

# THESIS

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**The effect that standardbred racehorse training has on the horses' limbs  
from an animal welfare aspect**

TDK Thesis

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## **List of abbreviations**

- STBR: Standardbred racehorse
- SDFT: Superficial digital flexor tendon
- TMTJ: Tarsometatarsal joint
- WOAH: World Organisation for Animal Health
- OIE: Office International des Epizooties
- EU: European Union
- SL: Suspensory ligament
- CDJ: Centrodistal joint
- PIT: Proximal intertarsal joint
- HILT: High intensity laser therapy

## **1. Introduction**

Standardbred horse racing, also known as harness racing, is a discipline where the horses are constantly racing at a trot gait while simultaneously pulling a sulky with the trainer behind them. This sulky is a two-wheeled vehicle with a seat for the trainer behind the horse and joined to the horse's harness with two pieces attaching on each side of the horse [1]. The races take place in an oval shaped track filled with sand and can be of different lengths but most commonly advisors seem to think that the optimal length of the track should reach around 1400 metres [2].

The study is focused on injuries related to the limbs of these standardbred racehorses (STBR) during the course of their training and the races themselves. In this thesis different aspects were investigated, such as the different ground types and different racing patterns. Significance toward the animal welfare in this discipline was given. The injuries which were focused on the most were the most common ones seen in this type of horse training. Primarily, the superficial digital flexor tendon (SDFT) injury or rupture, the bone spavin in the Tarsometatarsal Joint (TMTJ), splint bone and proximal sesamoid bone fractures, different hoof problems and injuries – as mentioned by the local veterinarian specialising in such injuries in Malta.

Different equine veterinarians were questioned about what they have witnessed throughout their career within the standardbred racing industry, such as problems due to lack of knowledge to problems which are, that lead to; problems arising from the ground type used in the racing track where such horses are both trained and raced. The answers from the questionnaires expose the most important aspects where the animal welfare has been neglected either due to lack of expertise, passivity or simply by providing incorrect information about certain aspects of standardbred horse racing to the owners, giving rise to further chances of the horses in question getting injured. A questionnaire was distributed among different veterinarians around the world, coming from different countries in order to get an idea of the animal welfare regarding the standardbred racehorses from different parts of Europe. The idea behind this was in order to improve the welfare of such horses.

## 2. Aims

The main aims of the study were to investigate the most common limb injuries which are being caused by standardbred horse training and the best prophylactic methods which may be used to counteract these injuries giving importance to the welfare of the animal.

The different problems which were investigated are:

- The age at which the horses start being broken-in (trained). This could show a great difference in the injuries that horses suffer from, not only in their limbs, but also in every part of their body.
- The ground types which have shown to cause the least injuries.
- If the vets have seen any difference between horses which are supported with regular visits by physiotherapists or acupuncturists and those horses which are not.
- If protective tack which can be used on the limbs, for example hock boots, weighted bell boots or even simple vet wrap on the carpus, provides proper protection from the injuries caused by the horses' limbs.
- Whether there is a difference if the horses were training and/or racing barefoot (unshod) or fully shod.

By taking into account these conditions, the horses would be able to live a longer healthier life by preventing unnecessary limb injuries. This study's contribution to knowledge is if protective and prophylactic methods are effective in preventing injuries which would also help the owners by needing less veterinary interventions and medications and therefore financially improving the horses' training and performance.



### 3. Literature review

The horse has a very complex anatomy, especially when focusing on their limbs. Every horse's conformation is different and therefore when the workload and competition levels are rising a lot of importance must be given to every little detail. A few examples of this include, the work regime, the amount of work the individual horse can withstand, the knowledge on preventing injuries and in unfortunate cases when the injuries happen, having the latest form of therapy [3].

#### 3.1 Standardbred trotter racing

Standardbred horse racing is ranked just after thoroughbred horse racing with regards to popularity, making it the second most popular type of horse race in the world. There are two different ways for standardbred horse racing, the most common way - by pulling a two-wheeled sulky and less commonly used – using a saddle with the jockeys on the horses' backs. The races may also be conducted in different gaits which include trotting, pacing and toelting [1].

Gait pertains to the manner in which limbs move during motion and it can be characterized by factors such as stride arrangement and the symmetry or asymmetry of limb movement [4]. Gaits can be categorized into symmetrical and asymmetrical. In symmetrical gaits, whether for bipeds or quadrupeds, each limb, forelimb or hindlimb is presumed to be employed equivalently. Each limb displays matching kinetics and kinematic parameters such as stance period, swing length and sweep angle. This results in equal intervals between the left and right foot contacts [5].

Leleu et al. (2002) also highlighted that during a trotting gait three stages are observed: hoof-landing, midstance phase and toe-off [6]. McCoy et al. (2009) underlined the definition of the trotting gait as a two-beat movement where the two diagonally opposite legs move forward in tandem [4]. Unlike the trotting gait, pacing is a lateral two-beat gait, characterized by the simultaneous forward movement of both legs on the same side of the quadrupeds [7].

In Icelandic horses there is an additional gait (a fourth gait) known as the toelt. The toelt is a symmetrical 4-beat gait and the pattern of the stride goes as follows: left hind, left fore, right hind and right fore. It is very important that the duration between the steps should all be akin [8].

Unlike the thoroughbred racing, trotters are not just one breed which can be recognised internationally, there are many different breeds which may take part in such races coming from

different parts of the world [1]. Although trotters are coming from many different breeds and not just one, it has been proven that all the standardbred horses nowadays trace back to the four sons of Hambletonian10 – an American trotter, sire of the standardbred horse breed [1].

According to Thiruvankadan et al. (2009) there are various differences between standardbred and thoroughbred horse racing for example: prior to the race, trotters must go through a number of trial races to be able to qualify for the finals [1]. Moreover, in international standardbred racing there are a number of different breeds participating and generally, standardbred horses have a longer racing career than thoroughbreds. Furthermore, Palmer et al. suggested that standardbred racehorses, on average, had a 50% lower probability of experiencing weakening during their career compared to thoroughbred horses [9]. Approximately standardbred racehorses career lasts 3-14 years but the duration also depends on their breed [10].

As mentioned by Physick-Sheard there are multiple types of trotting races, a few of which are:

1. **The qualifying race** – this is a race where no betting may take place but its sole use is to be able to place the horses into certain classes.
2. **An open race** – in this type of race, no classes are taken into consideration, all trotter horses may take part in this race. Normally, the comparably faster horses will take part in such races.
3. **Condition race** – this sort of race will classify horses into different conditions, such as young female horses (fillies) which have earnings and winnings less than \$100,000 [11].

The different classes of trotter races are dependent on multiple contrasting factors. The main consideration would be the yearly or career-based earnings, but once this has been established the grouping would be broken down into further groups such as age, sex, racing distances, class of race, prize money, type of trotting methods, eg: pacing and whether the race is a harness-based race or saddle-based race [1].

### 3.2 Animal welfare aspect of the sport

When studying racehorses, multiple injuries are often noticed, especially in relation to their limbs. We can notice many racehorses end up lame after training or after the race itself. This is normally because the horses are forced to race at very high speeds, reaching their maximum speed normally at around 50-60 kilometers per hour. This maximal speed is normally kept up for around one to three minutes without any rest. There may also be different races based on the

endurance of the horses, where the horses would race at slower speeds but would race for a longer time and over a longer distance [12].

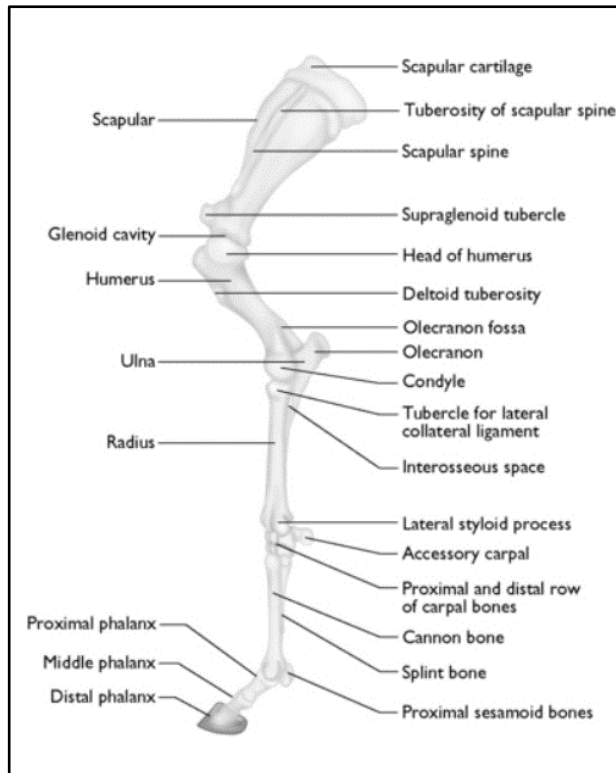
As indicated by the OIE Terrestrial Animal Health Code Chapter 7.1.(7.1.1) an animal which is in a good state of welfare is, when it is healthy, comfortable, well-nourished, safe, able to express innate behaviour and without suffering from pain, fear or distress (World Organisation for Animal Health (also known as OIE) [13].

As mentioned by Hedman et al. (2022) in the recent years the animal welfare awareness of society has been increasing but there still is no EU legislation which takes into account the holding, management and use of horses apart from when the animals are being transported or slaughtered [14]. On the bright side, the subject of the horses in the racing industry is often brought up during public debate. There is also quite an increase in the knowledge and public concern for the welfare of racing horses which in turn is causing certain settings and conditions to be questioned. Moreover, initiatives to improve the welfare may also be developing [14].

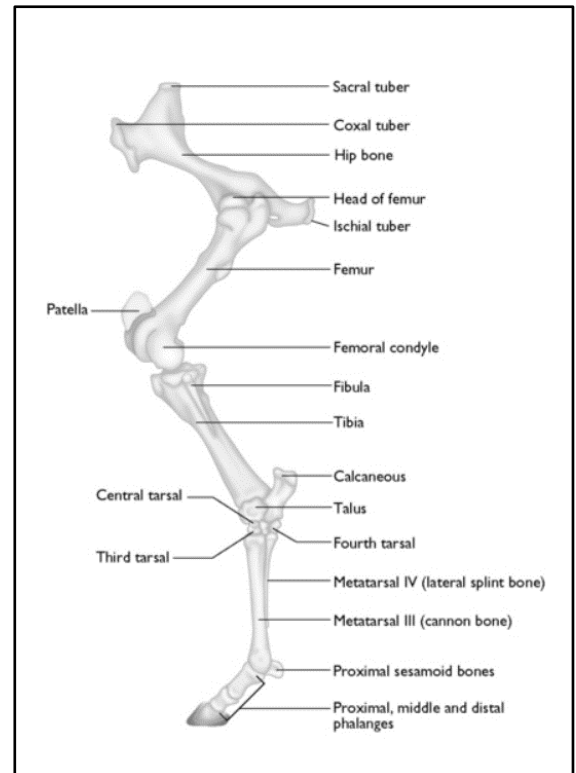
### 3.3 The anatomy of the horse limb

Demanding and repeated work which is carried out over a long period of time is not the most suitable type of work when taking into consideration the horses' limbs. How long a horse may go through such work depends a lot on their individual body conformation. With a better conformation a horse is more likely to have a superior and longer lasting racing career.

The bones which make up the forelimbs shows on the **Figure 1** and the bones of the hindlimbs on the **Figure 2** [15]. It is very interesting, that that the horse wears the entire body weight only on the one toe of each limb.



**Figure 1:** *The forelimb bones of a horse* [15]



**Figure 2:** *The hindlimb bones of a horse* [15]

The skeletal muscles of the horse are normally composed of groups of muscles which are separated based on their actions. Normally one group will have an opposite action of the other group, this allows for stable and regular movement to be carried out. The opposing groups are:

1. Flexors – this muscle group may be found at the back of the bone to haul it backward.
2. Extensors – this muscle group can be found on the front of the bone and their action is used to haul the leg forward.

Muscles are composed of a muscle belly which then narrows down into a tendon and has the role of attaching the muscle to a bone. The anatomy of the horses' limbs is very interesting as below the carpus and tarsus there are no muscles but only tendons and ligaments, this is why in racing horses many times we see problems associated with tendon and ligament injuries [3].

### 3.4 Limb injuries in standardbred racing horses

As mentioned by a veterinarian specialising in standardbred racehorses in Malta, very common limb injuries which may be noticed in standardbred racehorses are SDFT injury or rupture, bone spavin of the TMTJ, splint bone and proximal sesamoid bone fractures and different hoof problems and injuries.

There have not been many studies carried out on the injuries of standardbred racehorses because disastrous injuries are quite uncommon during the races, therefore there has not been much attention given to the welfare of these horses [16].

#### 3.4.1 Superficial digital flexor tendon injury

According to Thorpe et al. (2010) most of the tendon injuries occurring in horses, especially in racehorses, can be recognised in the SDFT (75-93% of the cases) while the rest of the cases can be noticed in the suspensory ligament (SL) [17].

In most cases tendon injury is not a result of a one-time overexerting event but usually foreshadowed by degeneration in the extracellular matrix.

Type 1 collagen is the main factor forming the matrix composition but there are also other collagens and non-collagenous (mostly proteoglycans and glycoproteins) proteins which contribute to the composition. With regards to the non-collagenous glycoproteins, collagen oligomeric matrix protein (COMP) is the most copious. In ranking order, from the smallest particles to the largest, the tendon is made up of collagen fibrils (these are aligned in the direction where the force application will be applied), fibrils (groups of collagen fibrils), fibres and fascicles [17].

The degeneration of the SDFT can cause confined damage to the collagen fibrils when the tendon is exposed to strains due to high-speed movement (for example in the standardbred horses when training at their highest speeds). Even though this is just microdamage to the tendon, this can still lead to clinical injury as tenocytes will start to concentrate and aggregate. These high strains affecting the SFDT will surely commit to the high frequency of injury but every horse is different and the prevalence of the injury in various horses is very dependant on multiple factors such as the individual strength and rigidity of the SDFT [17].

#### 3.4.2 Bone spavin of the TMTJ

Bone spavin most commonly happens in the tarsus of older horses in both the TMTJ and the centrodistal joint (CDJ) and very rarely in the proximal intertarsal joint (PIT). In most cases of the bone spavin the lesions will appear on the dorsomedial side of the tarsus [18]. The main characteristic of bone spavin in horses would normally be lameness and pain [19]. There are many different predisposing factors but according to Eksell et al. (1998), the most commonly seen are the load and type of work the horse is carrying out, the conformation of the horses and any developmental anomalies which may be observed [19].

During the course of the bone spavin the cartilage found in the joint will become damaged and start to degenerate, eventually causing erosions to form on the cartilage. Due to this the subcartilaginous bone layers may become exposed and in turn will come into contact with the bones of the joint. The bone spavin disease can be split up into two phases:

- 1) **Early phase:** there will be macro- or micro-injury observed or overloading of the joint which lead to improper nourishment of the joint surface. In turn the synovial fluid will be affected, it becomes very watery and will not carry out its supposed function in nourishment of the cartilage. The synovial fluid is very important for shock absorption and therefore due to this disease the shock absorption will decrease [18].
- 2) **Chronic phase:** when the early phase is prolonged the disease will become chronic. Most times this happens due to tedious and lengthened strain on the joint which causes the formation of the osteocytes. In this chronic phase eventually the joint surfaces will not continue to be covered by cartilage and the rubbing of the bones will stop (bone ankylosis). Therefore the pain will disappear but a very high degree of lameness will still be present [18].

### 3.5 Methods of preventing limb injuries

Managing veterinarians at racetracks hold a pivotal position in guaranteeing the safety of all involved parties. Within the industry there is a significant apprehension regarding musculoskeletal injuries that occur during races [20]. Rouette et al. (2021) mentioned that injuries lead to both inflammation and mechanical activation of nociceptors located in the skin, subcutaneous tissue, fascia, muscles and periosteum, leading to discomfort and pain. The ethical concerns surrounding the pain and discomfort caused by such injuries are particularly prominent in the context of using horses in sports. This is seen more specifically in horseracing, as some of these injuries are directly linked to the demands and activities associated with racing [21].

Mundy (1997) argues that nevertheless, when injuries occur it results in increased attention and concern in understanding their causes and subsequently developing preventative procedures within the racing industry and among a broader population [20].

### 3.5.1 The racing track surface

Exercise-related musculoskeletal injuries are directly correlated with the way anatomical structure bear loads, that is determined by the external forces (such as the ground reaction forces) applied to the limbs directly during physical activity. The impact on limbs, specifically the loading rate of ground reaction forces, is influenced by the traits of the track surface [22].

There is an indication that the condition of the track surface, especially hard tracks with limited cushioning effects, could pose a risk for injuries in racing [23]. In the study by Crevier-Denoix et al. (2017), it was demonstrated that the average lesions per horse within the hard-track group was notably higher in comparison with those horses training and racing on a soft track [22]. However the study also showed that the average number of lesions per leg on the hind limb of each horse did not differ so much between those horses training and racing on the hard track compared to those on the soft track [22].

### 3.5.2 Protective tack wear

Tendon injuries in sport horses' lower limbs are a common occurrence [24]. To provide structural reinforcement and reduce the risk of trauma during competitions, tendon boots are routinely employed [24].

While the primary function of tendon boots is to mitigate the risk of external trauma, they are also intended to yield additional beneficial outcomes for the fetlock, including stabilizing the joint and limiting its maximum extension [25].

Lameness and catastrophic injuries are not typically the result of a single isolated incident, but rather stem from the cumulative effect of ongoing stress on the bones. Current preventative measures have primarily centred around the development of boots and wraps designed for the lower extremities [26]. The ultimate goal in lower limb protection is to create a conveniently adaptable and personalize boot that offers sufficient support to the fetlock area. This device should conform to the leg's natural shape without exerting excessive pressure that might impede blood circulation [26].

### 3.5.3 Physiotherapy and other alternative treatments

The Australian Physiotherapy Council has provided a definition for physiotherapy as “A holistic approach to the prevention, diagnosis and therapeutic management of pain, disorders of movement or optimisation of function to enhance the health and welfare of the community from an individual or population perspective” [27].

Physiotherapists strive to achieve the restoration of pain-free optimal function and of course, to prevent the loss of function. The idea of treating and rehabilitating athletic injuries in the field of veterinary medicine is now widely accepted and it falls within the purview of appropriately trained physiotherapists [27].

Most times, when performance horses are showing even small problems, there can be significant consequences [28]. In the context of equine physiotherapy, the primary focus revolves around the musculoskeletal system. This encompasses the evaluation, therapeutic interventions, and rehabilitation of neuromuscular and musculoskeletal issues. The fundamental sciences underpinning this profession are functional biomechanics, neuromotor control and exercise physiology [27].

#### 3.5.3.1 High intensity laser therapy (HILT)

This type of therapy is a non-invasive treatment for musculoskeletal conditions [29]. This laser is a tool that generates focused, uniform and single coloured-light by utilizing optical amplification through a stimulated electromagnetic radiation emission. Laser therapy harnesses light from the red and infrared portions of the electromagnetic spectrum.

In the clinical observations by Jaafar Se et al. (2021) SDFT tendinopathy was found to be more troublesome than damage to other tendons of ligament tissues [30]. Regardless of the initial lameness severity among horses at the study's onset, there was a statistically significant improvement in ultrasound findings and lameness degree observed on the day following laser treatment. This was also seen at weeks 2, 4 and 6 across all stages and types of tendon disorders [30].



## 4. Materials and Methods

### 4.1 Questionnaire

With regards to data collection a questionnaire for vets located in different countries was chosen, to which this received 11 responses. This is because a questionnaire provides an impartial method for gathering data on individuals' knowledge, convictions, perspectives and actions [31]. The utilization of questionnaires as a method of compiling information is firmly established in various fields [32]. According to Rattray et al. (2007) there are various scales and feedback formats which can be employed during the creation of a questionnaire thus resulting in diverse data types or levels. These choices will impact the available analytical approaches [33].

An essential part of conducting a questionnaire is, deciding what form of questions are going to be incorporated. One can choose to use open ended questions, multiple choice questions or even a mix of both types of questions. The choice of the question format is a crucial step in the questionnaire design process and it can have a significant impact on the data collected and how it is analysed.

With regards to open-ended questions, these types of questions are mainly used when the goal is to obtain diverse and detailed responses from the respondents. The questions could vary in length and quality of expression, and this can be very valuable especially when you aim to make highly accurate assessments of each individual respondent [34]. Reja et al. (2003) argued that even though open-ended questions yield a significantly broader array of responses it is indicated that open-ended questions also result in a higher incidence of missing data when compared to closed-ended questions [35].

Multiple choice questions are normally included to give a clear indication of the accurate selections [36]. When comparing multiple-choice questions to open-ended questions, respondents find it simple to answer the multiple-choice questions. These types of questions are also more straightforward to analyse and organize when compared to the open-ended questions. Malhotra (2006) also argued that there are drawbacks associated with multiple-choice questions. When the "other (please specify)" category is included and a considerable amount of

respondents choose this option it suggests that there may be issues with the list of alternatives [37].

## 4.2 Qualitative data analysis

Qualitative data analysis in the form of a questionnaire was selected for conducting my research as it is an appropriate method for interpreting the pertinent information collected from various sources. Other ways of gathering qualitative data could be interviews and on-site data examinations [38].

Qualitative research excels in addressing questions related to the “why”, “what” or “how” inquiries [39]. Seers (2011), brings forth the fact that qualitative research employs a systemic and accurate methodology focused on addressing queries related to the nature of something (such as a patients’ understanding). Some questions which can be answered by qualitative data analysis can be: people’s perceptions and emotions about past events and potentially delving deeper into the reasons behind specific answers [40].

## 4.3 Data collection

For the collection of data for my research I chose a specific group in order to gain deeper and more educational answers. The group opted for was, equine veterinarians who have worked with STBR at some point during their career but received the answers anonymously. Random samples were collected by sending out the questionnaire to multiple vets in a variety of countries. The task of sending out the questionnaires was completed by uploading the questionnaire to multiple groups online where only qualified veterinarians were asked to answer. I also sent out numerous emails including the questionnaire to vets whom I have met in the past and their colleagues.

The questionnaire covered various aspects of standardbred horse racing, for example: the welfare of the STBR participating in the sport, the ground types which support the limbs of such horses best but also those which veterinarians think are more detrimental to the horses’ limb health and which type of injuries the veterinarians consider to be the most common during STBR racing.

The aim of the research was targeting the animal welfare of the STBR and through the literature review it was possible to give light to the essential questions, such as the protective tack wear the owners should preferably use on their horses. It was concluded that some questions were more weight bearing than the others with regard to the animal welfare of the sport.

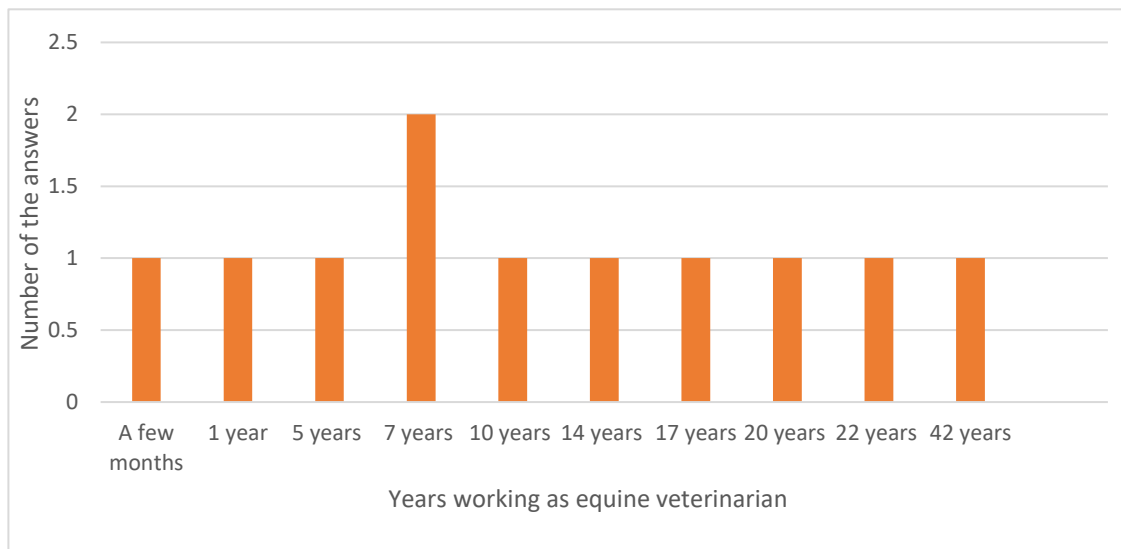
When deciding the type of question to be used I considered multiple factors, for example: the research objectives, the type of data needed and the preference and abilities of the respondents. I deduced that it was beneficial to start with getting a clear understanding of the age and nationality of the respondents in order to understand how much experience they have gained in this line of work and to see if there were any visible differences between nationalities and their thoughts as a whole.

## 5. Results

### 5.1 Years working as an equine veterinarian

Considering the results from my questionnaire it is evident that seven years was the most common answer for time the veterinarians have been working for. However this does not mean that other veterinarians who responded to the questionnaire have been working for this amount of time. It can be observed that multiple other answers were given to this question.

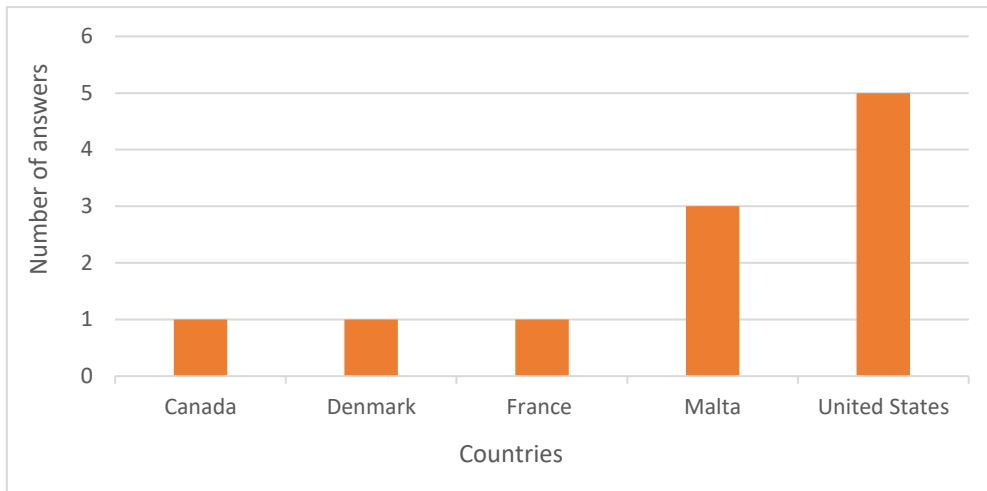
Two veterinarians replied that they have been working for seven years. All the other answers, ranging from a few months up to 42 years, were all answered by just one veterinarian (**Figure 3**).



**Figure 3** Years working as an equine veterinarian vs number of answers

### 5.2 The countries where the equine veterinarians are working in

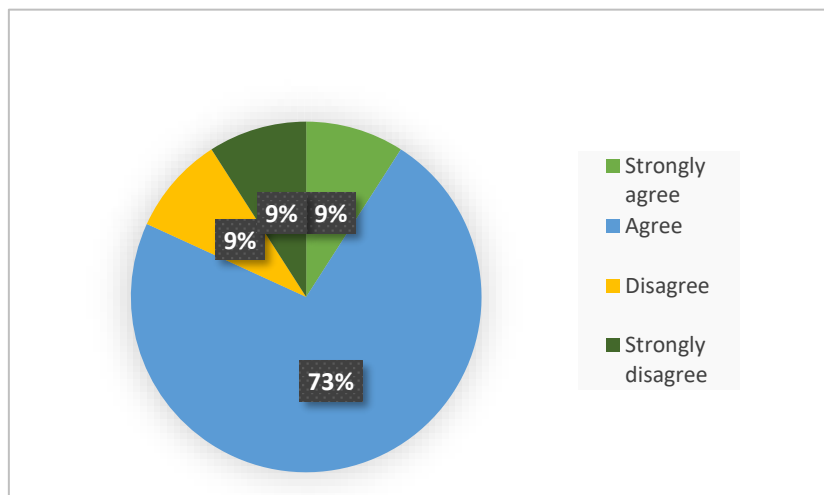
It can be observed that from the veterinarians who answered my questionnaire, the most common country where equine veterinarians specialising in STBR are working in is the United States with five results. The second highest number of answers from the veterinarians working in this sector is from Malta with three results. France, Denmark and Canada all had one result portraying that one veterinarian from each country answered the questionnaire (**Figure 4**).



**Figure 4** Countries the vets are working in

### 5.3 Animal welfare of the standardbred racehorses

When the veterinarians were asked whether they felt as though there is a certain amount of negligence with regards to STBR welfare from owners or the country itself, the most dominant answer was ‘agree’. ‘Strongly agree’, ‘disagree’ and ‘strongly disagree’ were all chosen by just one veterinarian each (**Figure 5**). This shows that the prevailing mindset on the matter of welfare is that there is in fact a certain amount of negligence in connection with STBR.



**Figure 5** Thoughts on the animal welfare by the veterinarians

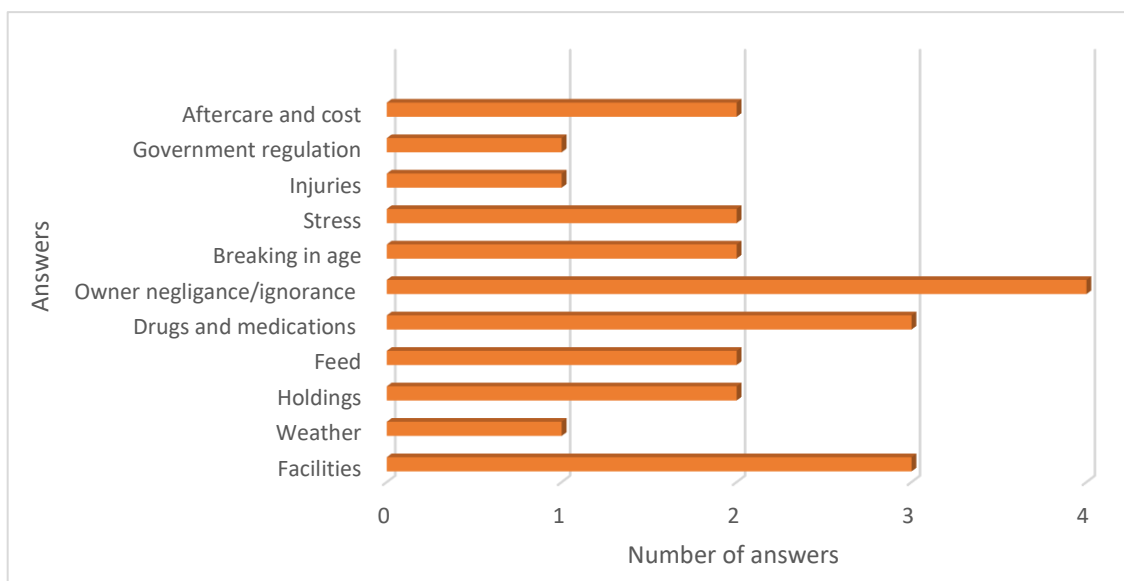
## 5.4 The veterinarian's opinions regarding the welfare of the STBRs'

This question was an open-ended question in which the veterinarians were asked about why they chose 'agree' or 'strongly agree' in the previous question. In their replies most veterinarians gave multiple explanations regarding the reason why they chose such answers in question three. The most common reply, with four answers, from the veterinarians was owner negligence and ignorance as the cause of the welfare problems regarding the STBRs'. The second most popular answers, with three responses each, were in connection with the drugs and medications being given to the horses, where the veterinarians expressed that there was unethical use and abuse of drugs in the racing scene. The other response was in relation with the amount of training facilities available for the horses and the facilities which are available are not of the appropriate standard (**Figure 6**).

There were five answers which got mentioned twice each and these related to the following factors:

- The feed these STBR were receiving being inappropriate.
- The stress induced on the horses from multiple different factors.
- The age at which horses are being broken in is too young in the opinion of the veterinarians.
- The aftercare and cost of such horses and the holdings being too small/dark and generally unfit for keeping horses in.

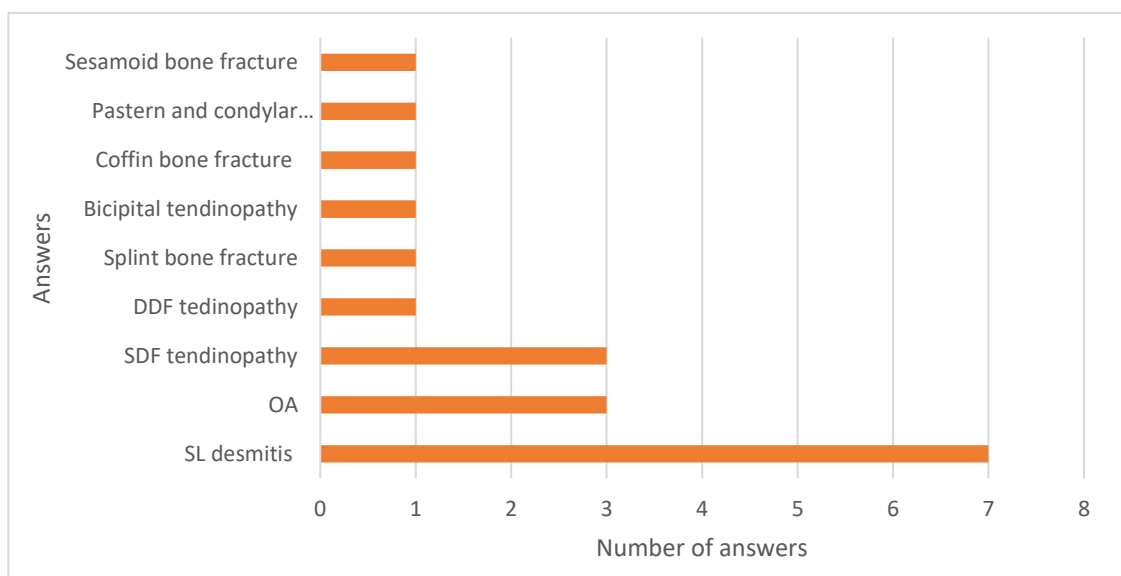
The three results with just one reference each were weather, injuries and government regulations.



**Figure 6** Animal welfare opinions from the veterinarians

### 5.5 Most common limb injuries in STBRs

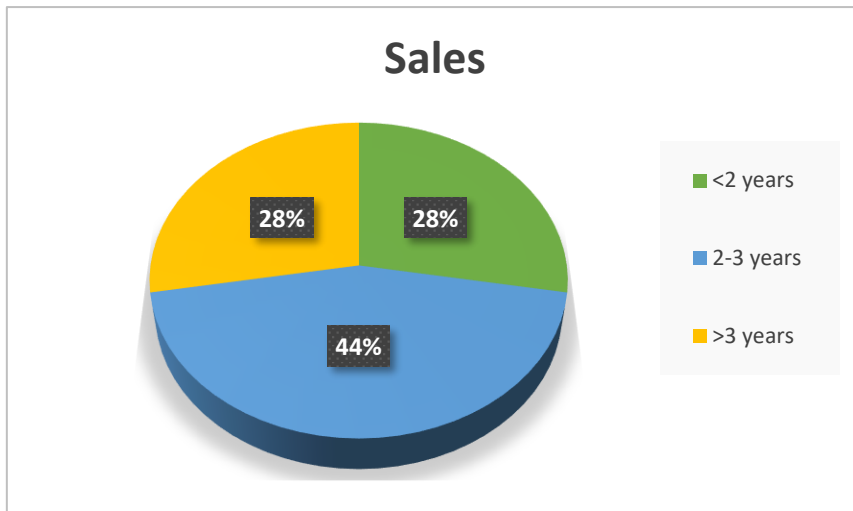
An analysis of the replies to this question from the veterinarians indicated that the most common injury was suspensory ligament desmitis. This was mentioned seven times. Osteoarthritis and Superficial Digital Flexor Tendinopathy received three mentions each making them the second most common injuries in the STBRs. Sesamoid bone fracture, pastern and condylar fracture, coffin bone fracture, splint bone fracture, bicipital tendinopathy and deep digital flexor tendinopathy were all mentioned once, making them the least common injuries in the sport according to the eleven veterinarians who answered this questionnaire (**Figure 7**).



**Figure 7** Most common limb injuries

### 5.6 Appropriate age for breaking in the STBRs

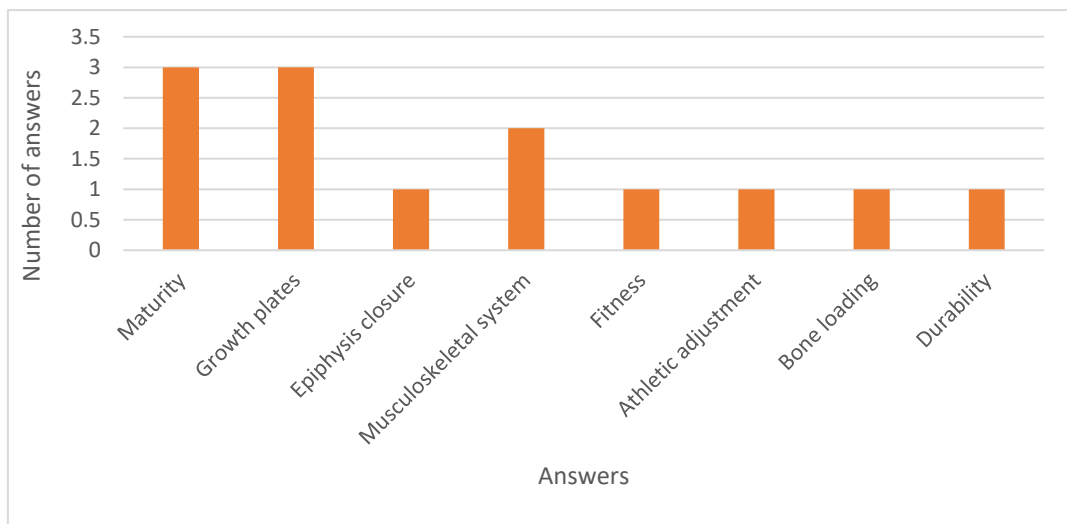
From the answers provided, it is clear that the majority of veterinarians agreed that the best age to break in the STBRs is around three years. The other two choices of less than two years and more than three years were less popular within the sample population (**Figure 8**).



**Figure 8** The usual age where horses should be broken in

### 5.7 The veterinarian's opinion regarding the best age for breaking in the STBRs

In relation to the previous question, the veterinarians were asked to give an explanation as to why they chose that age to break in the STBRs (**Figure 9**). The two most frequent answers related to maturity of the horses and the closure of the growth plates. Two other respondents argued that the younger the horse the less time available for the musculo-skeletal system to develop properly. The remaining five answers were mentioned once, these include : Epiphysis closure, Fitness of the horse, Athletic adjustments, Bone loading and Durability.

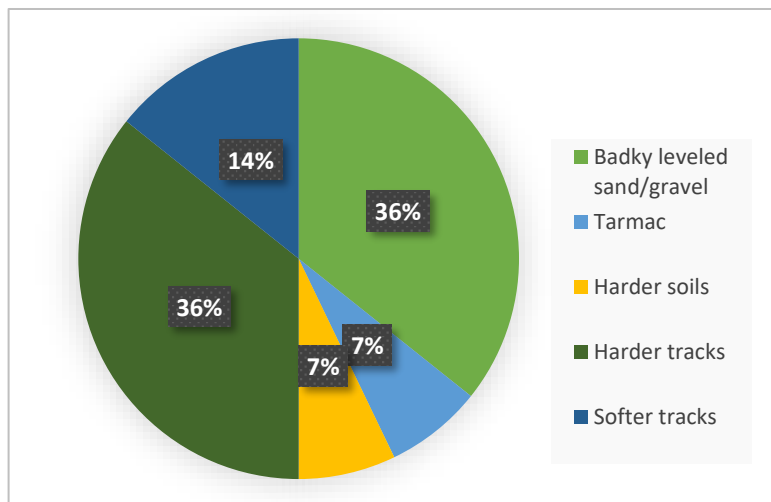


**Figure 9** Veterinarians opinion on the most appropriate to break in the horses



## 5.8 Worst ground types for racing and training the STBRs

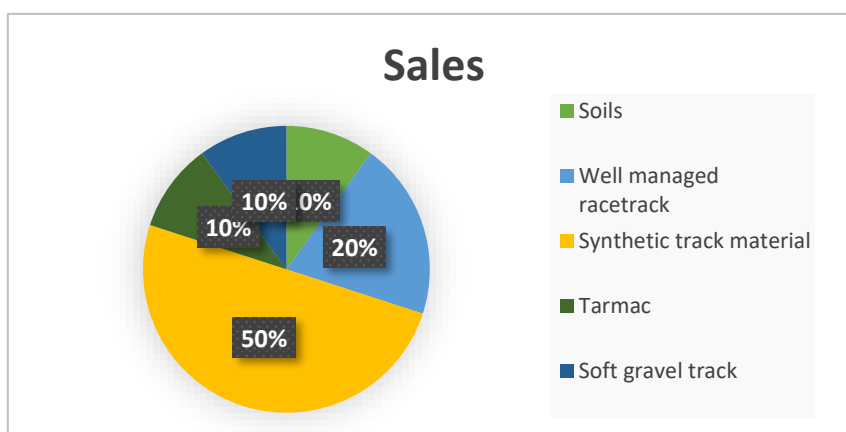
When the answers of the respondents were reviewed it was evident that the most common answers relating to the worst ground type for racing and training were badly levelled sand / gravel and harder tracks. The second most popular answer was softer tracks whilst the least common answers were harder soils and tarmac (**Figure 10**).



**Figure 10** Worst ground types for the limbs of the STBRs

## 5.9 Best ground types for racing and training the STBRs

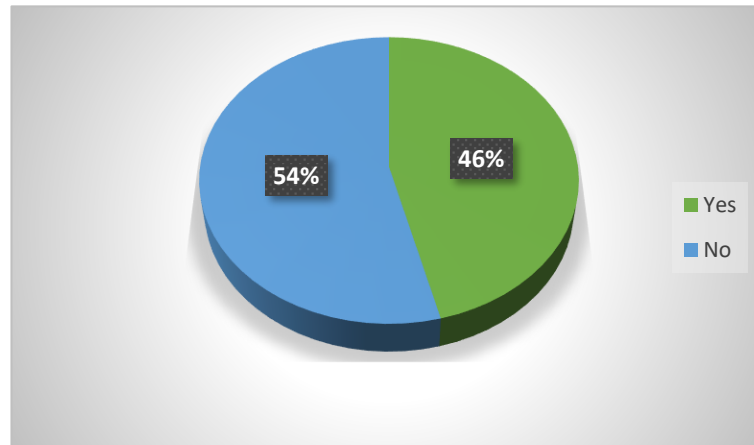
In contrast, the most common answer to the question regarding “best ground types for racing / training” was synthetic track material receiving 50% of the votes. On **Figure 11** we can show a well-managed racetrack received 20% of the votes making it the second most popular answer and with 10% of the votes each: soils, soft gravel track and tarmac were mentioned the fewest times by the participants.



**Figure 11** Best ground types for the limbs of the STBRs

### 5.10 Alternative therapy support for the STBRs in racing and training

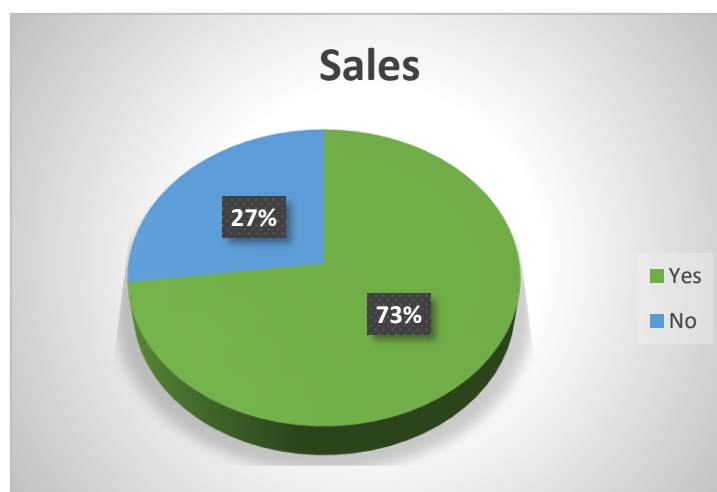
In this question the veterinarians were queried about their thoughts on the effect of alternative treatment on the likelihood of limb injury in STBRs. **Figure 12** shows that most expressed the view that there was a positive correlation between the two.



**Figure 12** Veterinarians opinion on alternative therapy support in STBRs

### 5.11 The use of protective limb wear in STBRs while racing and training

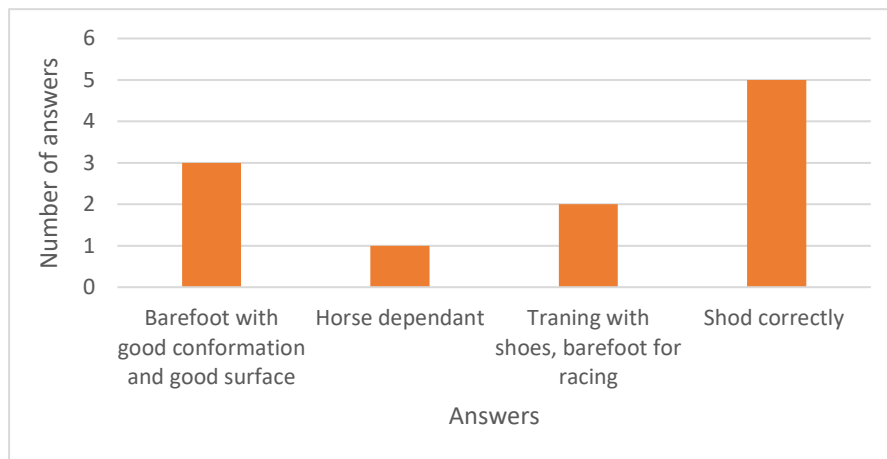
The answers to the question relating to the use of protective limb wear during training and racing of the STBRs indicated that most respondents believed that the use of such limb wear contributed strongly to preventing limb injuries (**Figure 13**).



**Figure 13** Protective limb wear use during the training and racing of STBRs

## 5.12 Veterinarians opinion on horses racing and training barefoot or fully shod

Based on the **Figure 14**, the majority of respondents agreed that racing and training of STBRs should be done when properly shod. This answer was mentioned five times. The second most common answer revealed that training and racing the horses barefoot with good conformation and good ground surface is important. This response was mentioned three times. The combination of training fully shod but racing while barefoot received two preferences. The least common answer with one result was that this is horse dependant.



**Figure 14** *Best options of horse shoeing in STBRs for racing and training*

## 6. Discussion

Through the questionnaire, it can be observed that even though all the veterinarians that have answered have gone through different experiences, studies and practices in various countries, the animal welfare standard of standardbred racehorse training is typically established.

When analysing the veterinarians' answers in connection with the question to whether they thought that there is particularly some negligence concerning the animal welfare of these STBRs, the majority agreed that this is so. In result to this answer it shows that the minority of only two respondents did not agree with this statement. The respondents provided many reasons in account to why they think that the animal welfare standards are quite low.

The main reason the veterinarians have given with regards to negligence to the welfare of these horses is owner negligence. Owner negligence could happen due to many different factors especially in the sport of standardbred racing. One reason for owner negligence could be that the owners only care about winning and not what state their horse is kept in. As a result of this horses can become malnourished, sick or even stressed which are all states that a horse should not be kept in. Stress, feed, holdings, weather and facilities were all mentioned by the veterinarians as other reasons that the welfare of these animals is lacking, which in turn can all be a result of owner negligence but not only.

When considering the weather, it is not something that the owners can control but the owners can apply methods to help with the heat or the cold and keep their animals in comfortable conditions. For example, adding fans and proper ventilation for the heat, while being able to close off the area in case of heavy wind or rain in the winter. Stress is another factor in which the owners play a big part, it is all connected with the type of training, the feed and the general care for these horses. When the owners are properly educated on such matters it is much easier to control the stress of the horse, but this is very dependent on each horse's nature.

Government regulations play a big part in guiding the owners and people in charge of training facilities and holdings. With proper regulation and enforcement from the government, the animal welfare standards for these STBRs could be improved drastically. Government regulations will differ between countries for reasons such as different weather. Depending on where the veterinarians are working in, the weather will always be different and this could be the fact that weather was not mentioned as often, as countries such as Denmark and France will not see temperatures as high as Malta and the United States.

Limb injuries in these STBRs may be a result of the minimal welfare standards of these horses. Such injuries may also be in connection with the ground types that the horses are racing and/or training on, which could also be reason for the different answers given regarding the most common limb injuries. The majority of the veterinarians agreed that the most common injury in this sport is suspensory ligament desmitis. Waselau et al. (2008), stated that in sport horses, injuries to the proximal portion of the interosseous muscle (suspensory ligament) are prevalent and often manifest as chronic repetitive strain issues [41].

These STBRs are trained rigorously every day while they are exerting the same movements continuously and repetitively. This can cause chronic repetitive strain issues which are mentioned above. Therefore leading to the injury of suspensory ligament desmitis and others such as osteoarthritis and SDF tendinopathy. The latter two injuries were mentioned three times each by the responding veterinarians.

There were multiple types of fractures that were mentioned by the veterinarians. These were mostly concentrated in the distal portion of the limb. These fracture types include, sesamoid bone, splint bone, pastern, condylar bones and the coffin bone. O'Sullivan et al. (1999), mentioned that two of the underlying causes contributing to such fractures include insufficient track slope or tilt [42]. Moreover, O'Sullivan et al. (1999) also stated that these fractures can occur when the STBRs are either landing on or striking a stationary object [42].

These injuries can therefore be associated with the ground types and how well taken care of the tracks are. Many of the respondents argued that the best track to race and train the STBRs on are synthetic racetracks which are well managed. A synthetic racetrack is constructed from man-made materials. These materials can include sand, synthetic fibres and rubber. As indicated above, there are certain government regulations in place to safeguard the welfare of the horses. This is as to decrease the amount of limb injuries by controlling the construction and management of the racetrack to reach the imposed standard.

Based on the veterinarians replies, limb injuries may also be linked to the age the horses are being broken in. Through the questionnaire, 44% of the respondents indicated that the best age to break in horses is between two to three years of age. The veterinarians believed that before this age the horses would not be mature enough to start training and racing. Furthermore, the veterinarians also argued that young STRBs growth plates (areas of new bone) would not have formed and closed properly. Two other respondents believe that STRBs younger than two to

three years would not have had enough time for proper development of the horse's musculoskeletal system.

Another veterinarian also pointed out that below four years of age the epiphyses of the bones would have not closed completely therefore the bones are much more prone to osteological changes. Nielsen et al. (2021), noted that young horses in the initial stages of race training exhibit a higher occurrence of bucked shins when contrasted with the more mature horses that already engaged in racing [10].

The previous statement reveals how the younger the horse is, the more prone they are to damages in the bone. Another point to be considered is that STBRs are part of the racing industry and therefore can be seen a means of income for many owners. Taking this into account it would not be valuable to the owners to start breaking in the horses too late and therefore a balance must be found. This could be the reason that the majority of the respondents agreed that the best age to break in these STBRs would be between two to three years of age.

The veterinarians were also questioned on whether they believed that any type of alternative therapy might help prevent limb injuries in the STBRs. The dominating answer was that they did agree to this statement. There are many different types of alternative therapies that may be applied in relation to the equine limb health. Other types of alternative therapies such as chiropractic therapy, physiotherapy and even acupuncture may be mentioned. This is as even though they might not be directly related to limb health, the whole-body structure is connected. Therefore using these methods, many other parts of the body can be taken care of and thus unwanted consequential problems in the limbs may be prevented.

When observing the use of protective limb wear during the STBRs racing and training it may be noticed that owners and trainers choose to use different types of boots and bandages. As a result of the questionnaire a large number of veterinarians agreed that the use of such protection does in fact contribute to protecting the horse's limbs from sustaining different types of injuries. There are endless types of protective wear to choose from, many times it is dependant on what the owners and trainers prefer, as well as the conformation and stance of the horse. The owners and trainers may change the type of boot or bandage being used multiple times until they find the most appropriate set of tack for the specific horse.

Some types of boots or bandages may include hock boots protecting both the carpus and tarsus from being hit by the opposing hoof being propelled forward and also bell boots which are attached around the pastern which can be weighted and non-weighted. The non-weighted bell

boots are used to prevent the hind limbs from hitting and causing injuries on the caudal part of the hoof (heel). The weighted bell boots can increase the weight on different limbs to balance the horses out.

While the majority of veterinarians agreed that if the horses are properly shod, there should be a limited amount of injuries during training and racing. Although, one of the veterinarians pointed out, that racing and training fully shod or barefoot is ultimately horse dependant. With regards to shoeing of the horse, there are various aspects that need to be taken into consideration by the owner, veterinarian and farrier. The owner, veterinarian and farrier can all agree on the best way is to be raced and trained.

## **7. Conclusion**

This research strived to expand the knowledge known at this time with regards the animal welfare of STRBs. Throughout this research different welfare aspects were tackled. Some of which being, the current government regulation regarding the animal welfare, the age that the horses are broken in, the ground type the horses are training and racing on, the alternative therapy and various other aspects indicated above.

This research highlighted the importance of government regulation for animal welfare, this is because many respondents agreed that owner negligence and education is one of the main problems in STRBs racing. Thus, this research can help in the educating the owner and veterinarians in the good welfare practices, in turn decreasing the instances of limb injuries observed.

It can be noticed that the welfare surrounding these STRBs has been slowly improving, but further understanding and education is a prerequisite in helping the personnel involved in the racing scene. On that account, further investigations need to be carried out to benefit the wellbeing of the STRBs.



## 8. Abstract

### 8.1 Abstract in English

The prevailing thought regarding limb injuries in STBRs when focusing on their animal welfare is that the welfare of such horses could be of a better standard. There are many methods which can be applied to improve the animal welfare norms such as well managed racetracks, the use of protective limb wear and proper shoeing of the racehorses [14].

With the use of a questionnaire which targeted a specific demographic, that being equine veterinarians who have worked in the STBR industry, it was possible to bring forth the thoughts of such veterinarians regarding the animal welfare of these horses.

The findings revealed that 73% of the respondents agreed that there is a certain amount of negligence concerning the animal welfare of the STBRs. Another very important insight which can be seen considering the questionnaire is that the most common injury in the STBRs career, in the opinion of the veterinarians, is suspensory ligament desmitis.

The research that has been carried out through the questionnaire is significant as it has brought to light the thoughts of multiple equine veterinarians with years of experience in the standardbred horse racing industry. The respondents have given very important explanations on how to improve the standard of these horse's welfare. The topics which have been discussed include the best and worst ground types to train and race these horses on, the appropriate age for breaking the horses in, whether alternative therapy is considered to improve the health and well-being of such horses, if protective limb wear is perceived as an important method for protecting the horses limbs during racing and training and the thoughts of the veterinarians regarding the best method of shoeing for these horses.

The findings from this research will contribute to the welfare of STBRs during both their training and racing. Through observing the data collected, various methods for both protecting the horses and limbs and improving the approaches and strategies that owners may follow in order to prevent, to the greatest extent, further trauma and harm to be caused to the horses' limbs by also improving the animal welfare guidelines with regards to the sport.

## 8.2 Abstract in Hungarian

Az Standardbred lovak végtagsérüléseivel kapcsolatban készült TDK munka fő gondolata az állatok védelmére összpontosul, ezen fajtájú lovak jóllétének magasabb minőségének elérésének lehetőségeit célozza meg. Számos módszer alkalmazható az állatjóléti normák javítására, mint például a jól karbantartott, megfelelően kezelt versenypályák és a versenylovak megfelelő patkolása.

Egy olyan kérdőív kitöltésére került sor a Stenderbred lovakkal foglalkozó állatorvosok által, mely során lehetővé vált az állatorvosok gondolatainak feltárása a lovak jóllétével kapcsolatban.

Az eredményekből kiderült, hogy a válaszadók 73%-a egyetértett azzal, hogy bizonyos mértékű gondatlanság áll fenn az STBR-ek jóllétét illetően. Egy másik nagyon fontos felismerés, amely a kérdőívet figyelembe véve látható, hogy az STBR-ek leggyakoribb sérülése az állatorvosok véleménye alapján versenyek és a felkészülési időszak során a felfüggesztő szalag (lig. susp.) gyulladása.

A kérdőíven keresztül végzett kutatás jelentős, mivel olyan szakértő állatorvosok gondolatait tárta fel, akik több éves tapasztalattal rendelkeznek a standardbred lóversenyiparban. A válaszadók nagyon fontos magyarázatokat adtak arra vonatkozóan, hogyan lehetne javítani a lovak jóllétének színvonalát. A megvitatott témák között szerepelnek a leginkább és legkevésbé használatos talajtípusok ezeknek a lovaknak a kiképzésére és versenyeztetésére, a lovak betörésének megfelelő életkora, az alternatív terápia kérdésköre a lovak egészségének és jóllétének javítására, a végtagok védelmét szolgáló eszközök viselése verseny és edzés közben, valamint a legjobb patkolási módszerek.

A kutatás eredményei hozzájárulnak az STBR-ek jóllétéhez mind az edzés, mind a versenyzés tekintetében. Az összegyűjtött adatok megfigyelésével, a lovak és végtagjaik védelmére szolgáló különböző módszerek, eszközök alkalmazásával, valamint a tulajdonosok által követett stratégiák javításával jelentős lépések tehetők annak érdekében, hogy a lehető legnagyobb mértékben megelőzzék a lovak végtagjainak okozott traumákat és károkat, következésképp pedig javítják a sportra vonatkozó állatvédelmi, állatjóléti irányelveket.

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## 10. References

1. Thiruvankadan AK, Kandasamy N, Panneerselvam S (2009) Inheritance of racing performance of trotter horses: An overview. *Livestock Science* 124(1) 163–181
2. Walsh JS (1997) *Track Design in Harness Racing*.  
[https://www.academia.edu/11827724/Track Design for Harness Racing%20.%20Accessed%204/07/2023](https://www.academia.edu/11827724/Track_Design_for_Harness_Racing%20.%20Accessed%204/07/2023)  
Accessed 04/07/2023
3. Pilliner S, Elmhurst S, Davies Z (2002) *The Horse in Motion*. Blackwell Publishing Company, Oxford UK, pp 3-27. <https://www.nature.com/articles/026196a0> Accessed on 07/07/2023
4. McCoy AM, Beeson SK, Rubin CJ, Andersson L, Caputo P, Lykkjen S, Moore A, Piercy RJ, Mickelson JR, McCue ME (2019) Identification and validation of genetic variants predictive of gait in standardbred horses. *PLoS Genet* 15(5) <https://doi.org/10.1371/journal.pgen.1008146>  
<https://journals.plos.org/plosgenetics/article?id=10.1371/journal.pgen.1008146> . Accessed 25/08/2023
5. Robilliard JJ, Pfau T, Wilson AM (2007) Gait characterisation and classification in horses. *The Journal of Experimental Biology* 210(2) 187-197 <https://doi.org/10.1242/jeb.02611> Accessed 37/08/2023
6. Leleu C, Gloria E, Renault G, Barrey E (2002) Analysis of trotter gait on the track by accelerometry and image analysis. *Equine vet. J., Suppl.* 34:344-348 <https://equi-test.com/wp-content/uploads/2020/05/20-validation-accel.pdf> Accessed 25/08/2023
7. Bhatti Z, Waqas A, Mahesar W, Karbasi M (2017) Gait Analysis and Biomechanics of Quadruped Motion for Procedural Animation and Robotic Simulation. *Bahria University Journal of Information and Communication Technologies* 10(2) <https://www.ojs.bahria.edu.pk/index.php/bujict/article/view/178> Accessed 26/08/2023
8. Zips S, Peham C, Scheild M, Licka T, Girtler D (2010) Motion pattern of the toelt of Icelandic horses at different speeds. *Equine vet K., Suppl.* 33(S33) 109-111 <https://doi.org/10.1111/j.2042-3306.2001.tb05371.x>  
Accessed 26/08/2023
9. Palmer S, Morales Gomez AM, Mohammed HO (2021) Attrition of Thoroughbred and Standardbred racehorses at New York Racetracks due to exercise and non-exercise related fatalities the 2016-2019 racing seasons. *Journal of Equine Veterinary Science* 104 <https://doi.org/10.1016/j.jevs.2021.103703>  
<https://www.sciencedirect.com/science/article/abs/pii/S0737080621003336#:~:text=TB%20horses%20had%20on%20an%20average%20a%2050%25,during%20their%20career%20than%20did%20the%20SB%20horses>  
Accessed 24/08/2023
10. Nielsen BD, Logan AA (2021) Training Young Horses: The Science behind the Benefits. *Animals* 2021, 11(2) 463 <https://doi.org/10.3390/ani11020463> Accessed 06/10/2023
11. Physick-Sheard PW (1986) Career profile of the Canadian Standardbred. II. Influence of age, gait and sex upon number of races, money won and race times. *Can J Vet Res.* 50(4) 457-70.  
<https://pubmed.ncbi.nlm.nih.gov/3791072/> Accessed 24/07/2023
12. Waran N (2007) *The Welfare of Horses*. Springer, Dordrecht, The Netherlands, pp. 7-8  
<https://link.springer.com/content/pdf/bfm:978-0-306-48215-1/1.pdf> Accessed on 07/08/2023
13. (2023) Terrestrial Animal Health Code 2023. <https://www.woah.org/en/what-we-do/standards/codes-and-manuals/terrestrial-code-online-access/?id=169&L=1&htmlfile=sommaire.htm> Accessed 31/08/2023
14. Hedman FL, Ewerlöf IR, Frössling J, Berg C (2022) Swedish Trotting Horse Trainers' Perceptions of Animal Welfare Inspections from Public and Private actors. *Animals* 2022, 12(11)  
<https://doi.org/10.3390/ani12111441> Accessed 28/07/2023
15. Figure 1 and 2: Cook R, Phillips C (2016) *The horse*. Butterworth–Heinemann, London, UK, pp 141.  
<https://veteriankey.com/the-horse/> . Accessed 08/09/2023
16. Bertuglia A, Bullone M, Rossotto F, Gasparini M (2014) Epidemiology of musculoskeletal injuries in a population of harness Standardbred racehorses in training. Bertuglia et al. *BMC Veterinary Research* 2014 10:11  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3922780/> Accessed 02/08/2023
17. Thorpe CT, Glegg PD, Birch HL (2010) A review of tendon injury: why is the equine superficial digital flexor tendon most at risk? *Equine Vet J.* 2010 Mar;42(2) 174-80 DOI: 10.2746/042516409X480395  
<https://pubmed.ncbi.nlm.nih.gov/20156256/> Accessed 02/08/2023
18. Eksell P, Axelsson M, Broström H, Ronéus B, Häggström J, Carlsten J (1998) Prevalence and Risk Factors of Bone Spavin in Icelandic Horses in Sweden: A radiographic Field Study. *Acta Veterinaria Scandinavica* 39:339-348 <https://actavetscand.biomedcentral.com/articles/10.1186/BF03547782> Accessed 05/08/2023
19. Nicpoń J, Kubiak K, Spuzak J (2009) Diagnosis and treatment of bone spavin in horses  
<https://www.semanticscholar.org/paper/Diagnosis-and-treatment-of-bone-spavin-in-horses-Nicpoń-C5%84-Kubiak/04d40a06307c89a4f7b95bde8e2b84fce857585f> Accessed 28/07/2023
20. Mundy GD (1997) Review of Risk Factors Associated with Racing Injuries. *AAEP Proceedings* 43:204-205 <https://www.ivos.org/sites/default/files/library/aaep/1997/Mundy.pdf> Accessed 01/09/2023

21. Rouette J, Cockram MS, Sanchez J, MacMillan KM (2021) Musculoskeletal injuries in Standardbred racehorses on Prince Edward Island. *Can Vet J.* 62(9) 987–993 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8360321/> Accessed 01/09/2023
22. Crevier-Denoix N, Audigié F, Emond AL, Dupays AG, Pourcelot P, Loic D, Chateau H, Denoix JM (2017) Effect of track surface firmness on the development of musculoskeletal injuries in French Trotters during four months of harness race training. *Am J Vet Res.* 78(11) 1293-1304 DOI: 10.2460/ajvr.78.11.1293 <https://pubmed.ncbi.nlm.nih.gov/29076363/> Accessed 05/08/2023
23. Maeda Y, Tomioka M, Hanada M, Oikawa M (2012) Influence of Track Surface Condition on Racing Times of Thoroughbred Racehorses in Flat Races. *Journal of Equine Veterinary Science* 32(11) 689–695 DOI: 10.1016/j.jevs.2012.02.012 [https://www.researchgate.net/publication/257242950\\_Influence\\_of\\_Track\\_Surface\\_Condition\\_on\\_Racing\\_Times\\_of\\_Thoroughbred\\_Racehorses\\_in\\_Flat\\_Races](https://www.researchgate.net/publication/257242950_Influence_of_Track_Surface_Condition_on_Racing_Times_of_Thoroughbred_Racehorses_in_Flat_Races) Accessed 05/08/2023
24. Hopewood L, Sander L, Ellis AD (2013) The influence of boot design on exercise associated surface temperature of tendons in horses. *Comparative Exercise Physiology:* 9(3-4) 147 – 152 <https://doi.org/10.3920/CEP13019> Accessed 07/08/2023
25. Kicker CJ, Peham C, Girtler D (2004) Examination of the influence of support boots on the fetlock of equine forelimbs. A kinematic study in walk and trot on the treadmill. *Pferdeheilkunde Equine Medicine* 20(5) 435-440 DOI: 10.21836/PEM20040504 [https://www.researchgate.net/publication/286687531\\_Examination\\_of\\_the\\_influence\\_of\\_support\\_boots\\_on\\_the\\_fetlock\\_of\\_equine\\_forelimbs\\_A\\_kinematic\\_study\\_in\\_walk\\_and\\_trot\\_on\\_the\\_treadmill](https://www.researchgate.net/publication/286687531_Examination_of_the_influence_of_support_boots_on_the_fetlock_of_equine_forelimbs_A_kinematic_study_in_walk_and_trot_on_the_treadmill) Accessed 11/08/2023
26. Granfone MC, Pena MR (2010) Equine Safety Equipment for Distal Limb Protection. <https://core.ac.uk/download/pdf/212973447.pdf> . Accessed 08/08/2023
27. Alteneji K, Falaknaz F, Andrea-Segovia J (2020) An approach to Equine Physiotherapy and Rehabilitation in United Arab Emirates. DOI:10.24966/ARVS-3751/100025 [https://www.researchgate.net/publication/344418195\\_An\\_Approach\\_to\\_Equine\\_Physiotherapy\\_and\\_Rehabilitation\\_in\\_United\\_Arab\\_Emirates](https://www.researchgate.net/publication/344418195_An_Approach_to_Equine_Physiotherapy_and_Rehabilitation_in_United_Arab_Emirates) Accessed on 15/08/2023
28. Johnston JL (2004) Chiropractic Treatment for the Performance Horse <https://www.logan.edu/mm/files/LRC/Senior-Research/2004-Dec-27.pdf> Accessed 18/08/2023
29. Zielińska P, Nicpoń J, Kiełbowski Z, Soroko M, Dudek K, Zaborski D (2020) Effects of High Intensity Laser Therapy in the Treatment of Tendon and Ligament Injuries in Performance Horses. *Animals (Basel)* 10(8) DOI: 10.3390/ani10081327 <https://pubmed.ncbi.nlm.nih.gov/32751968/> Accessed 15/08/2023
30. Jaafar SE, Al-Bayti AAH, Abdullah SI (2021) Using Short Term of High Power Laser Therapy in Horse's Tendon Injuries. *Arch Razi Inst.* 76(5) 1437–1444 DOI: 10.22092/ari.2021.356105.1779 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8934084/> Accessed 23/08/2023
31. Boynton PM (2004) Administering, analysing, and reporting your questionnaire. DOI: 10.1136/bmj.328.7452.1372 <https://pubmed.ncbi.nlm.nih.gov/15178620/> Accessed 01/10/2023
32. Jones S, Murphy F, Edwards M, James J (2008) Doing things differently: advantages and disadvantage of web questionnaires. *Nurse researcher* 15(4) 15 [Doing-things-differently-advantages-and-disadvantages-of-Web-questionnaires.pdf \(researchgate.net\)](https://www.researchgate.net/publication/344418195_An_Approach_to_Equine_Physiotherapy_and_Rehabilitation_in_United_Arab_Emirates) Accessed 08/09/2023
33. Rattray J, Jones MC (2007) Essential elements of questionnaire design and development. *Journal of Clinical Nursing* <https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2702.2006.01573.x> Accessed 08/09/2023
34. Burgess TF (2001) A general introduction to the design of questionnaires for survey research. University of Leeds, UK <https://docslib.org/doc/9333972/a-general-introduction-to-the-design-of-questionnaires-for-survey-research> Accessed 08/09/2023
35. Reja U, Manfreda KL, Hlebec V, Vehovar V (2003) Open-ended vs. Close-ended Questions in Web Questionnaires. *Metodološki zvezki*, 19 [https://begrijpelijkeformulieren.org/sites/begrijpelijkeformulieren/files/Reja\\_e.a.\\_Open-ended\\_vs.\\_Close-ended\\_Questions\\_in\\_Web.pdf](https://begrijpelijkeformulieren.org/sites/begrijpelijkeformulieren/files/Reja_e.a._Open-ended_vs._Close-ended_Questions_in_Web.pdf) Accessed 09/09/2023
36. Diaz J, Rifqi M, Bouchon-Meunier B, Jhean-Larose S, Denhière G (2008) Imperfect Answers in Multiple Choice Questionnaires. Springer-Verlag Berlin Heidelberg, pp 144-145 [https://link.springer.com/chapter/10.1007/978-3-540-87605-2\\_17](https://link.springer.com/chapter/10.1007/978-3-540-87605-2_17) Accessed 09/09/2023
37. Malhotra NK (2006) *The Handbook of Marketing Research*. California, USA [https://www.simplypsychology.org/wp-content/uploads/chapter\\_5.pdf](https://www.simplypsychology.org/wp-content/uploads/chapter_5.pdf) Accessed 09/09/2023
38. Wholey JS, Harty HP, Newcomer KE (2004) *Handbook of Practical Program Evaluation*. John Wiley and Sons, Inc. San Fransisco, USA [http://surjonopwkub.lecture.ub.ac.id/files/2018/02/Handbook\\_of\\_Practical\\_Program\\_Evaluation\\_Essential\\_Texts\\_for\\_Nonprofit\\_and\\_Public\\_Leadership\\_and\\_Management.pdf#page=465](http://surjonopwkub.lecture.ub.ac.id/files/2018/02/Handbook_of_Practical_Program_Evaluation_Essential_Texts_for_Nonprofit_and_Public_Leadership_and_Management.pdf#page=465) Accessed 08/09/2023
39. Lacey A, Luff D (2009) *Qualitative Data Analysis*. NIHR RDS for the East Midlands/NIHR RDS for Yorkshire and the Humber, UK, pp 3-10 [https://www.rds-yh.nihr.ac.uk/wp-content/uploads/2013/05/9\\_Qualitative\\_Data\\_Analysis\\_Revision\\_2009.pdf](https://www.rds-yh.nihr.ac.uk/wp-content/uploads/2013/05/9_Qualitative_Data_Analysis_Revision_2009.pdf) Accessed 08/09/2023

40. Seers K (2011) Qualitative data analysis. DOI: 10.1136/ebnurs.2011.100352 [https://web.archive.org/web/20180720102745id\\_/https://ebn.bmj.com/content/ebnurs/15/1/2.full.pdf](https://web.archive.org/web/20180720102745id_/https://ebn.bmj.com/content/ebnurs/15/1/2.full.pdf) Accessed 08/09/2023
41. Waselau M, Wesley Sutter W, Genovese RL, Bertone AL (2008) Intralesional injection of platelet-rich plasma followed by controlled exercise for treatment of midbody suspensory ligament desmitis in Standardbred racehorses. JAVMA, 232(10) <https://doi.org/10.2460/javma.232.10.1515> Accessed 01/10/2023
42. O'Sullivan CB, Dart AJ, Malikides N, Rawlinson RJ, Hutching DR, Hodgson DR (2008) Nonsurgical management of type II fractures of the distal phalanx in 48 Standardbred horses. Australian Veterinary Journal, 77(8) 501-503 <https://doi.org/10.1111/j.1751-0813.1999.tb12118.x> Accessed 01/10/2023

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I, the undersigned Dr. Kiss Annamária, as the supervisor, declare that I have read and approved the thesis "The effect that standardbred racehorse training has on the horses' limbs from an animal welfare aspect" of the student (name)Patricia Farrugia, (year) VI., and support her participation in the Scientific Student Conference of the University of Veterinary Medicine in 2023. Furthermore, I declare that the uploaded TDK thesis has been successfully checked for plagiarism and that any matches found comply with the University guidelines/rules.

Budapest, 2023. 10. 10.



supervisor

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**Appendix 4. Supervisor counter-signature form**

I hereby confirm that I am familiar with the content of the thesis entitled  
The effect that standardbred racehorse training has on the horses' limbs from an animal  
welfare aspect

written by Patricia Farrugia (student name)

which I deem suitable for submission and defence.

Date: Budapest, 21, .....day.....10.....month.....2023.....year



Dr. Kiss Annamária  
Supervisor name and signature

Department of Laboratory Animal Science  
and Animal Protection

Department

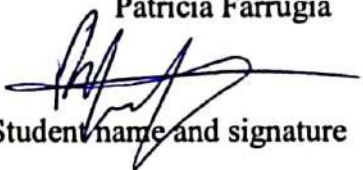
## DECLARATION

I hereby declare that the thesis entitled .....The effect that standardbred racehorse training has on the horses' limbs from an animal welfare aspect .....

is identical in terms of content and formal requirements to the TDK research paper submitted in .....2023.....

Date: Budapest, 3<sup>rd</sup> of November 2023

Patricia Farrugia



Student name and signature



### Thesis progress report for veterinary students

Name of student: Patricia Farrugia






Neptun code of the student: GC4257

Name and title of the supervisor: dr. Kiss Annamária, departmental veterinarian, PhD student

Department: Department of Laboratory Animal Science and Animal Protection


Thesis title: The effect that standardbred racehorse training has on the horses' limbs from an animal welfare aspect

#### Consultation – 1st semester

	Timing			Topic / Remarks of the supervisor	Signature of the supervisor
	year	month	day		
1.	2023.	03.	10.	Discussion of the topic and title, and the content requirements of the TDK thesis	
2.	2023.	03.	21.	Introduction, checking and discussing the writing of objectives	
3.	2023.	07.	20.	The process of finding resources, using useful websites and books	
4.	2023.	08.	08.	Discussing how to make the literature background and how to make the questionnaire	
5.	2023.	08.	22.	Improving and discussing the literature review	

Grade achieved at the end of the first semester: 5

#### Consultation – 2nd semester

	Timing			Topic / Remarks of the supervisor	Signature of the supervisor
	year	month	day		
1.	2023.	09.	05.	Finalization of the literature background, preparation of material and methods (questionnaire)	



2.	2023.	10.	02.	Checking material and methods and discussion	
3.	2023.	10.	12.	Discussion of the preparation of results and conclusions	
4.	2023.	10.	18.	Discussion of the summary of the thesis, preparation of the bibliography (Zotero use)	
5.	2023.	10.	22.	Finalization of the thesis, exact placement of figures, correction of captions, checking bibliography	

**Grade achieved at the end of the second semester: 5**

The thesis meets the requirements of the Study and Examination Rules of the University and the Guide to Thesis Writing.

I accept the thesis and found suitable to defence,

.....  
 signature of the supervisor

Signature of the student:   
 .....

Signature of the secretary of the department:   
 .....

Date of handing the thesis in: 2023.10.25  
 .....

