# Bachelor Thesis

# Practice what you preach

## Using communication through reins in dressage riding at B and L level


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# Preface

This report is the result of my graduation research for the Bachelor Equine, Leisure & Sport at Van Hall Larenstein University of Applied Science Wageningen. During the past four months I have been performing research for Centaur Consultancy in Den Dolder. This period has been both challenging and fun and I look back with positive feelings. I gained a lot of insights and knowledge on rein tension and how to apply riding aids during training. I also learned a lot regarding my planning skills and how to stay positive with considerable setbacks.

I would like to thank several people for the support during this final project. First of all I would like to thank Menke van Steenbergen for providing me this interesting research topic and the meetings on Monday morning. I would also like to thank Sandra van Iwaarden for the constructive criticism and for all the meetings during the entire period.

Most of all I must thank my family and boyfriend for their unconditional support during my entire studies.

I hope you will enjoy reading this thesis as much as I enjoyed doing the research.

Valerie Lotgering

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## Summary

This research is performed to get an insight view in what dressage riders at novice B and L level intended to do with rein riding aids and what kind of rein riding aids they are actually give. The main question of this research is '***What are the intentions compared to the execution of rein riding aids with dressage riders at B and L level?'*** This question is answered by making use of five sub questions. This study originates from experiences during measurements with the rein tension device of Centaur Consultancy produced by Freesense solutions. The aim of this research is to answer some of the questions, which resulted from these measurements with the rein tension device in a scientific set-up.

The basic exercises found for B and L level riders are; halt, stretching the neck of the horse, turn to left or right, extended trot, sitting and rising trot and transitions between walk, trot and canter (KNHS, 2011). Explanations about these aids are found and described from nine different authors. It is remarkable that there is such a big difference among the descriptions of the authors related to the exercises. Facing all the different descriptions, how can it be possible for the rider to find the right description of how to execute a specific exercise?

Eighteen horse rider combinations are used for this research (mean age 9.4 ± 2.7 years, 12 geldings and 6 mares) of various breeds and with a trainings history maximum at L level (nine competing in dressage at B level, five at L1 level and 4 at L2 level) were tested to identify if dressage riders are doing what they intended to do, related to rein riding aids. All the participated horses were schooled at the levels B and L and never higher.
The eighteen riders (mean age 27,4 ± 9,4), all women, are schooled at B or L level and have never been schooled at a higher level before. The horse rider combinations are all trained by different trainers to prevent training bias. All testing was conducted in a 20m x 40m riding arena. The tests were recorded; the recording took place in the corner between the M and C. The rein tension device used for this research is the rein tension device of Centaur Consultancy produced by Freesense solutions.

To acquire these results, a questionnaire in combination with a riding test was used. The questionnaire was presented in advance of the riding test and was composed of ten questions on the intended rein use and ten questions on the intended kind of tension used. The riding test is composed of the basic exercises in dressage at B and L level in combination with several more advanced exercises. Subsequently the intended and executed exercises were compared.

In conclusion, the intentions of the horse rider combinations do not correspond to the executed exercises. Riders intend to mainly use both reins with rhythmical tension and actually use a single hand with continuous tension during the exercises. The difference between intention and execution in combination with variation in learning theories can lead to miscommunication within the horse rider combination and lower performance of horse rider combination.

# Index


Preface ..... 2
Summary ..... 3
Index ..... 4
Introduction ..... 5
  Problem definition: ..... 6
  Research questions: ..... 6
Literature review ..... 8
  Communication between horses and humans ..... 8
    Eight principles of training by McLean ..... 8
    Natural and artificial aids ..... 10
  Rein riding aids ..... 10
  Rein tension ..... 15
Methodology ..... 16
  Research design ..... 16
  Animals ..... 16
  Riders ..... 16
  Equipment ..... 16
  Questionnaire ..... 17
  Standardized riding test ..... 17
  Filming ..... 19
  Measurements and data analysis ..... 19
  Three types of tension ..... 20
  Determination of different reins and tension used during the riding test for example: both reins, left rein- right rein, less tension, left right rein alternately and remaining same tension. ..... 22
Results ..... 23
  Riding test ..... 23
  Rein tension ..... 24
  Results questionnaire ..... 25
  Percentage of applied rein aids and tension as intended ..... 32
Discussion ..... 34
    Literature review ..... 34
    Comparing with existing literature ..... 34
    The standardized riding test ..... 34
    Determination of different kinds of tension ..... 35
    History of horse rider combinations ..... 35
Conclusion ..... 36
Recommendations ..... 38
    Determination kind of tension ..... 38
    Environmental influences ..... 38
    Standardized riding test ..... 38
    Future research ..... 38
References ..... 39
Annex 1: The standardized riding test ..... 42
Annex 2: Questionnaire rein tension measurement ..... 51

# Introduction

Riders make use of riding aids during training to communicate with the horses, these aids can be divided in two categories (Murdoch, 2006). The natural aids: the seat, weight, leg and rein tension and the voice. These aids are natural aids because humans have to make use of their body or voice. The other category is artificial aids: whip, spur etc. aids that are not part of the body of the human. Realizing that horses learn in different ways while taking a look at how people try to communicate with horses, it is clear that by using several different kinds of aids at the same time, miscommunication arises easily.

Rein tension measurements are an interesting source of information to find out how riders communicate with their horses next to weight and leg riding aids. Do all riders give similar aids to perform a specific movement, how reproducible and reliable are the riding aids riders give? Furthermore, it will become possible to measure symmetries and asymmetries in rein tension in riders.
This study originates from experiences during measurements with the rein tension indicator. The aim of this research is to answer some of the questions, which resulted from these measurements with the rein tension indicator in a controlled standardized setting.

Communication between humans and horses is really important, without communication the humans were not able to domesticate such large animals. Humans started domesticating horses around 6000 BC in order to let the horses work on the field and in the woods. Later on people started riding horses as well and used them for transportation and war purposes (Van Zeveren, 2012).
Communication is passing through by information or a message. Communication is very important for humans and animals. Communication exists for only 7% of words. The other 93% is done by tonality (sound) or intonation (pitch) (38%) and physiology (body) (55%) (Roberts, 2014). If communication doesn't go properly between people and animals, miscommunication and misunderstanding may arise. Resulting in stress for both horse and rider.
Horses learn by non-associative and associative learning. In non-associative learning, horses learn through repeated exposure to a single stimulus, this happens when something new enters their environment. The reaction of the horse is to become sensitized to it or habituated to it. In case of sensitization the horse shows an increase in response and in case of habituation the horse shows a decrease in response. Non-associative learning helps horses to either learn to react to something new in their environment or to not react.
Associative learning means that the horse is going to make associations between things. This kind of learning consists of two categories namely; classical and operant conditioning. In classical conditioning, associations are made between two or more signals. With operant conditioning associations are made between signals and outcomes (Fraser, 2014).
Besides these two kinds of learning in horses, McGreevy and McLean describe eight principles for horse training (McGreevy & McLean, 2011). The principles are: 1. Understand and use learning theory appropriately. 2. To avoid confusion, train signals that are easy to discriminate. 3. Train and shape responses one-at-a-time (again, to avoid confusion. 4. Train only one response per signal. 5. For a habit to form effectively, a learned response must be an exact copy of the ones before. 6. Train persistence of response (self-carriage). 7. Avoid and dissociate flight response. 8. Benchmark relaxation. By keeping these 8 principles in mind before and during training, the amount of miscommunications and misunderstandings between a horse and rider could decrease.

## Problem definition:

There are about 500.000 riders and 450.000 horses in The Netherlands whereof 50.000 riders who participate in competitions at different levels and in eight different disciplines. 70% of all the riders are recreational riders and most of these riders have riding lessons at one of the 1000 riding schools in The Netherlands. Keeping in mind that most of the riders have riding lessons at riding schools, the beginning of their learning process of how to communicate with horses starts at the riding school (KNHS, 2014).
During training, riders communicate with their horse by the use of riding aids. As there are many different aids, often several aids are used at the same time. When using different kinds of riding aids, people expect their horse to understand what is meant by these aids. Miscommunication arises and the horse reacts differently than expected. People experience this behaviour as contra productive and frustrating. What people do not realize is the frustration that the horse experiences when the rider does not give the signals intended. Looking at the eight principles, the first 6 principles are about how horses learn. The seventh principle is about avoiding flight responses. Unfortunately that is exactly what the horse does when it does not understand the signals of the rider. Or the flight response can be triggered by external factors. Principle number eight is about keeping relaxation during training. In miscommunication stress occurs instead of relaxation. It makes sense that when riders have better understanding on the aids they give and the learning principles of they might substantially improve communication. Even when people do understand in what way an aid is supposed to be given, do they apply the riding aid in a correct manner? For example, every different aid given to the horse, should give a different reaction of the horse. Are riders aware what type of aid they give to their horses, and are they able to repeat this aid in a similar way?
To measure if riders do as they say and give a similar aid for the expected response a standardised and validated test is necessary. Therefore, one of the aims of this study was to develop a reliable test to validate the rider aid versus the horse's response. A riding test in which the basic communications for transitions, circles and rein changes occur is made. These tasks are essential for the horse and the rider before becoming a successful team with good performances. Once there is a suitable test, this could be used trough all levels of dressage and maybe also for any other disciplines in which riders expects a similar response of the horse to their aid. Another aim of this research is to find if out whether riders do what they indented to do with rein riding aids. Are the riders conscious about the riding aids they give during riding and are these the aids they wanted to give? A pilot test of a riding protocol in combination with a questionnaire in 20 horse rider combinations is done and the results are analysed.

A problem that needs a standardised riding test to measure at least 20 horse rider combinations to find if they practice what they preach focused at rein riding aids measured with a rein tension device. This research is focused on the riders competing in the dressage class at novice levels, B and L, who make use of the English riding method.

## Research questions:

Is it possible to develop a reliable riding test to measure whether riders execute what they intended focused on rein riding aids when they are riding a simple test that is measured with a rein tension device? Are we able to detect the differences that occur between executed aids and intended aids in such a test and can it be used as reliable measure for horse rider communications? This last question is solved by making use of a questionnaire were riders had to fill in the intended rein riding aids and tension, subsequently these results are compared with the riding test and the question can be answered.

***What are the intentions compared to the execution of rein riding aids with dressage riders at B and L level?***

Sub questions:

What kinds of rein aids are used at B and L level according to literature?

What is the correct application of rein riding aids for specific exercises according to the literature?

What are ways of testing rein-riding aids in a controlled standardized setting?

What rein riding aids do riders at B and L level intend to do per exercise?

What rein riding aids do riders at B and L level execute per exercise?

Which intended rein-riding aids correspond to the executed rein riding aids?

# Literature review

## Communication between horses and humans

The communication between horses and humans started many years ago. Around 30,000 BC wild horses were hunted for meat. In 2000 BC the first riding horses appeared in Mesopotamia, 500 years later they also appeared in Mongolia (Van Zeveren, 2012). Communication is the transmission of information or a message. Communication is a very important need in live for humans and animals. It exists for 7% of words. The other 93% are determined by the tonality (sound) or intonation (pitch) (38%), and the physiology (body) (55%). If communication doesn't go properly between humans and animals, miscommunication and misunderstanding may arise.
Humans started domesticating horses around 6000BC to let the horses work on the field and in the woods. Later on people started riding horses as well. Horses were used by the cavalry to perform during wars but less during WOI and WOII. After WOII more machines were introduced and the horse became a companion animal instead of being used for agricultural purposes (Van Zeveren, 2012).
At the cavalry before WOI young riders were coached to become an instructor. These instructors were very important because they were responsible of training the potential soldiers who had to serve during war. These riders were taught how to communicate with the horse and especially how to learn the different horse riding aids to ensure obedience and the proper reaction at the specific riding aids (De Stichting Nederlandse Rijschool, 1950).

Horses learn by non-associative and associative learning. In non-associative learning, horses learn trough repeated exposure to a single stimulus, this happens when something new enters their environment. The reaction of the horse becomes desensitized or habituated to the stimulus. Desensitized or habituation is when a horse becomes less reactive to certain stimuli. It's a type of learning whereby the horse learns to accept normal activities like human contact, brushing, applying the saddle pad and tendon boots. A perfect example of a well-desensitized horse is a police horse that is completely desensitized to loud noises, moving vehicles and crowds. The opposite of a desensitized horse is a sensitized horse. The horse becomes more sensitive for a certain stimulus. For example during riding, if the rider gives some pressure with the legs, he expects the horse to go forward. Non-associative learning helps horses to either learn to react to something new in their environment or to not react (Heleski, 2012).
Associative learning means that the horse is going to make associations between things. This kind of learning consists of two categories namely; classical and operant conditioning. In classical conditioning, associations are made between two or more signals. For example, a horse that becomes really excited when he hears the sound of a feed cart that starts rolling. Or a saddle that is associated with the job of riding (Heleski, 2012).
With operant conditioning associations are made between signals and outcomes. For example, leg pressure stops when the horse is moving forward. So the stimulus is being removed if the horse gives the right response to the stimuli (Heleski, 2012).

### Eight principles of training by McLean

Next to these types of learning theories for horses Mclean and McGreevy (2007) describe eight principles for training horses. The principles are:
1. *Understand and use learning theory appropriately.*
Successful equitation is dependent of non-associative and associative learning.
2. *To avoid confusion, train signals that are easy to discriminate.*
To make the horse stop, turn, go sideways, changing gait (walk, trot, canter and gallop) and lengthening or shortening in steps, many different riding aids are used. All these different responses have their own need in riding aids. Each riding aid should have a different

response. The rider has some limitations with regard to the position on the horse's body. There cannot be simultaneously increase in measurement locations on the horse's body in which to apply these responses. For example, the rider sits approximately in the middle of the saddle. The legs of the rider can exert pressure in a range of 20 cm, whereas the reins can exert pressure in three different ways namely: equilaterally, bilaterally and lateral pressure at the horse's neck. Finally, the seat of the rider can exert pressure at three different positions namely; at the horse's dorsal musculature equilaterally and bilaterally. Or seat movement with every stride of the horse and pressure can be given by accentuate pressure to cue deceleration and acceleration. The rider is also in position to make use of artificial aids like spurs. All these different kinds of applying responses emphasize how important the position of the rider on the horse's body is to achieve the consistent responses in the horse.

3. *Train and shape responses one-at-a-time (again, to avoid confusion).*

When the different functions of the reins and riders legs are seen in the light of their fundamental accelerating and decelerating actions, confusion arises with the horse if both are applied at the same time (Hilgard, 1944). Asking the horse for two or more responses at the same time is defined as 'overshadowing' or 'blocking' depended on the strength of the different stimuli. This results in heaviness in the reins and dullness to the rider's legs during locomotion and transitions (Hilgard, 1944). The German National Equestrian Federation suggest that '' Rein aids should only be given in conjunction with leg and weight aids'' (German National Equestrian Federation, 1997). Yet Decarpentry maintained the famous statement '' hands without legs, legs without hands'' (Decarpentry & Bartle, 1971).

4. *Train only one response per signal.*

A horse doesn't know the intentions of the rider. So it can be very confusing for the horse if one signal has more than one response attached to it. For example making a turn with one rein and asking to horse to bend his neck with one rein, this are two different responses for one signal. In addition that the rider becomes frustrated when the horse doesn't respond as expected.

5. *For a habit to form effectively, a learned response must be an exact copy of the ones before.*

Responses should be consistently trained so they become fixed. All the responses should be trained with the discriminative stimulus: the light aid. The process to make it possible for the horse to react at light aid is a process with three components. 1. A light aid followed by; 2 increasing pressure to motivate the response followed by; 3. Immediate removal of the pressure when the horse gives the response as desired (McLean, 2003). So this means that every transition made at each level should be made within 3 beats of the rhythm of the strides (McLean, 2006).

*6. Train persistence of response (self-carriage).*

The horse must respond to the rider and sometimes it has to continue responding for a certain period of time. The horse has to continue responding until signalled to switch to another response. This principle is called 'self-carriage' meaning that the horse maintains in the same rhythm and tempo, line and straightness and head neck position without any help of the reins of rider's legs. 'Self-carriage; can be tested by the rider by completely releasing the pressure of the reins or taking the legs away from the horse's sides for two steps in walk or trot and two strides in canter and gallop. During these two steps or strides the horse should not lose rhythm, gait, tempo, line, straightness and continue in the same head neck position.

*7. Avoid and dissociate flight response.*

The fear response is less prone to extinction than other behaviours like bolting, bucking, rearing and shying (D, Le Doux, 2002). Therefore, it is important for reasons as safety for the horse as for the human that such behaviours are neither provoked nor maintained (McLean, 2006).

*8. Benchmark relaxation.*

By keeping these eight principles in mind before and during training, the number of miscommunications and misunderstandings between a horse and rider will decrease. This will lead to less wastage of riding horses that would otherwise be determined unsuitable.

### Natural and artificial aids

Riders make use of riding aids during training to communicate with the horses. These riding aids can be divided in two categories (Murdoch, 2006).
There are two different kinds of riding aids, natural aids and artificial aids. The seat, weight and rein and leg aids are natural aids. These aids are named natural aids because riders have to make use of their voice or body to give an aid. The artificial aids are; whip, spur etc. aids that are not part of the rider but an expedient. However, this research is focused on riding aids given by the reins.
According to the learning theory for dressage judges, the rider needs to be elastic in the hips and the loins, the legs are in contact with the saddle and hang down, the upper body is flexible, free and straight, the hands of the rider need to be placed close to each other and close to the withers of the horse. The thumbs up and the hands are not allowed to touch each other or the horse. This together makes it possible for the rider to follow the movements of the horse and give invisible riding aids (International Equestrian Federation, 2007).

When the rider can use their seat and leg aids to shape the horse in the direction of travel, to indicate the gait, to set the rhythm, and to regulate the horse's speed and impulsion, they can use their rein aids to manage the subtle coordination of all of these performance parts (Faith, 2010).

## Rein riding aids

Many equestrian riders tend to consider their hands as riding aids that lead the horse in the same way as the steering wheel of the car directs the car. This is a common misconception as the reins are the finishing touch between the rider and the horse and support the connection with the horse’s mouth (Masuch, 2014) (Clarke, 1990).

The sense of touch is well developed in horses and particularly in the mouth of the horse (Cook, 1999). Humans make use of this sense, by giving riding aids via the reins trough the bit in the horse’s mouth (Clayton, 1985). As mentioned before, training horses is mostly based on negative reinforcement (associative learning) and they should respond to light stimuli (Back & Clayton, 2013). Therefore, a horse that is well trained with negative reinforcement is able to learn to respond to the light signals trough classical conditioning. A goal of classical conditioning is to give stimuli in such a way that is nearly invisible (Wynmalen, 1954). This also includes the stimuli to the mouth. Stimuli can be seen as all the different riding aids riders intend to give with the reins to the horse. Examples are making a turn to the left, the riding aid for halt etc. The most obvious riding aid given by the reins is to reduce speed or to make a transition to another gait.
If children or even adults who want to learn how to ride a horse, books are available to investigate how the appropriate riding aids should be given. Unfortunately there are many different opinions on how the riding aids should be given. At the next 4 pages an overview is given with the most common riding aids described by eight different authors.

In table 1 an overview is given of ten different riding aids explained by nine different authors. Some of the riding aids are not explained in the books and some of the riding aids are explained by the nine authors but they all have a different approach of how to apply the riding aid. For this overview the books of de KNHS and FNRS are used but also other authors are used. The most basic riding aids found in the dressage test are: halt, stretching the neck of the horse, turn to left or right, extended trot, sitting and rising trot and transitions between walk, trot and canter (KNHS, 2011). The exercises described in the table are linked to the exercise numbers of the riding test (see Annex 1).

### Table 1: Explaining rein riding aids according to literature

| **Riding Aids ➔**<br><br>**Authors ⬇** | **On the bit**<br>**(Exercise 2)** | **Turn to left or right**<br>**(Exercise 4,7,25,27)** | **Halt/Stop**<br>**(Exercise 6 & 26)** | **Bending (head/neck) to left or right**<br>**(Exercise 8 &10)** | **Stretching the neck forward (Longitudinal flexion) (Exercise 13 &29)** |
|---|---|---|---|---|---|
| McGreevy & McLean (2011) | Nothing stated | Light pressure on the right is the main aid for turning right, whereas the light pressure at the left rein is the main aid for turning left.* | The fundamental signal for stopping is providing pressure at the bit via both reins. | Nothing stated | Before the horse can stretch their neck, they have to learn the riding aid for more lengthening in de steps. This lengthening will eventually invites the horse automatically to put his head and neck downwards. |
| Schoffmann (2011) | Nothing stated | The rider put's tension at the left rein and ask for bending in the neck. The left calf of the rider is placed at the girth and gives pressure and the calf at the right is placed a little bit behind the girth to support the hind leg of the horse. At the moment of the turn, the tension at the left rein increases and the tension at the right rein decreases. | To make a transition to halt a half halt should be made. | A little tension is taken at the inner rein. The rider turns its hand a little to the inside and gives space at the outer rein. | The rider opens its fists, so the horse can follow the reins forwards and downwards. The rider remains contact with the horse's mouth through the reins in order to keep control over the tempo and neck of the horse. |
| Daalen (2008) | By giving riding aids for going forwards and activating the hind legs of the horse. The head will going forwards and downwards. Prevent the horse from going to low with the neck. | A few meters before making a **turn to left**, the rider puts tension at the left rein to already bend the horse before the turn is made. During this process the riders has to look to the direction he want to go. Keep the horse at the track with having continued pressure at the left leg. By reaching the right point to make the turn, follow the horse's mouth with both reins. | The rider has to breath in and extending the upper body and put tension at both reins. If the horse does not react, give continues tension until the horse reacts. Release tension if the horse reacts. | Nothing stated | Give the horse gradually more length in the reins |

| **Riding Aids ➔**<br><br>**Authors ⬇** | **On the bit (Exercise 2)** | **Turn to left or right (Exercise 4,7,25,27)** | **Halt/Stop (Exercise 6 & 26)** | **Bending (head/neck) to left or right (Exercise 8 &10)** | **Stretching the neck forward (Longitudinal flexion) (Exercise 13 &29)** |
|---|---|---|---|---|---|
| Davison (1995) | Nothing stated | Nothing stated | Nothing stated | Noting stated | Noting stated |
| Muller (2004) | Nothing stated | Rotate with the upper body of the rider to whichever way you are riding. | The point of gravity becomes heavier. You provide the horse with resistance in its movement. | Turn your focus and point of gravity in the direction of bending. The outer shoulder/rein and leg of the rider are more in contact with the horse. | Take two imaginary rods and push the head of the horse forward. |
| Clarke (1990) | Nothing stated | The inner rein leads the bending in, the outer rein limits. | By giving a correct halt the horse stops. | By using the forward pressure of the rider's sit the inner calf pushes the horse against the outer rein. | Nothing stated |
| Stichting Recreatieruiter (2002) | Nothing stated | Nothing stated | Giving a halt, consecutive by half halts leading to halt. | By placing the inner hand a little bit inwards (from the neck). While the inner leg of the rider is placed against the flank of the horse and gives pressure. The rider puts pressure at the inner seat bone. | Nothing stated |
| KNHS (2008) | A light springy tension at both reins offered by the horse, as a result of forward influence of the rider. | Nothing stated | Nothing stated | The rider has equal pressure at both seat bones. The outer rein in placed to the front almost as far as the inner rein is shortened. | During on the bit. The inner hand gives followed by the outer hand. The rider always has to keep contact with the horses mouth. |
| German National Equestrian Federation (2005) | ''Pushing the horse forwards from behind onto contact'' | Nothing stated | Made by one of more halts to prepare the horse and the transition is made by a halt. | The rider remains equal weight at both seat bones, without giving up the contact with the horse's mouth, yields the outside rein by almost the same amount that the inner rein is shortened. | Nothing stated |

| **Riding aids ➔**<br>**Authors ⬇** | **Counter bending**<br>(**Exercise 16 & 32)** | **Collected trot**<br>**(Exercise 22)** | **Extended trot**<br>**(Exercise 24)** | **Transition to a lower gait**<br>**(Exercise 5,20 & 36)** | **Backwards**<br>**(Exercise 6)** |
|---|---|---|---|---|---|
| McGreevy & McLean (2011) | Nothing stated | Brief signals or pressure applied during a single step within a stride. Tension via the reins. Strongly and brief emphasising the bracing seat for a couple of beats of the rhythm. | Brief pressure of the rider's legs for a portion of a single step and repeating until the horse's learns to lengthen the strides. | To make a transition from trot to walk, put light tension at both reins. More details to the riding aid like weight of the rider can be added to the riding aid to make a clear riding aid for deceleration. | The riding aid for going backwards is often, moving both legs 10 cm behind the girth or leaning slightly forward.** |
| Schoffmann (2011) | Nothing stated | The rider shortens the reins. By pushing the hind legs of the horse underneath the body and simultaneously prevent the horse going forward. The movement is transformed in to more bending of the joints. This contributes to lowering of the hindquarters of the horse. | Giving short pressure with the calves to bring the hindquarters underneath the body of the horse. Like compressing a spring together. This compression will be released as the extended trot. | The rider puts a little bit more tension at both reins at the same time both legs are giving pressure to get the hind legs of the horse underneath the horse's body. The riding aids of the hands and legs are given after each other until the horse has made the transition to walk. | The upper body of the rider is leaning slightly forward to relieve the pressure of the horse's back. Both legs are placed just behind the girth. The riders give the horse the riding aid for going forwards and with both hands tension is given at the reins to change the forward movement into an backwards movement. |
| Daalen (2008) | Nothing stated | Nothing stated | Activate the hind legs by giving pressure with the calves. The activated energy needs to be controlled with the reins. By extended trot, the rider has to place the hands a little bit to the front and has to remain in activating the hind legs. | A transition need to be smooth, the riding aids need to be clear but not with to much pressure. If the horse does not respond to the riding aid, the aid must be repeated with more pressure. | After halt the riding aid for forwards is given, during this aid the rider has to give tension at both reins and the horse has to react by going backwards. |
| Davison (1995) | Nothing stated | Nothing stated | Nothing stated | Nothing stated | The rider gives light forward pressure with the cafes in the opposite of the direction of movement |

| **Riding aids ➔ Authors ⬇** | **Counter bending (Exercise 16 & 32)** | **Collected trot (Exercise 22)** | **Extended trot (Exercise 24)** | **Transition to a lower gait (Exercise 5,20 & 36)** | **Backwards (Exercise 6)** |
|---|---|---|---|---|---|
| Muller (2004) | Nothing stated | Nothing stated | Nothing stated | Nothing stated | Give the horse a halt. |
| Clarke (1990) | Nothing stated | By giving a half halt the length of the strides will decrease. | Nothing stated | A half halt is given to make a transition to a lower gait | The rider lightens the sit, the calves gives pressure to move forward simultaneously giving the horse resistive tension with the reins. |
| Stichting Recreatieruiter (2002) | Nothing stated | By giving a halt. (Squeeze in the rein) | Nothing stated | A halt or a couple half halts are given to make a transition. | The rider brings both legs a little bit behind the girth and gives halts to prevented the horse from going forward. |
| KNHS (2008) | Nothing stated | Nothing stated | Giving the horse more riding aids for going forward with the seat and calves. | A half halt can be given to make a transition or a halt can be given. | The rider pushes the horse forwards at the same time the hands of the rider prevent the horse going forwards so the horse has to go backwards. Release the tension if the horse goes backwards. |
| German National Equestrian Federation (2005) | Cannot be found | The rider alternately 'asks; and yields with the hands, pushes with his weight and legs, so the horse steps further forward under its centre of gravity and takes shorter strides. | Rider prepares the horse with a half-halt, then uses his weight and both legs positively, simultaneously and smoothly to send to horse forward. At the same time the rider must give sufficiently with the hands to allow the horse necessary stretching of the neck and lengthening of the frame. | A half halt is given to make a transition to a lower gait. | The rider uses his weight and legs to send the horse forward. The lower legs are placed in a 'guarding' position to prevent the hindquarters going sideways. If the horse responds forwards, the rider 'feels' both reins and gives a asking rein aid, to case the forward energy into backwards movement. |

**Direct turn to the left:**

* Light tension on the right is the main aid for turning right, whereas the light tension at the left rein is the main aid for turning left. It's common seen that riders bring both hands slightly towards the side of the turn. McGreevy made a distinction between direct en indirect turns. A direct turn is made with more tension at the rein moving slightly away of the horse's neck. When there is more tension at the rein that comes closer to the horse's neck, it is called an indirect turn. The direct turn is the preferred turning method. (McGreevy & McLean, 2011)

**The riding aid for backwards**

** To be able to ride backwards with a horse, the horse need to be shaped before he is able to go backwards with the rider on his back. During shaping the horse learns by steps which signal means that he has to go backwards. The riding aid for going backwards is often, moving both legs 10 cm behind the girth or leaning slightly forward. (McGreevy & McLean, 2011)

## Rein tension

During horse riding, movement of the rider happens by the natural forces of each step of the horse. It's the ability of the rider to adjust to these forces and don't put extra tension on the reins to keep in balance and to regain position (Eisersiö, Roepstorff, Weishaupt, & Egenvall, 2013). The connection between the rider's hands to the horse's mouth via the reins is considered as 'contact' (McGreevy, McLean, Warren-Smith, Waran, & Goodwin, 2005). A crucial point is that the amount of tension applied to the reins to achieve 'contact' has never been determined. There is a large variation between and within riders in rein tension.

As mentioned by the learning theories, for optimal results during training, every cue or signal cannot be the same, and the rider has to release the pressure as soon as the horse gives the right response for the cue. Another very important thing is that rider should give the cue's in that kind of matter that the horse is able to recognize difference in baseline bit tension or pressure that are cue's. Baseline contact means that there is always tension at the reins, so the horse is never free of tension (Hawson, Salvin, McLean, & McGreevy, 2014). By giving variation in rein tension accidently, a horse can interpret this as signals and this can lead to miscommunication and poor learning (Saslow, 2002). Having too much tension on the reins causes discomfort in the horse's mouth (Manfredi, Clayton, & Rosenstein, 2005) .Scars in the mouth of the horse are very common (Tell, Egenvall, Lundström, & Wattle, 2008), whereas lighter ridings aids given by the reins and by repeated release from the bit will lead to more desirable effect (Egenvall, Eisersiö, & Roepstorff, 2012), (Eisersiö et al., 2013).

A study done by Warren-Smith (Warren-Smith, Curtis, Greetham, & McGreevy, 2007) demonstrated that the rein tension required for going straight was less than for any other response, showing that a lighter contact on the reins can be maintained between the application of specific stimuli. The rein tension required for a halt response was greater than for any other response ($P < 0.001$).

A study by Randle (Randle, Abbey, & Button, 2011) demonstrated the difference in rein tension between individual riders. The subject was to maintain medium contact for 3 seconds and then drop it for 2 seconds. The average medium contact tension applied was 283.2 ± 154 gramForce. However the rein tension is also dependent at the material of the reins, a study was done with six different rein types (dressage, eventing, laced, leather, rubber, narrow leather and webbing). The rein type significantly affected the rein tension applied. The greater tension was applied with leather reins whereas webbing and narrow leather showed less tension (Hawson et al., 2014).

# Methodology

## Research design

This study was set up as a pilot study. This research was the first research in comparing the difference between intended and executed rein riding aids and rein tension. The type of research was an experiment.
An experiment with 20 horse rider combinations is done to determine whether riders really do what they intended to do in relation to rein riding aids. Eighteen horse rider combinations were eventually analysed due to one horse rider who wasn't able to perform the riding test, and the other horse rider combination had a data fail in the outcome of the rein tension measurement.

## Animals

Eighteen horses (mean age 9.4 ± 2.7 years, 12 geldings and 6 mares) of various breeds and with a known training history (nine competing in dressage at B level, five at L1 level and 4 at L2 level) were tested to identify if dressage riders are doing what they intended to do related to rein riding aids. All the participated horses were schooled at the levels B and L and never been schooled higher.

## Riders

Eighteen riders (mean age 27,4 ± 9,4, all women) are all schooled at B or L level and never been schooled at higher level before. The horse rider combinations are all trained by different trainers to prevent training bias. All testing was conducted in a 20m x 40m riding arena. The tests were recorded; the recording took place in the corner between the M and C.

## Equipment

For this research a rein tension device is used. The rein tension device of Centaur (Centaur Consultancy, Den Dolder, The Netherlands) produced by Freesense solutions is used. Figure 1 and 2 are photographs of the rein tension device.

Figure 1: Rein tension device attached to bridle.


Figure 2: Rein tension device in storage box.

The rein tension device is attached to the bridle at three different points. The rein tension device is placed between the rein and the bit ring at both sides. The rein is attached directly to the tension device and the tension device is attached to the bit ring by using a carbine. The signals of the rein tension device are send to a transmitter which is attached to the

throat-lash. The signal is send wireless from the transmitter to the USB receiver. The receiver is plugged in to the USB-port of the computer. Subsequently the received signals are processed in a dedicated piece of software designed solely for measuring rein tension.

***Software***
The USB receiver was plugged into a Macbook Pro running OS 10.7.5 (Apple Inc. Cupertino, CA). Because the software of the rein tension device only operates on a windows setup a virtual environment by Virtualbox (Oracle Corp., Redwood Shores, CA) was used running Windows 7 (Microsoft Corp., Redmond, WA).
Data was analysed using Excel version 14.4.7 (Microsoft Corp., Redmond, WA)

## Questionnaire

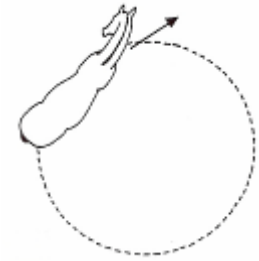
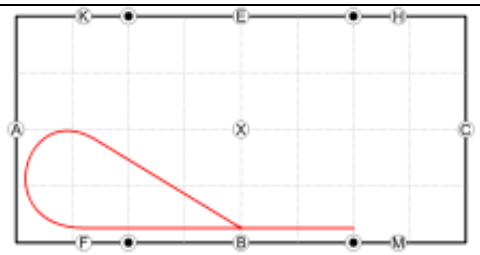
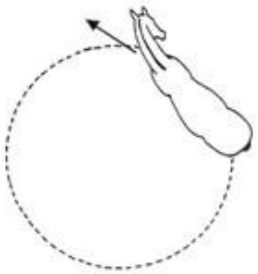
The questionnaire contained ten questions arising from the riding test. Each different exercise from the riding test is asked in the questionnaire but only at one hand. The ten exercises asked for in the questionnaire are; asking for on the bit, turn to the left, transition from trot to walk, four strides backwards, bending (head neck) to right, large circle stretching the neck forward (Longitudinal flexion), large circle counter bending to left, large circle sitting trot, couple strides collected trot and a couple strides extended trot. Each question consists of two parts. The first part is about which rein is used: left rein, right rein, both reins or left and left right rein alternately. Second part of each question is about what kind of tension is used, rhythmical tension, continuously tension or short tension. The questionnaire was designed with one possible answer per part of the question. See Annex 2 Questionnaire rein tension measurement.

## Standardized riding test

Each horse rider combination had to ride a standardized riding test, based at the riding test at B and L level of the KNHS and the FNRS. Adaptations were made to get one exercise performed at both hands. The riding test starts with asking the horse on the bit and will continue with a baseline rein tension measurement at the longer side of the riding arena. This baseline rein tension measurement is done to be able to compare the baseline tension with other tension given during the riding test. During the test fifteen circles of 20 meter are made at the middle of the arena (B-E-B), this is done in order to compare circles with each other by having the same bending in the body of the horse and having the same environmental influences.
The exercise backwards, bending of the head/neck and counter bending are added to the riding test, because this test should also be used at more advanced levels. The horse rider combinations of this research had to ride to whole test, except when the riders were not able to perform an exercise due to the advanced level.
Before the riding test could start, the riders had to fill in a questionnaire linked to the standardized riding test with ten questions about which rein riding aids the rider intended to give and what is the intended tension during the riding test. After the questionnaire the rein tension device was attached to the bridle of the horse. All combinations were given a period of time (15 min) to warm-up the horse before the actual test started. The duration of the riding test is 6 minutes.

**The standardized riding test**

| | | |
|---|---|---|
| 1 | | Trotting in free position of the head and neck, with light contact at the left hand. |
| **2** | **Between B-M** | **Asking the horse on the bit** |
| **3** | **H-E-K** | **Baseline tension measurement in trot** |
| **4** | **A** | **Turn to left** |
| **5** | **For X** | **Transition to walk** |
| **6** | **Na X** | **Halt en 4 strides backwards, forward in trot** |

| | | |
|---|---|---|
| **7** | **C** | **Right hand** |
| **8** | **M-B** | **Asking for bending to the right (only head–neck)** |
| 9 | B-K | Changing hand |
| **10** | **F-B** | **Asking for bending to the left (only head–neck)** |
| 11 | B-H | Changing |
| **12** | **B-E-B** | **Large circle** |
| **13** | **B-E-B** | **Large circle stretching the neck** |
| 14 | At B | Get reins to normal length |
| 15 | B-E-B | Large circle |
| **16** | **B-E-B** |  **Large circle counter bending** |
| | **B-E-B** | **Large circle sitting trot** |
| 18 | B | Transition to right canter |
| **19** | **B-E-B** | **Large circle** |
| **20** | **B-E** | **Transition to working trot** |
| 21 | B | Following track |
| **22** | **Between K en H** | **A couple strides collected trot (smaller strides in the same rhythm** |
| 23 | H |   Turn on the haunches |
| **24** | **F-H** | **Changing hand, a couple strides extended trot (larger strides in the same rhythm** |
| **25** | **C** | **Turn to the right** |
| **26** | **Between X en D** | **Halt, forward in trot** |
| **27** | **A** | **Left hand** |
| **28** | **B-E-B** | **Large circle** |
| **29** | **B-E-B** | **Large circle stretching the neck** |
| 30 | At B | Get reins to normal length |
| 31 | B-E-B | Large circle |
| **32** | **B-E-B** |  **Large circle counter bending** |
| **33** | **B-E-B** | **Large circle sitting trot** |
| 34 | B | Transition to left canter |
| **35** | **B-E-B** | **Large circle** |

| | | |
|---|---|---|
| **36** | **B** | **Transition working trot** |
| 37 | E | Following track |
| 38 | | End of test |

All the bold type letters in the standardized riding test are that are measured. As seen in the test all the measurements are done in both directions, to be able to compare both hands in these exercises. All the exercises are measured at specific moments during the test. These specific moments can be found in annex 1.

## Filming

The riding test of all combinations is filmed from the corner between M and C. From that point it is able to follow all the exercises with the camera. Filming is done hand held by the researcher for each combination. The black dot in the left corner is the spot were all the filming is done. Filming started at K when the riding test started at A, so there was enough time to focus on filming and recording the rein tension.

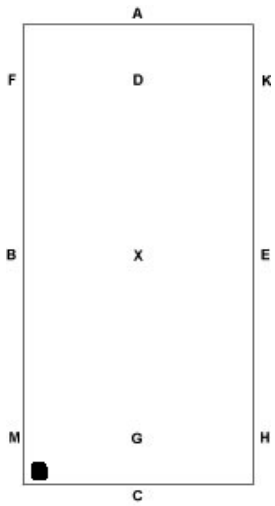



**Figure 3: The black spot is where all the tests are filmed**

## Measurements and data analysis

The tension is expressed in Newton's (N). Each rein was recorded continuously during the test. After each test the data was saved in a comma-separated-file (.csv) with the name of the rider. The film made during the test is analysed with a stopwatch to precisely see where the riding aids were given. This is all done by visual observation: watching the film with a stopwatch and with each riding aid the time was noted. The list with specific time notes per rider were later linked to times in the excel sheet of each rider. The specific times were selected and copied to an overall excel sheet with the different riding aids and horse rider combinations together so an overview of all the riders is achieved.

### Scoring the questionnaire

To be able to determine whether the rider is doing what he or she intended to do or whether that the rider is doing something else a scoring system is developed. In table 2 an overview is given on the points given during scoring the questionnaires. The rider gets 2 points if the rider executed what he intended to do. If the rider does what is intended, but simultaneously doing something with the other rein 1 point is given. If the rider executed something else than intended 0 points are given.

| Score | Determination score |
|---|---|
| 0 | Rider does something completely different than he intended to do. |
| 1 | Rider does what he intended to do but simultaneously doing something with the other rein. |
| 2 | Rider does what he intended to do. |

**Table 1: Scoring system for the questionnaire.**

If the rider had filled in all the questions of the questionnaire correctly, so if intended was the same as executed, 40 point could be obtained.

**Determination of tension dosage given with the reins during the riding test.**
Time is used to determine whether a tension is short, rhythmical or continuously. This has to do with the different baseline of rein tension for every horse rider combination. Time is always the same with every combination that is why in this research time is used as a determination of tension instead in tension in Newtons.

## Three types of tension

***Rhythmical tension***
Is seen as tension that changes within every 0,30 seconds. An example of rhythmical tension is given in figure 4.

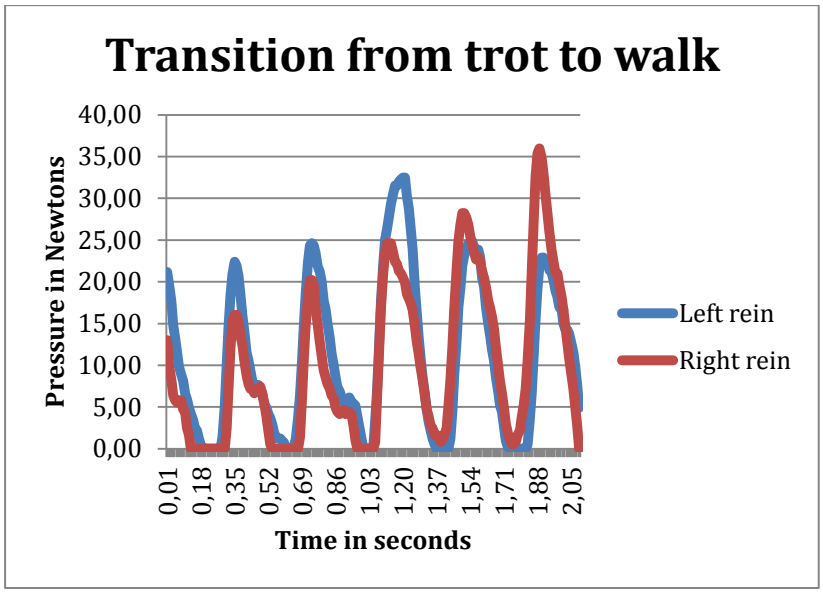



Figure 4: Example of rhythmical tension, the blue line represents the left rein and the red line represents the right rein.

***Continuously tension***
Is seen as tension that increases for a longer period than 0.30 seconds. An example is given in figure 5.

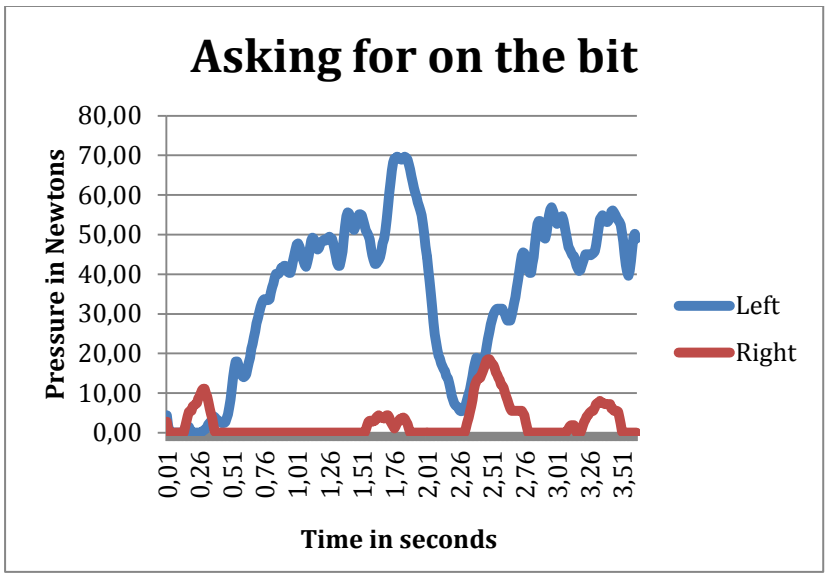



Figure 5: Example of continuously tension, the blue line represents the left rein and the red line represents the right rein.

***Short tension***
Is seen as tension that is shorter than 0,30 seconds in a non-repetitive way. An example is given in figure 6.

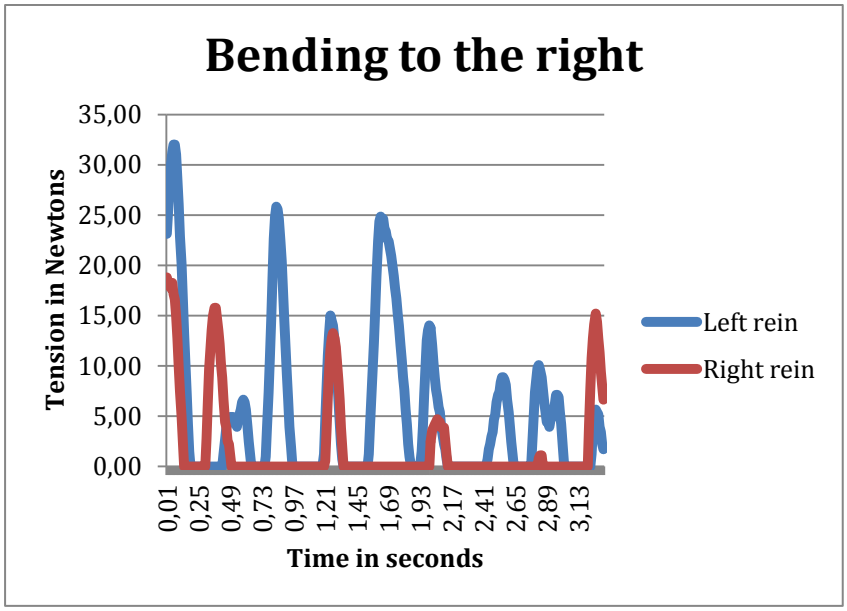



**Figure 6: Example of short tension, the blue line represents the left rein and the red line represents the right rein.**

## Determination of different reins and tension used during the riding test for example: both reins, left rein- right rein, less tension, left right rein alternately and remaining same tension.

***Remaining the same tension as rising trot***

Besides the previous three options another option is possible. This option is given to the rider at the question about sitting trot is to remain the same tension as during riding trot. This can be measured by comparing the average value of both reins during rising trot with the average value of both reins during sitting trot, again with a margin of one Newton. As showed in table 3 and table 4 this rider does not have the same tension.

| Large circle | Sitting trot |
|---|---|
| **L**eft rein | **R**ight rein |
| 2,24Newton | 21,18Newton |

**Table 3: Example of tension during sitting trot at a 20meter circle (B-E-B) at the right hand.**

| Large circle | Rising trot |
|---|---|
| **L**eft rein | **R**ight rein |
| 2.96Newton | 18,88Newton |

**Table 4: Example of tension during rising trot at a 20meter circle (B-E-B) at the right hand.**

***Less tension***

Measuring less tension is measured at the same way, as by remaining the same tension. The tension during the exercise is compared with the baseline tension at the circle or at the straight line. Again a margin of one Newton applies.

**Left or right rein**

The overall tension at the left or right is higher than the other rein during the exercise of the test. This can be seen in table 5. An example of exercise number 5 is given with the tension at both reins. Evidently there is more tension (32.71N) at the right rein than at the left rein (19,90N). Subsequently, this exercise should be scored as a tension given with the right rein.

| Transition trot to walk | |
|---|---|
| Left rein | **R**ight rein |
| 19,90Newton | 32,71Newton |

**Table 5: Example of tension on the right rein during the exercise transition from trot to walk at a straight line (A-X).**

***Both reins***

The overall tension between both reins should be the same with a margin of 1 Newton. As seen in table 6 there is a difference of 0,95N so this is exercise should be scored as a tension given with both reins.

| Asking the horse on the bit | |
|---|---|
| Left rein | Right rein |
| 17,61Newton | 16.56Newton |

**Table 6: Example of tension on both reins during the exercise asking the horse on the bit at the long side of the track (B-M).**

***Left right rein alternately***

With this method, the rein tension should be change within 0.30 seconds from the left rein to right rein and vice versa. This means the tension is going from one rein to the other within 0.30 seconds.

# Results

## Riding test

The riding test exactly did what it was designed for, testing whether riders are doing the same with both hands. In table 7 the two exercises of turning left and right of the riding test are compared with each other by making use of the average tension of the exercise.
As showed in table 7 the tension of the turn to the left is very variable between these three examples. There is a difference between the tension at the left and right rein and the difference between the two different turns to the left of the same combination is remarkable (marked in red). The tension between the two turns varies at the left rein with 13 Newton, the right rein varies with 2 Newton.
Another remarkable thing is that the tension increases at the right rein by making a turn to the left (marked in green). Having a look to the turn to the right, five out of six turns to the right is made with the right rein. Remarkable is the amount of tension increases by the third combination an increase in rein tension of at least 10 Newton (marked in blue).

| Master | Example 1 | | Example 2 | | Example 3 | |
|---|---|---|---|---|---|---|
| Side | Left rein | Right rein | Left rein | Right rein | Left rein | Right rein |
| Turn to left | **18,27** | **25,68** | 25,13 | 6,20 | **26,16** | **28,67** |
| Turn to left | **31,17** | **23,20** | 17,53 | 5,70 | **20,63** | **33,21** |
| | | | | | | |
| Turn to right | 20,93 | 16,83 | 5,79 | 6,67 | **23,71** | **49,57** |
| Turn to right | 13,66 | 24,55 | 8,09 | 9,48 | **29,69** | **39,77** |

**Table 7: Compared rein tension during 2 different exercises of 3 combinations. A difference between tension in two turns to the left by the same combination is marked in red. Marked in green is the increased tension at the right rein by making a turn to the left. The tension marked in blue illustrates the increases rein tension at the right rein by making a turn to the right.**

All the combinations had to ride the same standardized riding test. However out of the 18 combinations, seven combinations made riding mistakes at the same exercises. The exercise was bending to the right and subsequently changing hands (exercise 8 & 9). All these seven combinations forgot to change hands and followed track.

## Rein tension

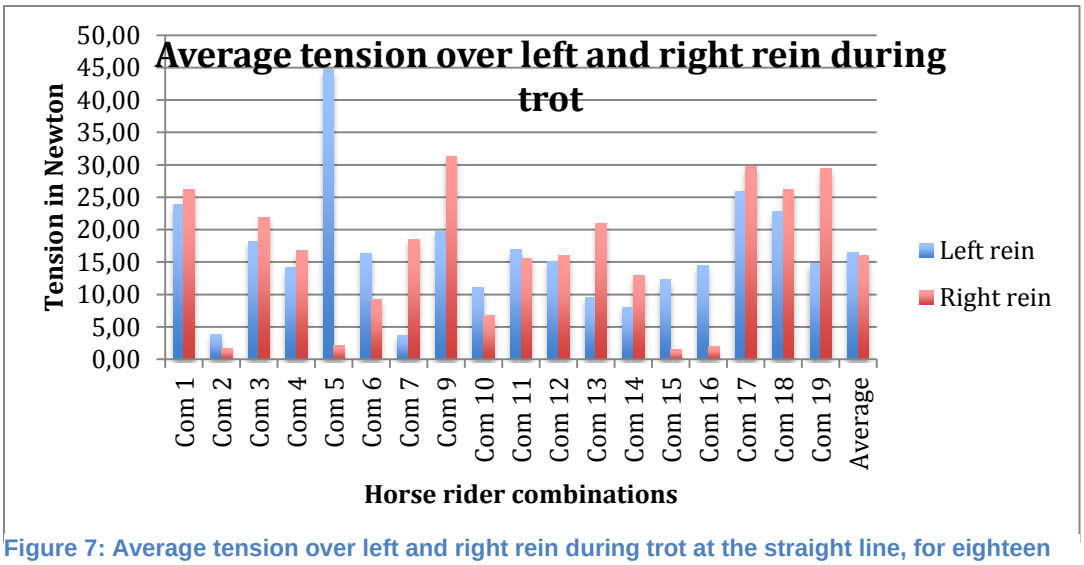



**Figure 7: Average tension over left and right rein during trot at the straight line, for eighteen combinations in a standardized riding test.**

The rein tension device illustrates what riders are doing during riding horses. All the riders have a different baseline tension. As showed in figure 7 the average tension over the left and right rein during trot at a straight line is measured. The average tension differs a lot between all the eighteen combinations. The biggest difference can be found by Combination 5, measured is 45 N at the left rein and 2N at the right rein.

## Results questionnaire

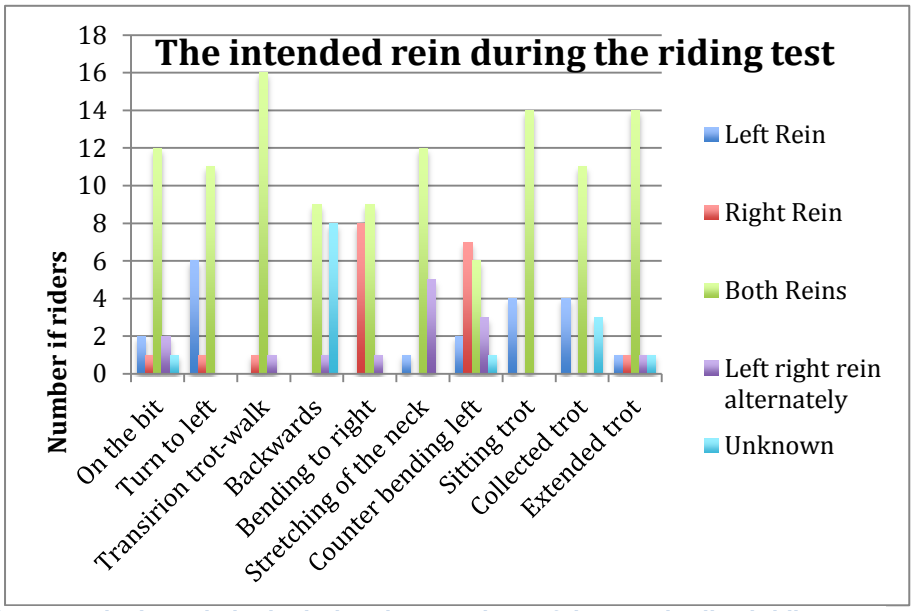



Figure 8: The intended rein during the exercises of the standardized riding test

The riders had to fill in the questionnaire as how they thought that they applied the riding aids and tension during ten different exercises of the standardized riding test. In figure 8 the perceived rein is showed in a table, at each exercise of the riding test the answer of both reins was given the most. More than 50% of the riders mentioned that both reins are most intended. After both reins, the right rein is the second most chosen answer.

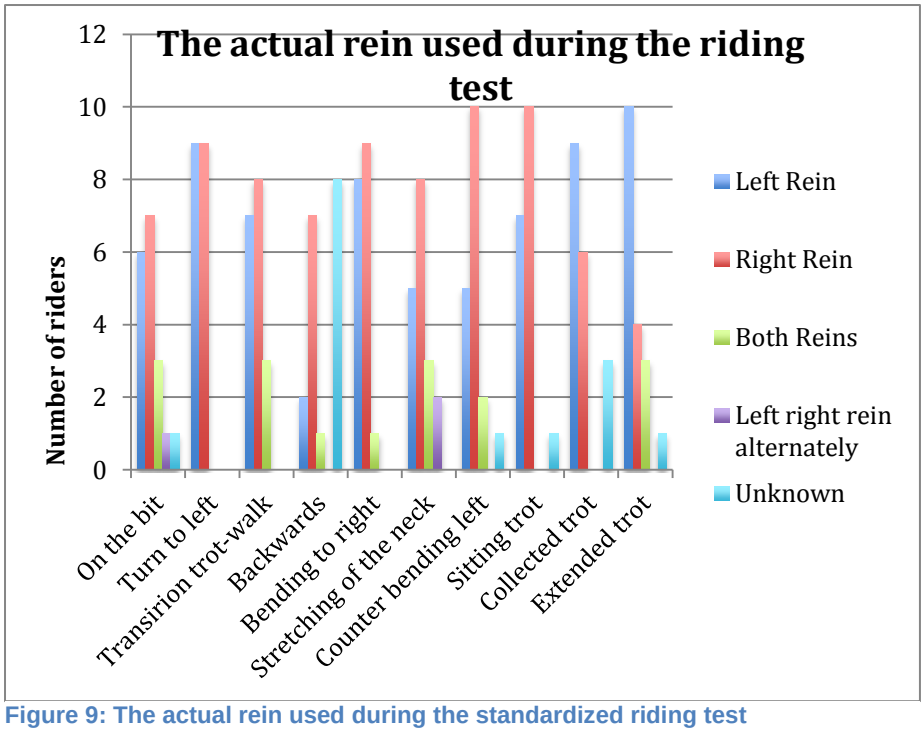



Figure 9: The actual rein used during the standardized riding test

Comparing the intended rein with the actual used rein shows that the actual used rein is different than from the intended rein. The most actual used rein during all the exercises is the right rein. Whereas showed in figure 9. It is intended with both reins.

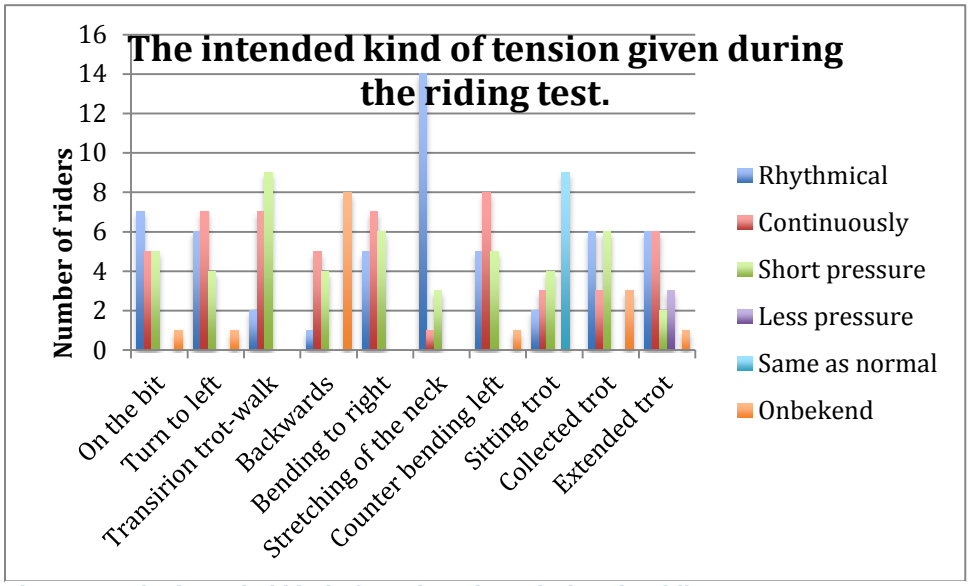



Figure 10: The intended kind of tension given during the riding test

Another result is the difference between perceived tension given trough the riding test and the actual given tension during the riding test. As showed in figure 9 the tension most given by the riders during the whole riding test is the continuously tension. Fourteen combinations perceive rhythmical tension at the exercise of stretching the horse's neck. 50% of the riders perceive the same tension by sitting trot as by rising trot. Short tension is with 50% of the riders mostly perceived by making a transition from trot to walk.

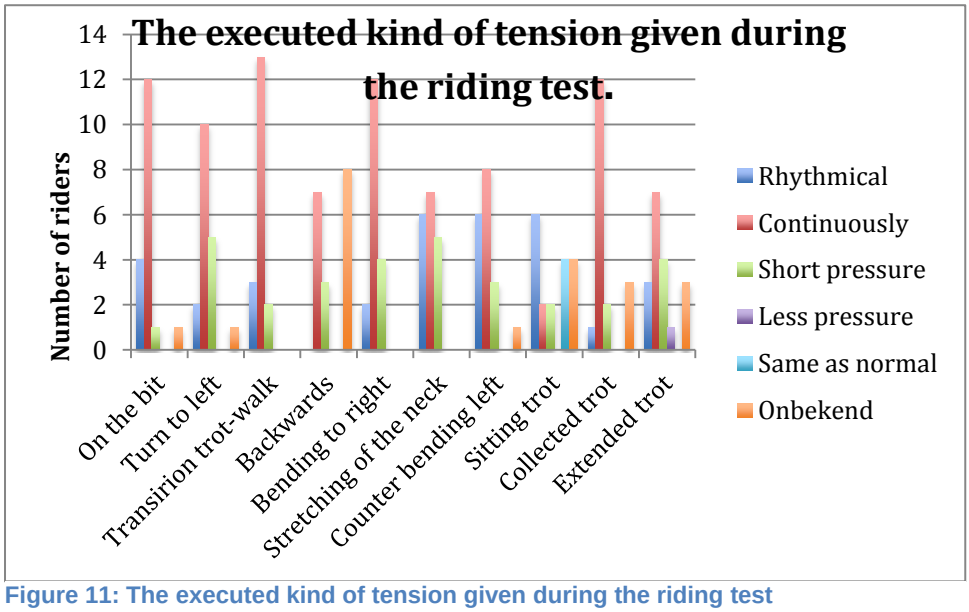



Figure 11: The executed kind of tension given during the riding test

Looking to the actual kind of tension in figure 10 given during the riding test, continuously tension is the most used tension. Whereas the transition from trot to walk is perceived by short tension the actual kind of tension given by the rider is continuously tension. The same for stretching the neck of the horse is perceived by rhythmical tension and actually done by giving continuously tension. Eighteen riders perceived rhythmical tension, six combinations actually give rhythmical tension at stretching of the neck.

In figures 12 to 20 an overview is given on the intended and executed kind of rein and tension given per exercise of the standardized riding test. The unknown rein/tension can be explained as a horse rider combination that is not able to perform that kind of exercise, so the intended and executed rein and tension is unknown.

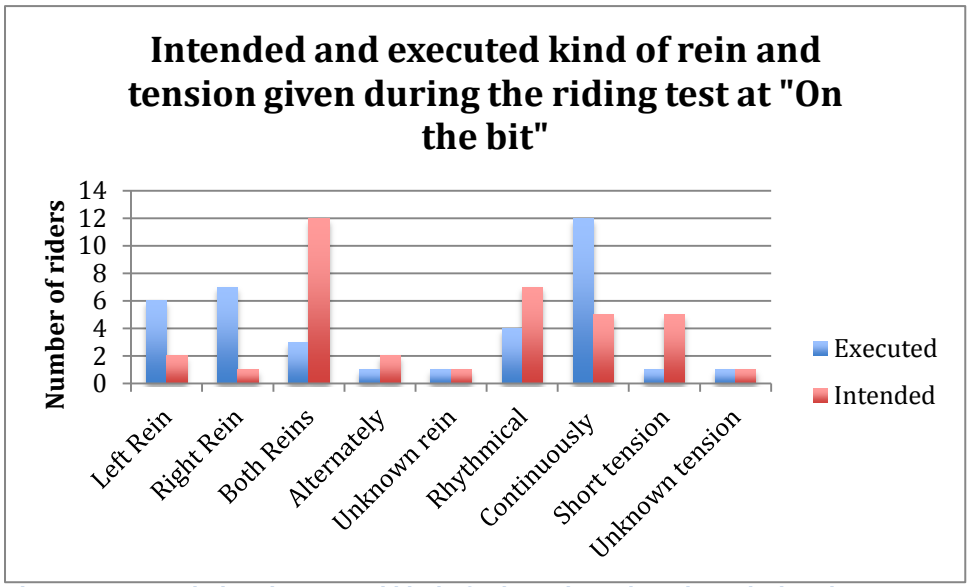



**Figure 12: Intended and executed kind of rein and tension given during the standardized riding test at riding the horse on the bit at a straight line.**

The intended rein and tension given during the exercises of the standardized riding test are marked in red in figure 12. Riding the horse on the bit is intended with both reins and rhythmical tension. Riding the horse on the bit is executed with a single rein left or right with continuous tension.

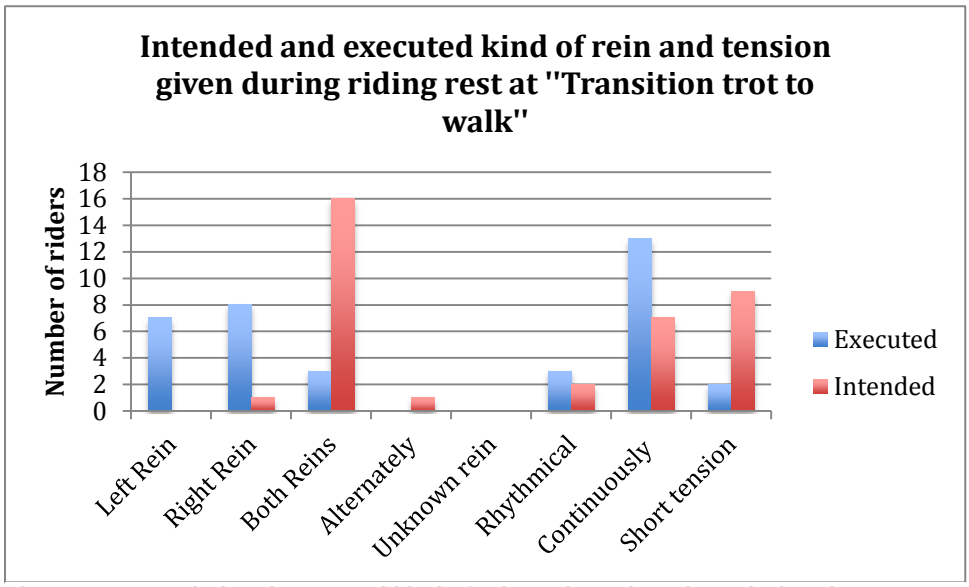



**Figure 13: Intended and executed kind of rein and tension given during the standardized riding test at the transition from trot to walk at a straight line.**

The intended rein and tension given for making a transition from trot to walk is shown in figure 13. The intended rein and tension for the transition from trot to walk at a straight line are with both reins and with continuous or short tension. The executed rein and tension used for a transition from trot to walk are; continuous tension with a single rein either left or right.

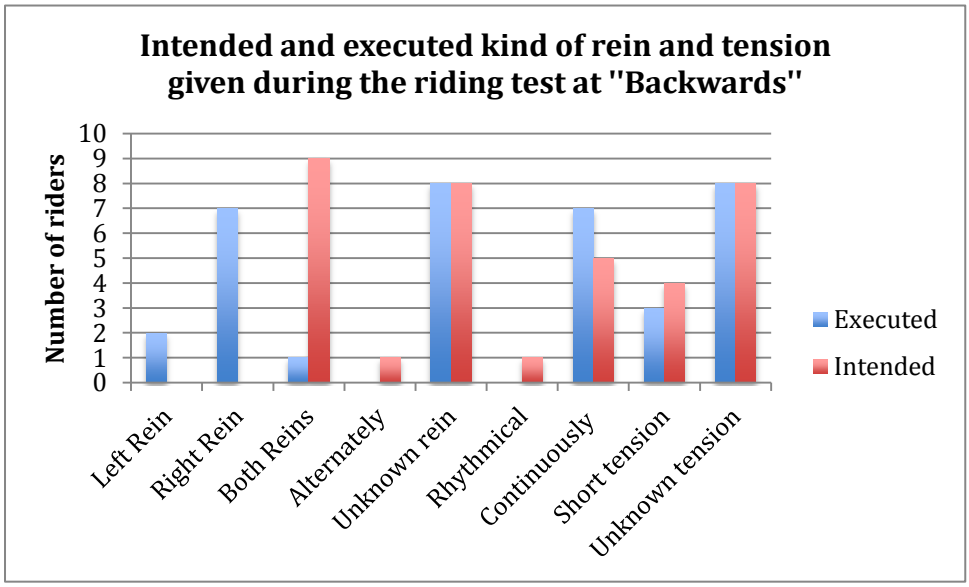



**Figure 14: Intended and executed kind of rein and tension given during the riding test at the exercise backwards at the straight line.**

Riding backwards is intended to be done with both reins. Eight riders were not able to perform the exercise riding backwards. This explains the number of unknown rein/tension in figure 14. The nine riders that were able to perform the exercise backwards intended to make use of both reins and one rider intended to make use of left right rein alternately. The intended tension used for riding backwards is for five riders continuous tension and four riders intended short tension, one rider intended rhythmical tension. The executed tension is with seven riders continuous tension and three riders short tension.

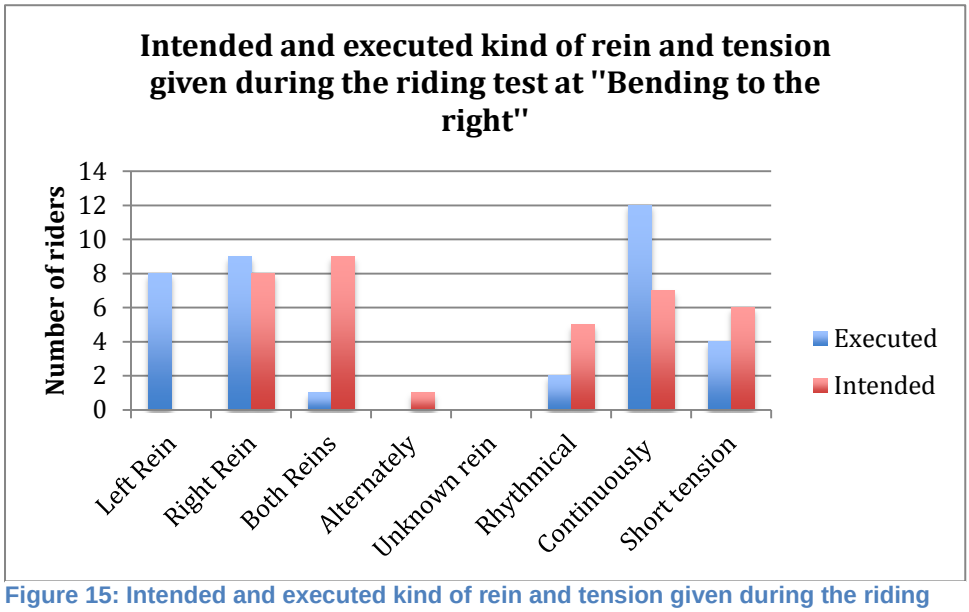



**Figure 15: Intended and executed kind of rein and tension given during the riding test at the exercise bending to the right at the straight line.**

The intended and executed rein and tension given during the exercise bending to the right are showed in figure 15. Nine riders intended to perform bending to the right with both reins, eight riders intended the right rein and one rider intended left right rein alternately. The intended tension by bending to the right is for seven riders continuous tension and for six riders short tension, five rider intended to make use of rhythmical tension. Executed is by twelve riders continuous tension, two riders executed rhythmical tension and four riders executed short tension.

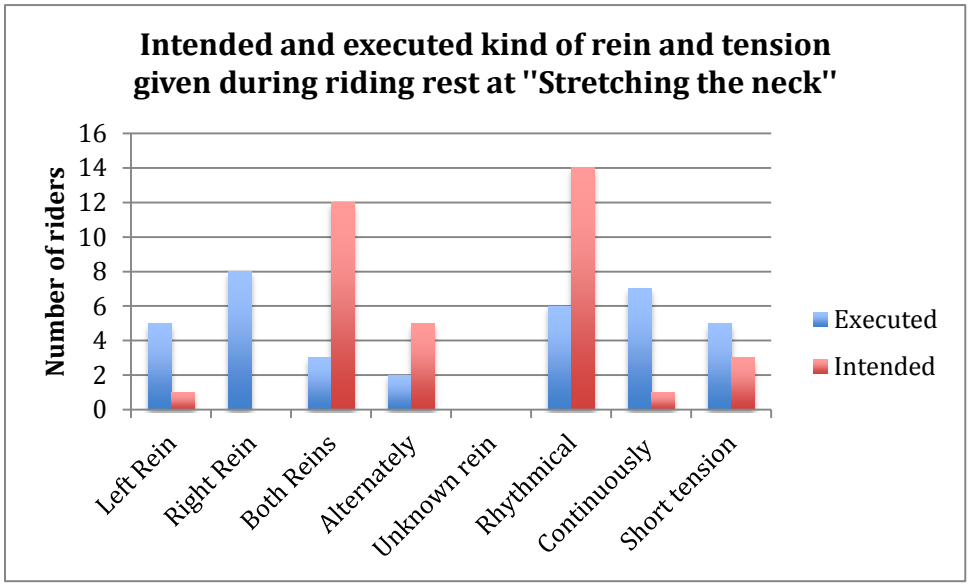



**Figure 16: Intended and executed kind of rein tension given during the exercise stretching the neck of the horse in a circle of 20 meters at the middle of the arena at the right hand (B-E-B).**

Stretching the neck of the horse is with both reins intended by twelve riders, one rider intended with the left rein and five riders with left right rein alternately. With the rhythmical tension as most intended tension. Fourteen riders intended rhythmical tension, one rider intended continuously tension and three combinations intended short tension. Eight riders use the right rein as the executed rein, seven riders the left rein, three riders are using both reins and two riders are using left right rein alternately. The executed tension during stretching the neck of the horse is by seven riders continuously tension, six riders executed rhythmical tension and five riders executed short tension.

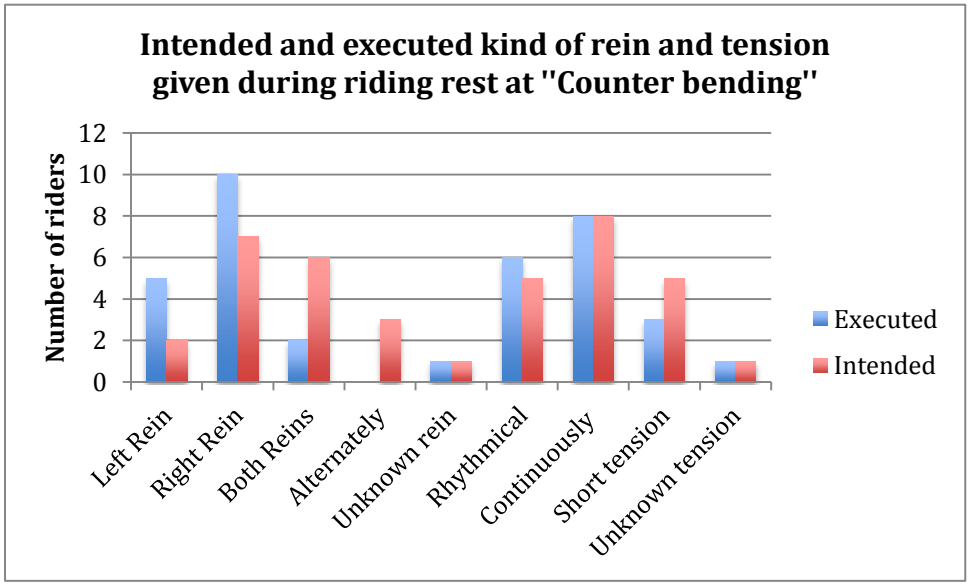



**Figure 17: Intended and executed kind of rein and tension given during the exercise counter bending in trot at a large circle of 20 meters in the middle of the arena at the right hand (B-E-B)**

The intended rein and tension used for counter bending at the right hand in trot are shown in figure 17. The intended rein by seven riders is the right rein, six riders intended both reins, three riders the left right rein alternately and two riders intended the left rein. Again one rider wasn't able to perform counter bending so one rider is unknown in rein and tension. The executed rein by counter bending is for ten riders the right rein, five riders use the left rein

and one rider use the both reins. The intended tension for counter bending is for eight riders continuous tension, five riders intended rhythmical tension and five riders intended short tension. Executed is by eight riders is continuously tension, seven riders executed rhythmical tension and three riders executed short tension.

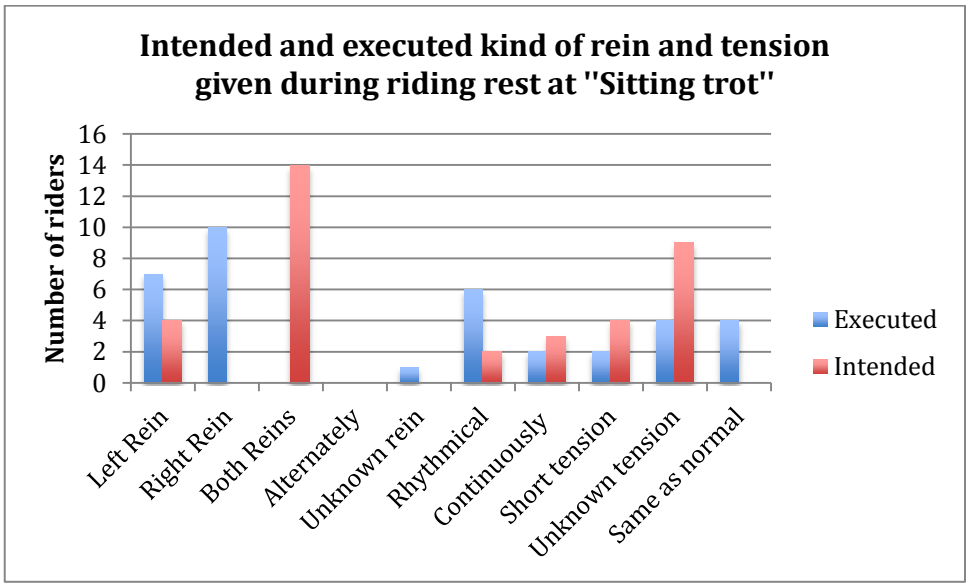



Figure 18: The intended and executed kind of rein and tension given during the exercise sitting trot at a 20meter circle in the middle of the arena (B-E-B)

The intended reins for sitting trot is for fourteen riders both reins and for four riders is the intended rein for sitting trot the left rein. This is shown in figure number 18. The executed rein is for ten riders the right rein and for seven riders the left rein. The intended tension is for nine riders unknown, two riders intend rhythmical tension, three riders intend continuously tension and four riders intend short tension. The executed tension is by six riders rhythmical tension, four riders executed the same tension as during rising trot, two riders use continuously tension and two riders use short tension.

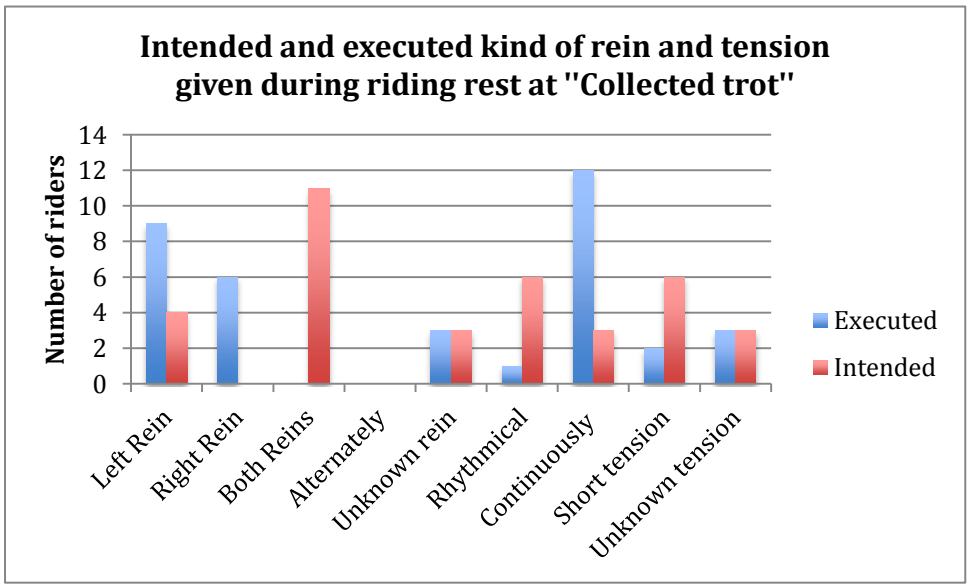



Figure 19: Intended and executed kind of rein and tension given during the exercise collected trot at a straight line.

The intended and executed rein and tension during the exercise collected trot are shown in figure 19. The intended rein used for collected trot is for eleven riders both reins, four riders

intended the right rein and three riders are unknown due to not being able to perform collected trot. The executed rein during collected trot is for nine riders the left rein and for six riders the right rein. The intended tension is for six riders rhythmical tension, six riders intended short tension, and three riders intended continuously tension and three are unknown. The executed tension is for twelve riders continuously tension, one rider executed rhythmical tension, and two riders executed short tension and three riders are unknown.

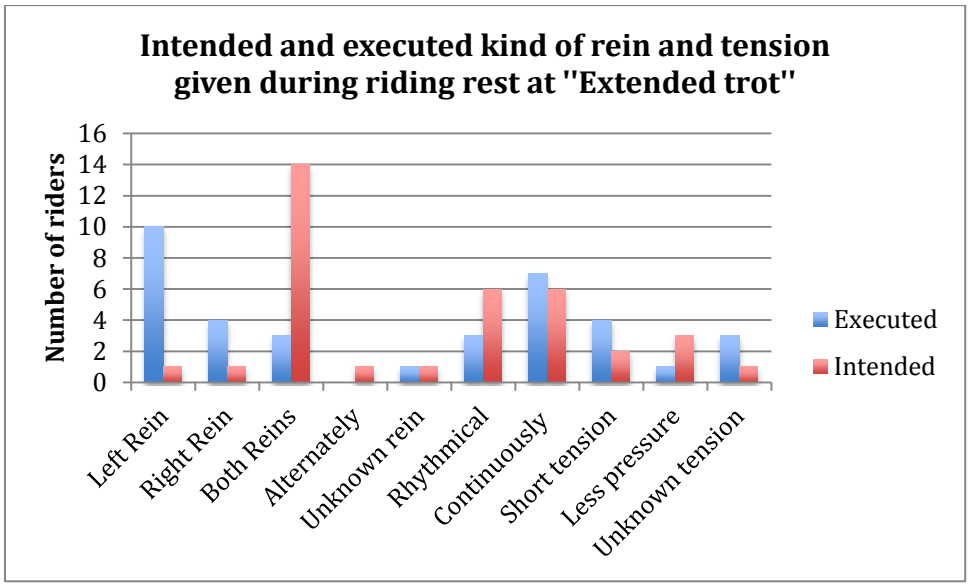



**Figure 20: The intended and executed kind of rein and tension given during the exercise extended trot during the riding test at a straight line.**

The intended and executed rein and tension during the exercise extended trot is shown in figure 20. Riding extended trot with both reins intended by fourteen riders, one rider intended the left rein and one rider intended the right rein, one rider intend left right rein alternately. The executed rein is the left rein by ten riders, four riders use right rein and three riders use both reins. Intended tension by extended trot is continuously for six riders, rhythmical tension is also intended by six riders. Two riders intend short tension and three riders intend to have less tension during extended trot. The executed rein tension during the exercise extended trot is for seven riders continuous tension, four riders use short tension, three riders are using rhythmical tension and one riders use less tension during the extended trot.

## Percentage of applied rein aids and tension as intended

Question 1 has the highest percentage (33%) of corresponding answered questions. This is the question about how the ask the horse on the bit. Question 4 and 9 had the lowest percentage of 6 % correct answers. These questions were about going backwards and collected trot. The total percentage of correct answered question about the chosen rein is 20%. This can be seen in figure 21.

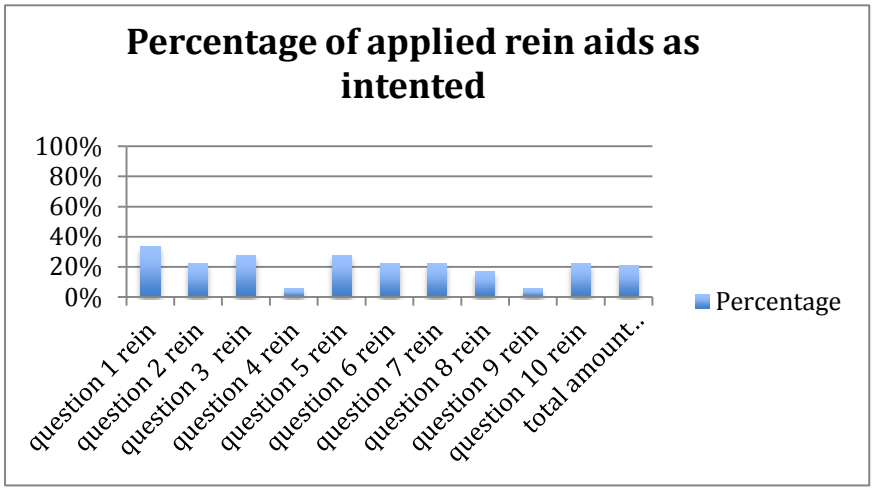



**Figure 21: Percentage of applied rein riding aids as intended. Measured by comparing the intended rein aids and tension of the questionnaire with the results of the standardized riding test.**

In figure 22 an overview is given about the correct answered questions about rein tension. The percentage of correct answered questions is higher than the questions about the chosen rein. Questions 6, 8 and 10 had scored the lowest percentage (28%). While question 5 scored has the highest percentage of correct given rein tension (50%). Comparing figure 21, about the percentage correct answers about the chosen rein, and figure 22, about the correct given rein tension, the overall percentage (37%) of correct answered questions about the given rein tension is higher that the (21%) overall percentage of questions about the chosen rein. The total percentage of correct answered questions considering all the 20 questions is 29%.

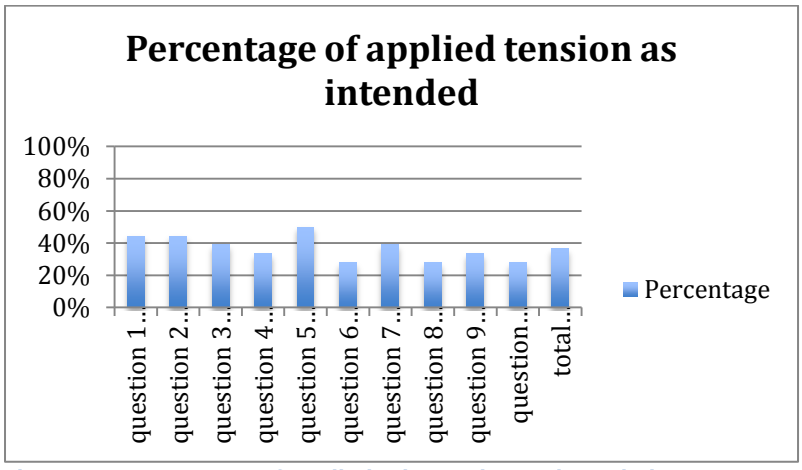



**Figure 22: Percentage of applied rein tension as intended.**

**Questionnaire scores per combination**
Riders could score a maximum of 40 points at the questionnaire, were the rider had to fill in which rein aid and tension it intended to give during the specific exercises of the standardized riding test. In table 8 an overview is given about the total scores achieved by the riders. The highest score is achieved by combination 3 and 11 and is 18 points out of the maximum score of 40 points. The lowest score is achieved by combination 8, 15 and 16 and is a score of 6 points.

| Combination | Total score of questionnaire |
|---|---|
| 1 | 16 |
| 2 | 16 |
| 3 | 18 |
| 4 | 17 |
| 5 | 9 |
| 6 | 10 |
| 7 | 12 |
| 8 | 6 |
| 9 | 10 |
| 10 | 8 |
| 11 | 18 |
| 12 | 12 |
| 13 | 10 |
| 14 | 12 |
| 15 | 6 |
| 16 | 6 |
| 17 | 16 |
| 18 | 10 |

**Table 8: Total score achieved with the questionnaire.**

# Discussion

The aim of this research was to find out whether B and L level riders practice what they intend related to rein riding aids with a new developed standardized riding test to measure the rein tension.

### Literature review

An interesting discussion point is table 1 with the overview of different riding aids explained by different authors. For an inexperienced rider who wants to learn how to ride and start with reading books this contains quite a challenge. There are so many different riding aids given for the same exercise. How can it be that everybody is giving the same riding aids to their horse? How can a horse be able to understand humans if we are all doing something different but expect the same response from the horse? Books are writing about halt and half halt but don't even explain these words or how to apply a halt to a horse. Because of the variation between the explanations of riding aids in books, variation between the execution of the exercises of the riding test could appear and could explain the difference of rein tension or rein use within the group of horse rider combinations.

### Comparing with existing literature

Despite the lack of literature of this specific subject, a summary of average rein tension is found in study done by Sarah Pesie (Pesie, 2010). When comparing this average tension to the average tension found in this experiment a lot of variation is seen as well.
In this research leg aids and weight aids are not included, so the correct execution might be related to those as rein riding aids are supposed to be used as finesse only (Clarke, 1990). A study done by Hawson confirms the complexity of horse-rider interactions and the large variations between horses and riders (Hawson et al., 2014).
During this research riders at B and L level are measured. In future research it is likely that riders of more advanced level will be measured. Menke Steenbergen indicates that in every next dressage level an average decrease of 365 grams is observed (Paard & Lifestyle, 2014).

### The standardized riding test

Factors that could have influence at the riding test are:
All the horse rider combinations were precisely selected before the official riding test was taken. But, even after a process of precisely selecting, some horse rider combinations did not match with selection criteria. Twenty horse rider combinations were selected for this research. Unfortunately the total number of eventually horse rider combinations was eighteen combinations. This had to do with one horse rider combinations who wasn't able to perform the standardized riding test, the other horse rider combination past the standardized riding test but the final data was not usable due to an error in the rein tension measurements file.
The riders had to fill in the questionnaire as found in Annex 2. This questionnaire consists of only ten questions related to ten different exercises, however all these exercises were ridden on both hands and only one hand was asked about in the questionnaire. By adding ten extra questions to compare all the exercises to all the questions more data will be available.

All the combinations had to ride the same riding test. However out of the 18 combinations, seven combinations made a riding mistake at the same exercises. The exercise was bending to the right and subsequently changing hands (exercise 8 & 9). All these seven combinations forgot to change hands and followed track. These riding mistakes can be prevented by making a little change in the riding test. This will lead to less noise in the rein tension measurements.

### Determination of different kinds of tension

The next point of discussion is the definition of the different kinds of tension used for the analysis. In the literature no definition for different kinds of tension is found. So a subdivision is made based on empirical findings. This automatically leads to the next point of discussion namely, the lack of definition in the questionnaire. This might have lead to different interpretations of the three kinds of tension with the participants.

The final point of discussion is the determination of equal tension over both reins. The method states that equal tension is when the average tension differs no more than one Newton. However, when inspecting the tension graphs the tension at a particular time could differ substantially and level out in the average. This was subsequently marked as equal tension even though visual inspection suggested otherwise.

### History of horse rider combinations

An influence with the rein tension measurements could be the history of the horse rider combinations. Some of the horse rider combinations were a combination for a couple years, but one rider had her horse for only two months. This can be of influence because the horse and rider have to get used to each other. The rider has to learn the responses of the horse to certain riding aids and the horse has to learn what the rider intends with certain ridings aids. Another influence on the results could be that three combinations had recently recovered from health issues with the horses (lameness, coughing and colic). These riders were only able to ride their horses two weeks before the measurement of this research.

## Conclusion

‘What kinds of rein aids are used at B and L level according to literature?’ can be answered by the found literature in the books described in table 1 at page 11, 12,13 and 14. In table 1 an overview is given from the most common rein riding aids given by B and L riders. This table is based on rein riding aids of the KNHS and the FNRS. The most common rein riding aids for rider of B and L level are, halt, stretching the neck of the horse, turn to left or right, extended trot, sitting and rising trot and transitions between walk, trot and canter. These exercises can all be found in the riding tests of KNHS and FNRS and are included in the riding test for this particular research.

‘What is the correct application of rein riding aids for specific exercises according to the literature?’ The correct application of rein riding aids for specific exercises was difficult to determine. This was due to the different explanations by different authors. Explanation about how to ride counter bending is not described in any of the reviewed literature. The extended trot is an exercise on which there is a lot of debate. Every author has a different view on how to apply rein riding aids for the extended trot. The same debate for stretching the neck and collected trot applies. Some authors are explaining the same riding aids whereas other authors give a completely different explanation.
In general, the explanation for the exercises halt and turn to left or right is the same with all the authors.

‘’What are ways of testing rein-riding aids in a controlled standardized setting?’’ the standardized riding test developed for research is suitable as it covers all basic riding exercises at B and L level. The exercises performed during the riding test are linked with the questionnaire and the exercises should be performed at both hands.

‘What rein riding aids do riders at B and L level intend to do?’ To answer this question the filled in questionnaires are analysed and this shows a large variety in intended rein riding aids. The most common tension intended during all the exercises was short pressure. However, Rhythmical pressure is the most preferred (14 out of 18 combinations) tension during stretching the neck of the horse. 50 % of the riders also intend to keep the same pressure during sitting trot as in rising trot.
The most frequently intended rein during exercises are both reins. Within every question more than 50% of the horse rider combinations intended to ride with both reins. Left and right rein alternately is the least chosen rein during exercises. During the exercise counter bending eight combinations intended to use the right rein where the counter bending is made to the left. The exercise of bending (head-neck) is also intended to use the right rein by eight riders. The exercise backwards was difficult to measure because eight combinations were not able to perform the exercise. However the riders who were able to ride backwards intend to give this riding aid with both reins. The extended trot was the exercise were all the riders intend to give the riding aid with both reins except of three combinations, who intend left right rein alternately, right rein and left rein.

‘What rein riding aids do riders at B and L level execute?’ Both reins are rarely used with the same tension at the same time. The most used kind of tension is the continuously tension during all the different exercises. Left right rein alternately is only used at the exercises stretching of the neck and on the bit and even than by only two combinations. This means that these eighteen combinations use continuous tension as the main kind of tension and the use of both reins is rare.

The final sub question ‘Which intended rein riding aids correspond to the executed rein riding aids?’ To answer this question the filled in questionnaire had to be compared with the executed exercises riding test by making use of the rein tension device. The average of correct answered questions of the questionnaire is eleven points were 40 points is the maximum. The maximum score of 2 points per question are given when intended is the same as executed. The questions about rein tension scored higher than the questions about which rein is used during specific exercises. The most intended rein used during the exercises is the option both reins. However, the most used rein during all the exercises is a single rein the right rein or left rein. The exercise extended trot is intended to be done with both reins by fourteen riders but actually happened with three riders. The actually used rein is the left rein by ten riders. Looking at the tension used during the exercises. The difference in intended and actual tension by stretching the neck is remarkable. The intended tension is rhythmical tension with 14 riders; three riders with short tension and one rider intended continuously pressure. When comparing this tension to the actual tension given by stretching the neck, eight riders use continuous tension, six rhythmical tension and five riders actually give short tension. So in conclusion the actual given tension differs quite a lot from the intended tension.

***What are the intentions compared to the execution of rein riding aids with dressage riders at B and L level?***

The intentions of riders at B and L level are often different than the rein riding aids executed. This is shown by the comparison between intended and executed aids where the intended aids are often rhythmical with both hands and the executed aids are often continuous on a single hand. Adding to the confusion is that literature is divided on de application of rein riding aids of several exercises. This makes it remarkable that horses are able to execute an exercise that is intended at all. In conclusion the awareness of rein riding aids is low with riders at B and L level. Subsequently, the lack of awareness can lead to miscommunication and frustration with both horse and rider.

# Recommendations

These recommendations are based on experiences during this research.

### Determination kind of tension

First I would recommend Centaur to determine what the preferred definitions of the different kinds of tensions rhythmical, continuously and short are. This to prevent misunderstanding about intended tension given during the exercises. For example; Riders might have another interpretation on short tension than the researcher and miscommunication on which tension is given arises. This makes the data also hard to compare within participants.

### Environmental influences

The next recommendation has to do with the environmental influences during the riding test. The riding tests during this research are done at the home of the riders, so each rider had different environmental influences during the riding test. This can influence the riding test because all the riding arenas were different (outside/inside) and it is very time consuming to visit each participant individually. The recommendation would be, to measure all the combinations at one riding arena to have equal environmental influences. At the same time this decreases the time spend on visiting horse rider combinations for a riding test.

### Standardized riding test

During the riding test seven combinations made a riding mistake during the same exercises. The exercises bending to the right and subsequently changing hands (exercise 8 & 9) were going wrong.  All these seven combinations forgot to change hands and followed track. This problem can be overcome by adding an extra lap on the track before these exercises start.

### Future research

In future research a way has to be devised in which the compliance of the selection criteria can be ensured. A possible way to do this is to use an application form on which the selection criteria are described in detail and can be verified by, for example, a photograph of the competing member-card.

Another interesting addition to further research would be to investigate whether there is a link between executed rein riding aids and the dominant hand of the rider. Some research on this subject has already been performed. Even though a significant result has been found, due to small sample sizes this might be an interesting subject for further research (Kuhnke et al., 2010)

This research can be interpreted as a pilot test. The findings can serve as a reference and guideline for future research. The recommendation on future research is to have a larger number of participants at B and L level to increase the reliability of the tests. When this provides insight in the actions of these “novice” riders, more experienced riders can be measured to compare the characteristics of riding at different levels.
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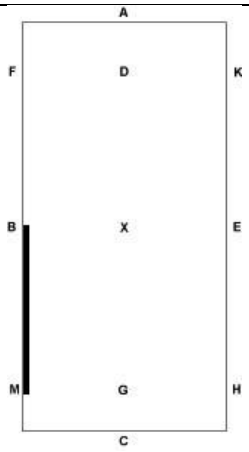
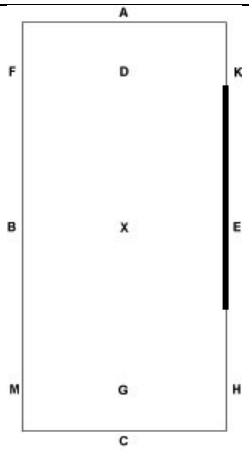
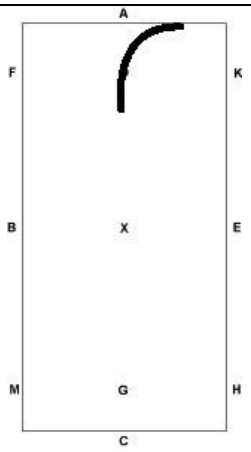
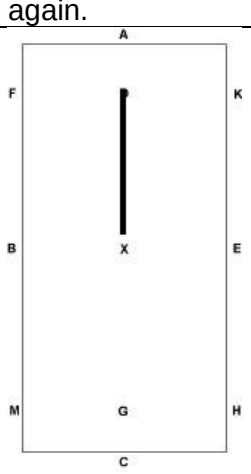
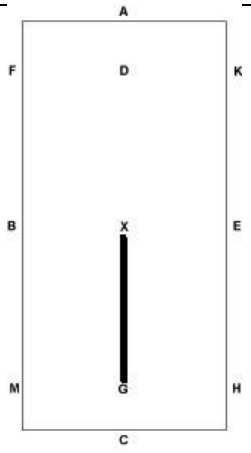
## Annex 1: The standardized riding test

Beneath an overview of the riding test is given with an outline of the exercises and the exact place of measuring. The riding test is filmed from the corner between M and C, because from that point all the exercises are easy to see. All the bold pieces of text are exercises that are measured; the normal text is only to get the horse in the right direction during the test.

## The standardized riding test

| **Exercise number** | | **Specific exercises during the test** | **Place of measuring** |
|---|---|---|---|
| 1 | | Trotting in free position of the head and neck, with light contact at the left hand. | |
| **2** | **Between B-M** | **Asking for on the bit** |  Measurement exactly between the B and M |
| **3** | **H-E-K** | **Baseline tension measurement in trot** |  The baseline tension measurement is done at the place showed at the picture |

| | | | |
|---|---|---|---|
| **4** | **A** | **Turn to left** |  <br>The turn is measured from the point visually seeing that the horse is prepared for the turn (bending in de neck), until the horse is straight again. |
| **5** | **For X** | **Transition to walk** |  <br>The transition to walk is measured from the point visually seeing that the rider is going to make a transition to walk until the horse walks 2 strides. |
| **6** | **Na X** | **Halt en 4 strides backwards, forward in trot** |  <br>The transition to halt is measured from the point of visually seeing that the rider is giving riding aids for a halt. The measurement stops after the backwards is finished. |

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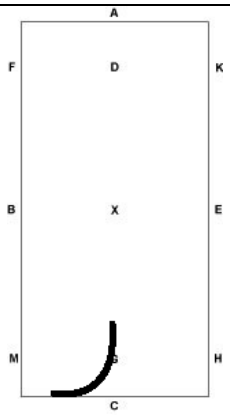
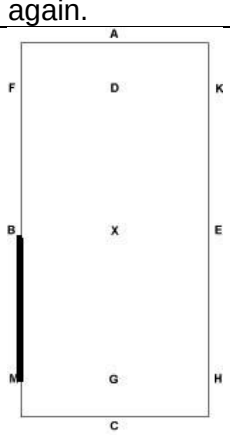
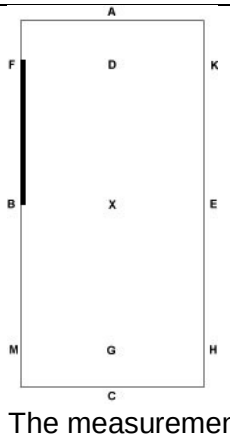
| **7** | **C** | **Right hand** |  <br>The turn is measured from the point visually seeing that the horse is prepared for the turn (bending in de neck), until the horse is straight again. |
| **8** | **M-B** | **Asking for bending to the right (only head–neck)** |  <br>The measurement for bending is measured from the point visually seeing the bending in the horse's head/neck until the rider is going to change hands (still four legs at the track) |
| 9 | B-K | Changing hand | |
| **10** | **F-B** | **Asking for bending to the left (only head–neck)** |  <br>The measurement for bending is measured from the point visually seeing the bending in the horse's head/neck until the rider is going to change hands (still four legs at the track) |
| 11 | B-H | Changing | |

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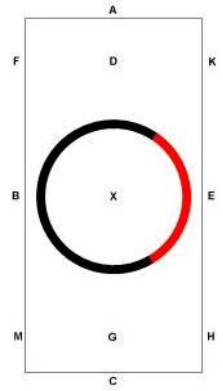
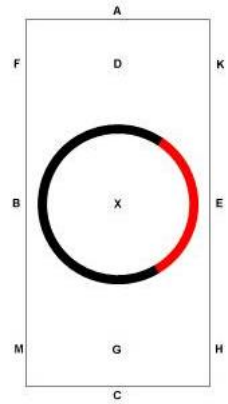
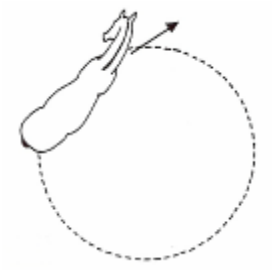
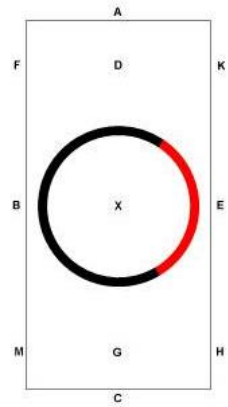
| **12** | **B-E-B** | **Large circle** |  <br>The measurement at the large circle is done at the red part of the circle. This to make sure that the rider had enough time to prepare the exercise and not already busy with the next exercise at the circle. |
| **13** | **B-E-B** | **Large circle stretching the neck** |  <br>The measurement at the large circle is done at the red part of the circle. |
| 14 | At B | Get reins to normal length | |
| 15 | B-E-B | Large circle | |
| **16** | **B-E-B** | **Large circle counter bending**<br>  |  <br>The measurement at the large circle is done at the red part of the circle. |

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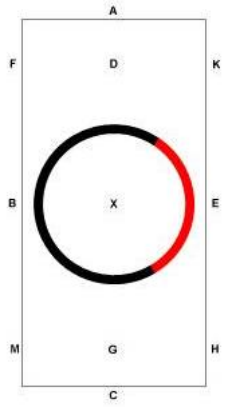
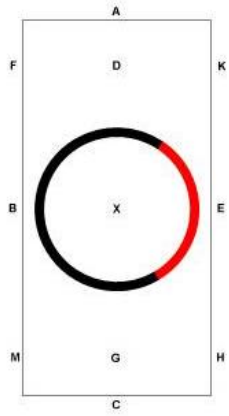
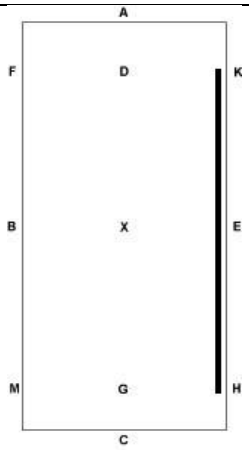
| | **B-E-B** | **Large circle sitting trot** |  <br>The measurement at the large circle is done at the red part of the circle. |
| 18 | B | Transition to right canter | |
| **19** | **B-E-B** | **Large circle** |  <br>The measurement at the large circle is done at the red part of the circle. |
| **20** | **Between B-E** | **Transition to working trot** | The transition to trot is measured from the point visually seeing that the rider is going to make a transition from canter to trot until the horse trots 2 strides. |
| 21 | B | Following track | |
| **22** | **Between K en H** | **A couple strides collected trot (smaller strides in the same rhythm** |  <br>The measurement done for the collected trot is done by visually seeing that the horse shows collected trot for five strides. |

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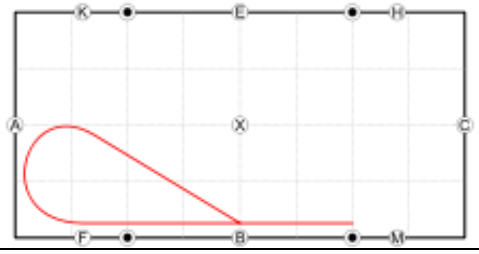
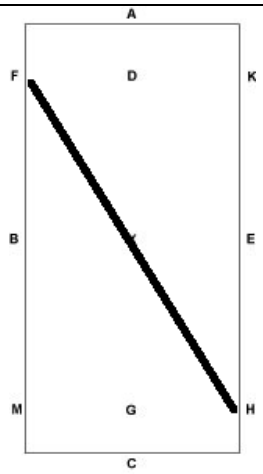
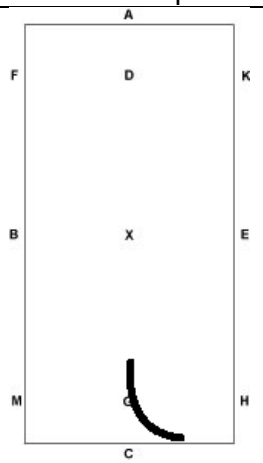
| 23 | H | Turn on the haunches<br>  | |
| **24** | **F-H** | **Changing hand, a couple strides extended trot (larger strides in the same rhythm** |  <br>The extended trot is measured from the point visually seeing the extended trot for a couple strides. |
| **25** | **C** | **Turn to the right** |  <br>The turn is measured from the point visually seeing that the horse is prepared for the turn (bending in de neck), until the horse is straight again. |

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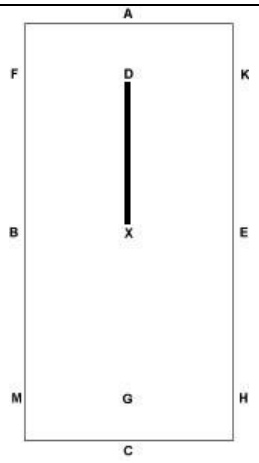
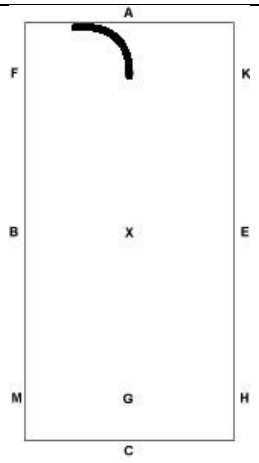
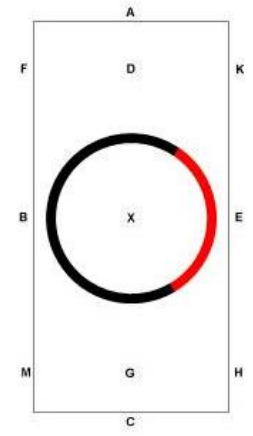
| **26** | **Between X en D** | **Halt, forward in trot** |  <br>The transition to halt is measured from the point of visually seeing that the rider is giving riding aids for a halt until the horse is really halt. |
| **27** | **A** | **Left hand** |  <br>The turn is measured from the point visually seeing that the horse is prepared for the turn (bending in de neck), until the horse is straight again. |
| **28** | **B-E-B** | **Large circle** |  <br>The measurement at the large circle is done at the red part of the circle. |

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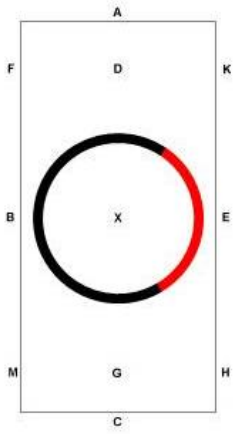
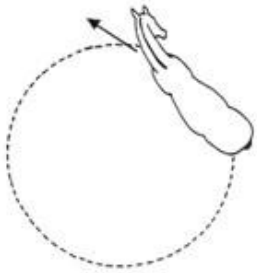
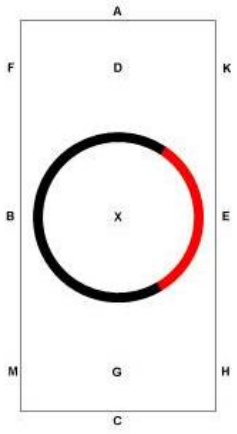
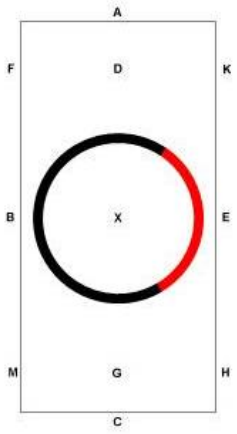
| **29** | **B-E-B** | **Large circle stretching the neck** |  <br>The measurement at the large circle is done at the red part of the circle. |
| 30 | At B | Get reins to normal length | |
| 31 | B-E-B | Large circle | |
| **32** | **B-E-B** | **Large circle counter bending**<br>  |  <br>The measurement at the large circle is done at the red part of the circle. |
| **33** | **B-E-B** | **Large circle sitting trot** |  <br>The measurement at the large circle is done at the red part of the circle. |
| 34 | B | Transition to left canter | |

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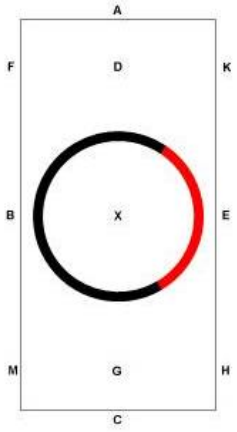
| **35** | **B-E-B** | **Large circle** |  <br>The measurement at the large circle is done at the red part of the circle. |
| **36** | **B** | **Transition to working trot** | |
| 37 | E | Following track | |
| 38 | | End of test | |

## Annex 2: Questionnaire rein tension measurement

# Vragenlijst teugeldrukonderzoek:

Onderstaande vragenlijst is gemaakt om inzicht te krijgen in welke hulpen je als ruiter denkt te geven aan je paard tijdens bepaalde oefeningen. Vul onderstaande lijst dan ook zo correct mogelijk in. Bij elke vraag kun je twee keer kiezen tussen het abc, meerder antwoorden per vraag is niet mogelijk.

Naam ruiter:
Leeftijd ruiter
Naam paard:
Leeftijd paard:
Stokmaat paard:
Start gerechtig in klasse:

**Vraag 1**
Als je je paard nageefelijk gaat rijden, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk

**Vraag 2**
Als je een wending wilt rijden naar links, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk

**Vraag 3**
Als je een overgang wilt maken van draf naar stap, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk

**Vraag 4**
Je wilt je paard een 4 passen achterwaarts laten stappen, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk

**Vraag 5**
Als je stelling naar rechts wilt vragen, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk

**Vraag 6**
Als je het paard de hals wilt laten strekken op de grote volte(E-B-E) in draf, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk

**Vraag 7**
Als je contrastelling vraagt aan je paard op de grote volte (E-B-E) in draf, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk

**Vraag 8**
Je gaat een grote volte (E-B-E) doorzitten in draf, welke teugel gebruik je?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk
d) Behoud van dezelfde druk als tijdens lichtrijden.

**Vraag 9**
Als je het paard een paar passen verzameld wilt laten draven, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk

**Vraag 10**
Als je het paard een paar passen midden draf wilt laten draven, welke teugel gebruik je dan?

a) Beide teugels
b) Linker teugel
c) Rechter teugel
d) Linker - rechter teugel om en om

Hoe geef je de hulp met welke druk?

a) Ritmische druk
b) Aanhoudende druk
c) Korte druk
d) Verminder de druk

Hartelijk dank voor het invullen van de vragenlijst!