3 Relaxation results

Table 3.2 provides the relaxation signs by indicating the horses' heart rate measurement differences before and after each treatment.

Table 3.2 The effects (mean ± standard deviation) of Swedish massage on the heart rate measurements - measured before and after ten Swedish massages

PARAMETER	HEART RATE BEFORE (Beats/min.) (n=10)	HEART RATE AFTER (Beats/min.) (n=10)
Dressage	36.00 ± 4.00[a]	34.60 ± 3.60[b]
Endurance	32.50 ± 4.90[a]	31.60 ± 4.40[b]
Saddlebred	34.3 ± 4.60[a]	33.50 ± 4.00[b]

Means with different letters within the same row differ significantly: p<0.05

Massaging the different zones had an overall significant effect in reducing the heart rate of the horses, as indicated in Table 3.2. A significant difference ($P<0.05$) was indicated in the Dressage horses' heart rate measurements. The average pre-treatment heart rate measurement was 36 beats per minute, and the average post-treatment heart rate was 34.6 beats per minute. The average pre-treatment heart rate measurement of the Endurance horses was 32.5 beats per minute, whilst the average post-treatment measurement was 31.6 beats per minute. A significant difference ($P<0.05$) is displayed.

A nervous horse's heart rate may increase dramatically during stress, whilst a relaxed horse shows a decrease in heart rate (McBride, Hemmings and Robinson 2004). The resting heart rate of a horse is when the horse is resting quietly in a stall, stable or paddock. The normal resting heart rate of a horse ranges between 25 to 40 beats per minute. Measuring a resting heart rate in relaxed, resting conditions is important, as sudden excitement, fear or anticipation can elevate the heart rate rapidly to over 100 beats per minute (Humphrey 2003).

Resting heart rate is one of the vital signs that can provide an excellent benchmark when it comes to assessing the general health status of the horse. An increase in the resting heart rate might be an indication that the horse has an underlying disease or disorder. From Table 4.7 it is evident that none of the horses showed an increase in heart rate due to fear, excitement or anticipation, therefore it can be deducted that the Swedish massages only relaxed the horses and did not make them nervous.

A further response to the Swedish massage that was measured was the horses' visual responses towards the massage, which were recorded on a record card. During the research study, the researcher developed methods of recognising the horses' visual responses to touch. These responses enabled the researcher to release accumulated stress in key junctions of the body which mostly affected the horses' performance. Lick and chew, amongst others, was a visual response, which showed a significant difference ($P<0.05$) in the percentage between Dressage, Endurance and Saddlebred horses at treatment three and treatment seven. The behavioural changes of the horses are an indication that the horses perceived the Swedish massage treatments as a pleasurable characteristic or “reward”. This “reward” potentially allows the massage to have relaxation qualities on the horse (Mcbride et al. 2004).

4. CONCLUSION

A horse's performance may be influenced by a muscle injury, poor flexibility of the muscle, a nervous horse, etc. Improvement of these influencing factors may improve the horse's performance ability. As mentioned earlier, known effects of a Swedish massage on humans is relaxation and improvement in muscle flexibility. Thus the researcher's curiosity was triggered by the possibility of performing a Swedish massage on horses which may result in similar human Swedish massage effects.

The research results indicated a lowered resting heart rate after the Swedish massage, which showed that the horses interpret the Swedish massages as relaxing. Furthermore, the horses' flexibility in the different zones (neck, back and shoulders) improved as a result of the Swedish massages performed on them, which can be noted as an improvement in the horses' range of motion. Analyzing the research results, the researcher came to the conclusion that Swedish massages performed on horses have similar effects when compared with the human Swedish massage. A somatologist have the knowledge to perform a human Swedish massage. The research results indicated that the horse loving somatologist can effectively perform a Swedish massage on a horse to improve relaxation and muscle flexibility. This can broaden the somatologist's specializing field by performing Swedish massages on horses. Furthermore, the possibility arises for the somatologist to work in collaboration with a veterinarian or horse trainer to improve discomfort signs shown due to tensed muscles or a nervous horse.

Comparing the three disciplines, the Saddlebred horses showed the most improvement in the neck area. This indicates that the Saddlebred horses experienced a lot of tension in the neck before the Swedish massages, and that this tension was released after the massages. Saddlebred horses can mostly benefit from a neck massage in order to prevent tension in the neck area. During a full body Swedish massage for a Saddlebred horse, most of the massage attention should be focused on the neck muscles. Dressage and Endurance horses responded best to a shoulder massage. Competitive horse owners may attend a Swedish massage training session which will equip them with skills to perform a massage on their own horse which can be incorporated into a warm up/ cool down routine.

Recommendations for future studies will be to rather investigate the relaxation effects of Swedish massage by sampling and testing the horses' salivary cortisol concentrations, and to include a Likert scale of one to five to record the horses' responses towards the massage.

Furthermore, it is recommended that horse owners consider incorporating Swedish massage in the horses' training routine, to help the horses' muscles recuperate faster after strenuous activity, thus improving the horses' performance ability. A limitation to a somatologist performing a Swedish massage on horses is that a somatologist need to have experience in horse behavior and handling of horses.

The results obtained were, however, temporary. A horse should receive a Swedish massage treatment at least once per week in order to maintain the results.

5. REFERENCES

BOOTH, R. 2009. *The role of massage in the management of the performance horse.* (http://www.elementals.com.au/equine/articles/booth_3.pdf) Retrieved on 6 July 2013.

CANFIELD, J. 2013. *Deep Tissue vs. Swedish Massage.* (http://bodysagemassage.com/deep-tissue-vs-swedish-massage/) Retrieved on 27 November 2017.

CASANELIA, L. & STELFOX, D. 2010. *Foundations of massage.* Third Edition 16:163. Australia: Churchill Livingstone.

DAUSEND, T. 2005. *The Horse's head and neck in relation to balance.* (http://www.ridingart.com/balance.htm) Retrieved on 13 May 2015.

DENSCOMBE, M. 2007. *The good research guide for small-social scale research projects.* Third edition. England: Open University Press.

DUNNING, A. 2014. *Horse-training for flexibility, Part 1.* (http://americashorsedaily.com/horse-training-for-flexiblity-part-1/#.VVNKJ46qqko) Retrieved on 5 May 2015.

ETTL. R. 2002. *The practical horse massage techniques for loosening and stretching muscles.* Germany: Cadmos Equestrian.

FRENCH, R. 2017. *The Difference Between Swedish Massage & Deep Tissue Massage* (https://www.livestrong.com/article/157061-the-difference-between-swedish-massage-deep-tissue-massage/) Retrieved on 27 November 2017.

FRICK, A. 2010. Stretching exercises for horses: Are they effective? *Journal of Equine Veterinary Science* 30(1):50-59.

GARLINGHOUSE, S. & FLEMING, B. 2000. *How to read a blood panel in one easy lesson* (http://www.quia.com/files/quia/users/medicinehawk/2407-Vet/labs.pdf) Retrieved on 5 January 2015.

HALL, C., HUWS, N., WHITE, C., TAYLOR, E., OWEN, H. & MCGREEVY, P. 2013. Assessment of ridden horse behavior. *Journal of Veterinary Behavior: Clinical Applications and Research* 8(2):62-73.

HOURDEBAIGT, J. 2007. *Equine massage, A practical guide.* Second edition. New Jersey: Wiley Publishing Inc.

HUMPHREY, P. 2003. *The importance of understanding resting heart rate.* (www.distanceriding.org/php/articles) Retrieved on 9 June 2015.

JACOBS, B. 2014. *How the body regulates muscle tension.* (http://beverlyjacobsequinemassage.com/?p=2295) Retrieved on 13 May 2015.

LARSON, E. 2012. *Muscle problems can cause poor equine performance.* (http://www.thehorse.com/articles/29363/muscle-problems-can-cause-poor-performance) Retrieved on 9 June 2015.

MCBRIDE, S.D., HEMMINGS, A. & ROBINSON, K. 2004. A preliminary study on the effect of massage to reduce stress in the horse. *Journal of Equine Veterinary Science* 24(2):76-81.

PALMER, S. 2012. *Horse massage for horse owners: Improve your horse's health and wellbeing.* Great Britain: Clerkenwell House.

PAVORD, T. AND PAVORD, M. 2004. *The complete equine veterinary manual.* New Edition. North America: F&W Publications Inc.

PORTER, M. 1998. Stretching for horses. (www.thehorse.com/articles /10491/stretching-for-the-horse) Retrieved on 2 June 2015.

SLY, D. 2001. *Riding a horse.* Select Edition. London: Annes Publishing Limited.

VOSLOO, M. 2009. *A framework to position the somatology profession in South Africa*. (Unpublished MTech Thesis.) Central University of Technology, Free State: Bloemfontein.

WEERAPONG, P., HUME, P.A. & KOLT, G.S. 2005. The mechanisms of massage and effects on performance, muscle, recovery and injury prevention. *Sports Med* 35(3).