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USE OF OVERGROUND ENDOSCOPY FOR DETECTION OF UPPER AIRWAY ABNORMALITIES IN THOROUGHBRED RACEHORSES IN SOUTH AFRICA

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DECLARATION

I hereby declare that this dissertation, submitted for the degree of MSc to the University of Pretoria, is my own work and has not been submitted to another university for a degree, and that the data included in this dissertation are the results of my investigations.

Javier Enrique Mirazo Michelena

South Africa, 20th June 2013

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To my family and friends in my dear Uruguay.

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LIST OF ABBREVIATIONS

4BAD	4th Branchial arch defect
ADAF	Axial deviation of the aryepiglottic folds
DDSP	Dorsal displacement of the soft palate
DOE	Dynamic overground endoscopy
ER	Epiglottic retroversion
FF	Frame by frame
GA	General Anaesthesia
GPS	Global positioning system
HSTE	High-speed treadmill endoscopy
IEE	Intermittent epiglottic entrapment
K	Kappa value
km/h	Kilometres per hour
LCPC	Left corniculate process collapse
OVAH	Onderstepoort Veterinary Academic Hospital
PC	Pharyngeal collapse
PI	Palatal instability
RE	Resting endoscopy
RLN	Recurrent laryngeal neuropathy
RT	Real time
SM	Slow motion
URT	Upper respiratory tract
VCC	Vocal cord collapse

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SUMMARY

USE OF OVERGROUND ENDOSCOPY FOR DETECTION OF UPPER AIRWAY ABNORMALITIES IN THOROUGHBRED RACEHORSES IN SOUTH AFRICA

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Upper airway endoscopy at rest has been the diagnostic method of choice for diagnosing equine upper respiratory tract (URT) disease since its development in the 1970´s. The development of high-speed treadmill endoscopy (HSTE) improved the sensitivity of URT endoscopy by allowing the examiner to observe the horse's nasopharynx and larynx during exercise. However, the level of exertion achieved during HSTE may not always represent that achieved during normal exercise as surface, rider, tack, and environmental variables are altered. Recently, the development of dynamic overground endoscopy (DOE) has addressed some of those shortcomings.

A retrospective study was undertaken to describe the upper airway abnormalities detected during DOE in horses presenting with poor performance and/or abnormal respiratory noise in South Africa. Patient records of Thoroughbred racehorses undergoing DOE from November 2011 to August 2012 by the Onderstepoort Veterinary Academic Hospital were reviewed. Data collected included signalment, primary complaint, distance exercised, maximum speed attained, and dynamic airway abnormalities detected.

A second study was carried out to evaluate agreement within and among examiners of three grading systems for laryngeal function at exercise. The grading systems assessed were an existing system for grading axial deviation of aryepiglottic folds (ADAF), a modified system for grading recurrent laryngeal neuropathy (RLN) at exercise, and a proposed system for grading vocal cord collapse (VCC). For investigation of intra-observer variability, recordings were watched by two of the investigators at the same time, on two different occasions, in real time, slow motion, and at frame-by-frame speed. To evaluate inter-observer variability, recordings were watched by four investigators on one occasion, as described for investigation of intra-observer variability, and scoring sheets completed. Kappa agreement was calculated for both intra- and inter-observer sessions.

Fifty-two horses that underwent DOE for investigation of poor performance and/or abnormal respiratory noise were identified. The main abnormalities detected included dorsal displacement of the soft palate (DDSP) (13/52 horses, 25%); recurrent laryngeal neuropathy (RLN) (17/52 horses, 33%); axial deviation of the aryepiglottic folds (ADAF) (21/52 horses, 40%) and vocal cord collapse (VCC) (18/52 horses, 35%). A total of 40 horses presented one or more abnormalities of the URT (77%). Fifteen horses (29%) had a single abnormality, and 25 horses (48%) had multiple abnormalities.

Results at frame-by-frame speed from the intra-observer evaluations for all the conditions showed substantial agreement for RLN by both observers (K = 74 - 80). Intra-observer evaluations for VCC were moderate to substantial (K 53 – 63). ADAF was the most difficult URT abnormality to assess for both observers, and agreement within observers was only fair to moderate (K = 36 - 52). Inter-observer evaluations for RLN showed substantial to moderate agreement (K = 62). Inter-observer evaluations for VCC showed moderate agreement (K = 47 – 54), and inter-observer evaluations for ADAF showed only slight to fair agreement and were the lowest for all the conditions (K = 14 – 22).

This study showed that DOE is a useful technique for providing valuable information about disease of the URT. Finding multiple abnormalities in 48% of horses examined using DOE suggests that DOE may be indicated even for those horses with an obvious abnormality found during resting endoscopy.

The intra-observer evaluations showed that RLN had higher agreement values than those for ADAF and VCC at all speeds, and that ADAF had lower agreement values than those for VCC and RLN at all speeds. Inter-observer agreement was less than intra-observer agreement, presumably because more observers were involved in the inter-observer assessment.

1 CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

1.1 Introduction

Upper airway respiratory endoscopy has been the method of choice for diagnosing disease of the equine upper respiratory tract (URT) since it was developed in the 1970´s (Lane, Bladon et al. 2006). Initially, URT endoscopy could only be performed with the horse standing at rest in stocks or a stall. Abnormal conditions detectable during resting URT endoscopy include recurrent laryngeal neuropathy (RLN), dorsal displacement of the soft palate (DDSP), epiglottic abnormalities, arytenoid chondritis, and pharyngeal lymphoid hyperplasia (Desmaizieres, Serraud et al. 2009; Perkins, Salz et al. 2009; Pollock, Reardon et al. 2009; Barakzai and Dixon 2011). These conditions are often associated with poor performance and/or respiratory noise at work (Martin, Reef et al. 2000).

The development of high-speed treadmill endoscopy (HSTE) more than 20 years ago improved the accuracy of upper airway endoscopy as a diagnostic tool. It allowed detection of certain conditions that are not apparent during resting examinations, such as palatal instability (PI) (Lane, Bladon et al. 2006), intermittent DDSP (Lane, Bladon et al. 2006; Desmaizieres, Serraud et al. 2009; Pollock, Reardon et al. 2009; Barakzai and Dixon 2011), left corniculate process collapse (LCPC)(Barakzai and Dixon 2011), axial deviation of aryepiglottic folds (ADAF), vocal cord collapse (VCC) (Barakzai and Dixon 2011), and pharyngeal collapse (PC) (King, Tulleners et al. 2001). In addition, it provided more information about RLN, allowing analysis of arytenoid abduction while the horse exercised (Franklin 2008; Desmaizieres, Serraud et al. 2009; Pollock, Reardon et al. 2009; Barakzai and Dixon 2011).

Although HSTE may allow the examiner to identify dynamic conditions, it may however, not replicate exercise during field conditions because surface, rider, tack, and environmental variables are altered (Franklin, Burnt et al. 2008; Desmaizieres, Serraud et al. 2009). Financial costs, time to train the horse to exercise on the treadmill, transport requirements and misconceptions regarding the safety of the technique are recognized as other disadvantages of HSTE (Franklin, Burnt et al. 2008).

The recent development of dynamic overground endoscopy (DOE) has addressed some of the shortcomings of HSTE. DOE can be conducted without training the horse for the examination, and fewer personnel are required. The equipment can be transported to the client, and the horse can exercise in its normal environment with tack and a rider. Allowing the horse to exercise in its normal environment may result in more accurate diagnosis of the cause of exercise intolerance (Franklin, Burnt et al. 2008; Desmaizieres, Serraud et al. 2009; Pollock, Reardon et al. 2009). However, to the authors' knowledge, there are no published reports comparing speed during DOE examination with racing speed, so it remains unknown as to whether horses are attaining speeds similar to race speeds during overgound, endoscopic examination. Other disadvantages of overground endoscopy are that the examiner has less control of the exercise protocol, inappropriate positioning of the insertion tube of the endoscope, failure of the endoscope's flushing system, potential loss of live transmission and recording, and diminished power from the light source resulting in a poorly illuminated view of the nasopharynx and larynx (Barakzai 2012). Several studies have reported findings of DOE in populations of horses in Europe (Franklin, Burnt et al. 2008; Desmaizieres, Serraud et al. 2009; Pollock, Reardon et al. 2009; Allen and Franklin 2010; Witte, Witte et al. 2011). To date, there are no studies reporting on the use of DOE in Thoroughbred racehorses in South Africa.

Grading systems are commonly used when assessing laryngeal (i.e., arytenoid) function (Barakzai 2007; Cramp and Barakzai 2012), ADAF (King, Tulleners et al. 2001; Barakzai 2007) and PC (Boyle, Martin et al. 2006) during dynamic endoscopic examination of the URT. Currently there is no grading system for VCC making it difficult to describe the disease or assess its progression. Agreement within (i.e., intra-observer variability) and between (i.e., inter-observer variability) examiners of the commonly accepted grading systems has not been assessed.

Assessment of agreement between and within examiners is important because inconsistent and/or inaccurate classification of abnormalities detected during HSTE or overground endoscopic examinations, may lead to incorrect diagnoses and/or inappropriate treatments.

1.2 Literature review

1.2.1 Poor performance in racehorses

Poor performance in horses can be defined as inadequate athletic performance compared to that expected (Morris and Seeherman 1991; Knight and Evans 2000; Martin, Reef et al. 2000). It may be due to a single cause or a combination of causes. Some of these causes of poor performance may only be evident at high speed and may involve more than one body system (Morris and Seeherman 1991; Martin, Reef et al. 2000). Investigation of poor performance may, therefore, include: clinical examination, lameness investigation, haematological and serum chemistry analyses, resting and exercising upper airway endoscopy, analysis of airway secretions, echocardiography, and a standardised exercise test (Morris and Seeherman 1991).

Musculoskeletal and respiratory dysfunction are reported to be the main causes of poor performance in racehorses (Morris and Seeherman 1991; Martin, Reef et al. 2000; Art and Van Erck 2008), with upper airway disease being a more common cause than lower airway disease (Art and Van Erck 2008). Common respiratory abnormalities found include upper airway obstruction due to laryngeal disease, such as recurrent laryngeal neuropathy (RLN) (Morris and Seeherman 1991), dorsal displacement of the soft palate (DDSP) (Morris and Seeherman 1991) (Martin, Reef et al. 2000), epiglottic entrapment (EE) or retroversion (ER) (Morris and Seeherman 1991), and dynamic pharyngeal collapse (PC) (Martin, Reef et al. 2000). Lower respiratory tract abnormalities include exercise-induced pulmonary haemorrhage (EIPH) (Morris and Seeherman 1991; Couetil and Denicola 1999; Knight and Evans 2000; Hinchcliff, Jackson et al. 2005) and inflammatory airway disease (IAD).

Other conditions affecting racing performance include neurological deficits, exercise-induced cardiac arrhythmias (Martin, Reef et al. 2000), fatigue, synchronous diaphragmatic flutter and exertional rhabdomyolysis (Martin, Reef et al. 2000).

Factors associated with the running of a race, such as weather conditions, track design, type of training, interaction between horses during the race, rider expertise, and temperament of the horse, may be additional causes of poor performance

(Knight and Evans 2000). According to a study by Knight and Evans (2000), no clinical abnormalities could be found in over 50% of racing horses presented for poor performance after a thorough veterinary evaluation (Knight and Evans 2000). It is essential to know that not all the horses have the temperament or athletic ability to perform at a high level, despite the trainer´s or owner´s expectations (Dyson 2000).

1.2.2 Respiratory noise in racehorses

While horses exercise or race, the airflow through their URT tract and their respiratory rate increases substantially. The nostrils, pharynx, and larynx dilate to cope with this increase in airflow, and normal respiratory noise is produced (McCann 2000), as shown in Table 1.

Table 1. Exercise related normal respiratory noise in horses: Modified from: McCann, J. (2000).

Type of noise	Description
Expiratory and inspiratory noises	Quiet noises associated with breathing are normally audible. Expiratory sounds are approximately double the loudness of inspiratory sounds (audible up to 20 m away while the horse gallops).
High blowing ("False nostril flutter")	Produced by the vibration of the false nostril during expiration. Varies from a soft fluttering to a harsh, stertorous sound. Does not compromise performance but may be mistaken for an abnormal respiratory noise.
Snorting	Expiratory noise, usually harsh and stertorous. Intermittent, generally in short bursts at the beginning of exercise or at faster paces (canter or gallop); it stops as exercise progresses. Appears to be associated with clearance of excess respiratory secretions from the URT. Does not compromise performance.
Sheath noise	Intermittent creaking noise sometimes likened to rubbing wet leather together. Produced by the aspiration of air into the sheath in stallions and geldings. Linked to stride pattern, may be mistaken for abnormal respiratory noise as the stride and respiration couple together at faster paces.
Thick wind	Loud, stertorous inspiratory and expiratory noise made by unfit horses during exercise. Disappears with training and increasing fitness.

Certain URT abnormalities that affect laryngeal or pharyngeal anatomy can cause turbulence in the airflow, producing abnormal respiratory noises and exercise intolerance (Attenburrow, Flack et al. 1990). Most of the abnormal exercise-related respiratory noises are heard when the horse canters or gallops and resolve as exercise decreases and demand for a large airflow reduces (McCann 2000). A description of dynamic abnormal respiratory noises is shown in Table 2.

Table 2. Exercise-related abnormal respiratory noise in horses: Modified from: McCann, J. (2000).

Type of noise	Description
Stridor	Shrill, harsh sound. Heard during inspiration in case of a laryngeal obstruction.
Stertor	Snoring, sonorous respiration. Usually due to partial obstruction of the upper portion of the airway.
Whistling	Stridorous, musical sound. Caused by forced breathing through a narrow opening. Usually indicative of static or dynamic stenosis of an air passage.
Roaring	Stertorous sound. Caused by air passing through a stenosed larynx.
Gurgling/ Choking up	Fluttering, snoring respiratory noise (stertor). Made during inspiration or expiration.

The type of sound can assist in the diagnosis of a certain condition, although no noise is pathognomonic for a particular abnormality. For example, epiglottic entrapment is considered to produce a sound similar to that produced by DDSP (McCann 2000).

During inspiration, the pressure in the airways is negative in relation to the atmosphere, so muscular effort is needed to achieve and maintain dilation of the pharynx and larynx. Deficient neuromuscular activity may then result in various grades of dynamic collapse of the pharynx. In abnormal conditions, such as RLN, the reduction of airflow results in a noise described as a “whistle” which eventually progress to a “roaring” sound in severely affected horses (Attenburrow, Flack et al. 1990; Pasterkamp, Kraman et al. 1997; McCann 2000). Other examples of respiratory abnormalities that produce respiratory noise during inspiration include pharyngeal collapse, severe arytenoid chondritis, 4^{th} branchial arch defect syndrome (4-BAD) (Derksen, Holcombe et al. 2001), ADAF, ER, DDSP and EE.

During expiration the airflow pressure is higher than atmosphere pressure, forcing the nasopharynx to expand (McCann 2000). Abnormal conditions, such as DDSP and EE, produce an abnormal, loud, respiratory noise during expiration due to vibration of the caudal free border of the soft palate (with DDSP) or the excessive loose epiglottic mucosa (with EE) (McCann 2000; Franklin, Price et al. 2004). The onset of many abnormal respiratory noises, such as an expiratory "gurgling" noise, may be associated with the horse immediately pulling up, as seen in cases of DDSP (Franklin, Price et al. 2004).

A list or the abnormal exercise-related respiratory noises associated with abnormal URT conditions are shown in Table 3.

Table 3. Abnormal exercise-related respiratory noises related to abnormal URT conditions in horses. Modified from McCann (2000).

Abnormal URT condition	Time of noise production	Type of noise
RLN	Inspiration	Whistling or roaring.
4BAD	Inspiration & Expiration	Whistling or roaring. Stertor: Vibration of the palatopharyngeal arch and turbulence of air in the proximal aspect of the oesophagus.
DDSP	Inspiration & Expiration	Gurgling (quiet): Inadequate airflow by turbulence. Gurgling / choking up (loud): Vibration of the caudal free border of the palate.
PC	Inspiration	Marked stridor.
ADAF	Inspiration	Stridor: Airway obstruction.
VCC	Inspiration	Stridor: Airway obstruction.
ER	Inspiration & Expiration	Stridor.
EE	Inspiration & Expiration	Gurgling (quiet): Turbulence by the epiglottic protrusion. Gurgling (loud): vibration of entrapped mucosa.

Due to the dynamic nature of conditions related to the production of abnormal respiratory noise, resting endoscopic examination tends to be insufficient in the detection of disease associated with abnormal respiratory noise (Morris and Seeherman 1990). Dynamic endoscopy is a useful technique to be able to hear and assess abnormal respiratory noises (Morris and Seeherman 1990; Tan, Dowling et al. 2005), but during HSTE examinations, the amount of normal background noise may interfere with detection of low grade noises. DOE may be better than HSTE for detecting abnormal respiratory noises (Morris and Seeherman 1990).

Recently, studies reported the spectral analysis of respiratory noise as a valid option for the diagnosis of URT dynamic abnormalities (Attenburrow, Flack et al. 1990; Derksen, Holcombe et al. 2001; Franklin, Usmar et al. 2003). However, some conditions may result in similar audible inspiratory sounds, such as a whistling/roaring sound created by horses suffering RLN or 4-BAD (Franklin 2008), a stridor sound created by horses suffering from PC, ADAF or VCC, and a gurgling sound created by horses suffering from DDSP or EE (McCann 2000). The presence of multiple abnormalities may confuse spectral analysis of respiratory noise, hampering diagnoses (Tan, Dowling et al. 2005; Lane, Bladon et al. 2006).

1.2.3 Upper respiratory tract (URT) endoscopy

1.2.3.1 Resting endoscopy (RE)

The upper respiratory tract is most often examined by endoscopically examining horses while they are at rest, and until recently this type of examination has been the diagnostic method of choice for diagnosing equine URT abnormalities since the 1970´s (Lane, Bladon et al. 2006). Usually, the examination is performed to investigate an abnormal respiratory noise or to determine the cause of poor performance (Martin, Reef et al. 2000).

The correct diagnosis, in many cases, is achievable during resting endoscopic examination, as this is a valid diagnostic method for diagnosis of anatomical/static and some functional abnormal conditions associated with poor performance and/or abnormal respiratory noise created when the horse exercises (Martin, Reef et al. 2000). These abnormalities include congenital palatal defects (Franklin 2008), left- or right-side arytenoid dysfunction (Franklin 2008), DDSP, arytenoid chondritis, pharyngeal lymphoid hyperplasia (PLH), RLN (Desmaizieres, Serraud et al. 2009; Perkins, Salz et al. 2009; Pollock, Reardon et al. 2009) and epiglottic abnormalities, such as EE and subepiglottic cysts (Franklin 2008; Desmaizieres, Serraud et al. 2009; Barakzai and Dixon 2011).

The procedure should be performed with the horse standing in stocks or in a stall, with minimal restraint and without sedation to avoid influencing laryngeal and pharyngeal function (Archer, Lindsay et al. 1991; Hackett, Ducharme et al. 1991). After the endoscope is passed through the right or left nostril, the examination of the URT should begin. Examination should include both nasal cavities, the nasopharynx, the larynx, and trachea (Franklin 2008). Laryngeal and pharyngeal function can be evaluated, at least in part, by stimulating the horse to swallow (to assess arytenoid cartilage movements and IEE) and by occluding the nares to simulate airway pressures achieved during exercise (Archer, Lindsay et al. 1991; Holcombe, Derksen et al. 1996).

Studies have shown that resting endoscopy may be less helpful in diagnosing dynamic URT disease (Kannegeiter and Dore 1995; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006). The failure to identify an URT abnormality during resting endoscopy does not rule out a pathological, functional airway condition, because many abnormalities in racehorses occur during strenuous exercise or as fatigue progresses. ADAF, VCC, and other forms of dynamic laryngeal obstructions are not evident during resting endoscopy (Franklin 2008). This has led to the development of URT endoscopic evaluation during high-speed exercise (Morris and Seeherman 1991; Kannegeiter and Dore 1995).

1.2.3.2 URT high speed treadmill endoscopy (HSTE)

Since the 1980´s, the development of high-speed, treadmill endoscopy (HSTE) has improved the sensitivity of upper airway endoscopy by allowing detection of certain conditions that are not apparent or could be under-diagnosed or misdiagnosed during resting, endoscopic examinations (Morris and Seeherman 1991; Parente and Martin 1995; Lane, Bladon et al. 2006; Lane, Bladon et al. 2006).
HSTE is usually performed to evaluate horses whose clinical history and resting endoscopic examination are inconsistent or whose resting endoscopic examination did not provide a convincing diagnosis (Dart, Dowling et al. 2001). It has also been useful for evaluation of post-operative patients who experience respiratory problems despite undergoing a corrective surgery (Dart, Dowling et al. 2001; Goldman 2006). The horse should receive a complete physical evaluation prior to the start of the examination to rule out abnormalities of other systems, such as the musculoskeletal system, that may affect normal exercise performance (Barakzai 2007).

HSTE requires experienced personnel and expensive equipment, facts that make the examination a complex procedure (Barakzai 2007).The treadmill should be housed in a large room, with ample space for the horse and the people involved in the examination. The horse should wear protective boots on all four feet and a safety girth, which helps prevent the horse from sustaining a serious injury if it falls or stops on the treadmill. In addition to the examiner who is performing the endoscopy, two handlers are needed for the examination. One is need to stand at the horse´s head, and one is needed to stand at the horse’s side to encourage the horse to move forward. The high-speed treadmill can be elevated at the front-end allowing a 10° uphill incline. Speeds up to 14m/s are used to replicate racing speeds, as best as is possible.
Different exercise testing protocols are available and vary according to the type of horse and the suspected problem (Barakzai 2007). Usually, after the horse undergoes a warm-up period, the treadmill is stopped, and the endoscope is placed through the nasal cavity so that its end lies just rostral to the epiglottis to provide clear visualization of the nasopharynx and larynx. After the endoscope is secured to

the horse´s head, the treadmill examination continues. A big cooling fan is placed in front of the horse to evaporate sweat so that hyperthermia is prevented.

Abnormalities of the URT are seen in 7 to 38% of horses examined during HSTE performed to determine the cause of poor performance or abnormal respiratory noise heard at exercise (Kannegeiter and Dore 1995; Dart, Dowling et al. 2001; Parente, Martin et al. 2002). Tan, Dowling et al (2005) definitively diagnosed the cause of abnormal respiratory noise in 81.5% horses that were evaluated using HSTE (Tan, Dowling et al. 2005). Other studies reported similar success using HSTE to diagnose the cause of abnormal respiratory noise (Morris and Seeherman 1990; Morris and Seeherman 1991; Kannegeiter and Dore 1995).

1.2.3.3 Dynamic overground endoscopy (DOE)

The development of DOE has addressed some of the shortcomings of HSTE by allowing direct visualisation of the URT during ridden exercise under field conditions (Tamzali 2008). The absence of variables associated with normal training/racing conditions, like ground quality, rider´s weight, normal tack, and environmental factors, may lead to a misdiagnosis when the horse is evaluated using HSTE (Franklin, Burnt et al. 2008; Desmaizieres, Serraud et al. 2009; Pollock, Reardon et al. 2009). Differences in heart rate, blood lactate concentration, and stride frequency and length have been detected between horses examined at exercise using HSTE and studies performed using DOE (Courouce, Geffroy et al. 1999; Evans 2004).

DOE systems available include a French system (Optomed®)[1], American systems (Remote Airway Inspection™ [2,], TeleView Equine Exercise endoscope®[3]), and a German system (Videomed ®).[4] Generally, the equipment components consist of a semi-rigid insertion endoscope, which is placed in the right nostril, secured to a special bridle system placed over the normal head tack, a saddle blanket or a rider´s backpack containing the electronic power source and water pump (depending on the

[1] Optomed ®, France
[2] Remote Airway Inspection ™, USA
[3] Tele View ®, San Diego, CA, USA
[4] VideoMed ®, GmbH, Germany

system), and a small recording device connected wirelessly to a video console held by the examiner. Excellent tolerance to the equipment and high-quality recordings using DOE have been reported (Tamzali 2008; Desmaizieres, Serraud et al. 2009). Distance and speed can be measured by using a global positioning system (GPS).

Common findings during DOE include DDSP (Lane, Bladon et al. 2006; Desmaizieres, Serraud et al. 2009; Pollock, Reardon et al. 2009),PI (Lane, Bladon et al. 2006), dynamic collapse of the apex of the left corniculate process (LCPC), axial deviation of one or both aryepiglottic folds (ADAF) (King, Tulleners et al. 2001; Desmaizieres, Serraud et al. 2009), arytenoid cartilage collapse (ACC) (Lane, Bladon et al. 2006), arytenoid chondritis (Pollock, Reardon et al. 2009) (Desmaizieres, Serraud et al. 2009), and epiglottic abnormalities (e.g., cysts, deviation, and entrapment) (Desmaizieres, Serraud et al. 2009).

URT abnormalities diagnosed using DOE are comparable to those diagnosed using HSTE (Parente and Martin 1995; Dart, Dowling et al. 2001; Tan, Dowling et al. 2005; Franklin, Naylor et al. 2006; Lane, Bladon et al. 2006). However, it has also been reported in studies comparing results of DOE and HSTE that the type of exercise test may affect the ability to make certain diagnoses. For example, DDSP is more likely to occur under strenuous exercise, and therefore, the use of appropriate field testing protocols aiming to make the horse´s work as strenuous as possible should be considered (Allen and Franklin 2010).

1.2.3.4 Advantages & disadvantages: HSTE vs. DOE

According to previous studies, HSTE and DOE can be compared on the basis of their efficacy at diagnosing URT abnormalities (Lane, Bladon et al. 2006; Franklin 2008). Important factors to consider when deciding to use HSTE or DOE include the type of gait performed by the horse, speed and duration of the exercise, safety of the horse and personnel performing the endoscopic examination, image quality, personnel availability and cost (Franklin 2008; Desmaizieres, Serraud et al. 2009; Allen and Franklin 2010).

Some investigators have reported that HSTE may not replicate field conditions for exercise because surface, rider, tack, and environmental conditions are altered (Parente and Martin 1995; Courouce, Geffroy et al. 1999; Evans 2004; Franklin, Naylor et al. 2006; Franklin, Burnt et al. 2008; Desmaizieres, Serraud et al. 2009). (Allen and Franklin 2010) considered neither DOE nor HSTE to accurately replicate race conditions.

Regarding the speed and duration of the test, horses examined by HSTE are unable to achieve the speed that horses may reach during DOE (16m/sec), but the high-speed treadmill usually provides a steadier and more controllable exercise making it possible for the horse to reach "fatigue point." The level of work can also be controlled with the HSTE by inclining the treadmill (Dixon 2011). Studies report that the ability to control the intensity and duration of the exercise test is highly useful in the search for dynamic abnormalities of the URT (Allen and Franklin 2010). Intensity and duration of exercise during DOE may be affected by the trainer and the rider. DOE can allow some horses to work in their normal harness and head position whereas this may not be possible when using HSTE.

The image quality of the DOE systems is dependent on the manufacturer, but the LED (light emitting diode) light source used by those systems do not provide the light quality of the halogen or xenon light sources used in HSTE. Due to various factors, including distance and reception availability, DOE may also lack consistent wireless communication between the video recorder and the video console, making the test useless if the lens of the DOE endoscope becomes covered by secretions or changes position during exercise (Dixon 2011). Some DOE video consoles, however, provide direction control of the image. Popularization of DOE may help to decrease the costs of the equipment, making it even easier for the equine practitioner to purchase (Dixon 2011).

In summary HSTE and DOE both have advantages and disadvantages. The diagnostic value of each lies in the appropriateness of the exercise test performed and the expertise of the evaluator (Allen and Franklin 2010; Dixon 2011).

1.2.3.5 Abnormalities associated with the collapse of the URT

There are a number of abnormal conditions that can cause collapse of one or more structures of the URT. These conditions can be classified according to their location (e.g., pharynx or larynx) or according to whether they are anatomical or functional (Strand and Staempfli 1993; Parente, Martin et al. 1998; King, Tulleners et al. 2001; Lane, Bladon et al. 2006).

1.2.3.5.1 Pharynx

The pharynx is a funnel-shaped, musculomembranous structure that is part of the digestive tract and part of the respiratory tract. The two parts of the pharynx, nasopharynx and oropharynx, are separated by the soft palate, which extends caudally from the hard palate to the base of the larynx. The nasopharynx connects to the nasal cavities and to the larynx (Rush and Mair 2007).

1.2.3.5.1.1 Anatomical disorders

1.2.3.5.1.1.1 Pharyngeal lymphoid hyperplasia

Pharyngeal lymphoid hyperplasia or pharyngitis is a commonly diagnosed condition of young horses (Holcombe and Ducharme 2007; Rush and Mair 2007) associated with exposure of the horse to novel antigens, such as bacteria, viruses, organic dusts, and other allergens. The condition is most commonly observed in horses beginning their racing career, horses sharing a barn with lots of other horses or horses travelling to shows/race events.

Clinically, this condition is characterized by the enlargement of lymphoid follicles on the lateral and dorsal walls of the pharynx and in the pharyngeal recess (Holcombe and Ducharme 2007; Rush and Mair 2007). This condition affects performance because it disturbs the normal laminar airflow and the pharyngeal diameter. The degree to which this condition affects performance depends on the grade of severity.

The grade of severity is observed during resting, endoscopic examination. These grades are shown in Table 4.

Table 4. Classification of grades of pharyngeal lymphoid hyperplasia. Modified from (Rush and Mair 2007)

Grade	Description
1	A few small inactive whitish follicles over the dorsal wall (considered normal).
2	Numerous small inactive follicles, with occasional hyperaemic follicles, extending downward over the lateral pharyngeal walls.
3	More active follicles located close together, covering the entire dorsal and lateral walls of the pharynx.
4	Large oedematous follicles, frequently coalesced into broad-based and polypoid structures.

According to a previous publications, horses with grades 1 or 2 have no clinical signs of respiratory disease, and horses with grade 3 or 4 may have some degree of exercise intolerance and may make abnormal respiratory noise (Holcombe and Ducharme 2007; Rush and Mair 2007). In one study, the prevalence of grade 3 and 4 PLH in 2-year-old horses was 37% but had decreased to 0% in horse 6 years old or older (Hobo, Matsuda et al. 1995). Other authors have stated that grade 3 or 4 PLH usually resolves when the immune system matures as the horse ages (Holcombe and Ducharme 2007).

Treatments include rest and/or throat sprays containing an antibiotic and an anti-inflammatory drug. More radical therapies for horses with grade 3 or 4 PLH include topical application of trichloracetic acid, cryotherapy, and electrocautery (Holcombe and Ducharme 2007; Rush and Mair 2007).

1.2.3.5.1.2 Functional disorders

1.2.3.5.1.2.1 Palatal instability (PI)

Palatal dysfunction, the most common cause of dynamic upper airway obstruction of Thoroughbreds, Standardbreds and other breeds is characterized by palatal instability (PI) or dorsal displacement of the soft palate (DDSP) (Ducharme 2006; Lane, Bladon et al. 2006; Pollock, Reardon et al. 2009; Barakzai and Hawkes 2010).

PI is the dorsal movement of the soft palate without the displacement of the palate's caudal border. It is thought to begin at the junction of the hard and the soft palate and progress caudally, causing turbulent airflow within the nasopharynx (Lane, Bladon et al. 2006; Barakzai and Hawkes 2010). This dorsal movement may cause elevation of the epiglottis and axial deviation of the aryepiglottic folds (ADAF) (Dart, Dowling et al. 2001; Barakzai and Hawkes 2010) and may eventually lead to DDSP (Kannegeiter and Dore 1995; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006).

It is not clear what degree of palatal instability is considered to be within normal limits, and how many horses diagnosed with PI experience DDSP concurrently, during strenuous exercise.

1.2.3.5.1.2.2 Dorsal displacement of the soft palate (DDSP)

According to several studies, dorsal displacement of the soft palate (DDSP) is the most common causes of URT obstruction in sport horses (Morris and Seeherman 1991; Lumsden, Stick et al. 1995; Martin, Reef et al. 2000; Barakzai and Hawkes 2010). DDSP can be persistent or intermittent. This multifactorial abnormality occurs when the caudal border of the soft palate dislocates from its normal subepiglottic position, leading to a partial obstruction of the rima glottidis, usually during strenuous exercise close to maximum exertion (Franklin, Naylor et al. 2002). It has been described as a cause of severe exercise intolerance associated with an abnormal "gurgling" or "snoring" noise due to the vibration of the caudal edge of the soft palate, particularly during expiration (Holcombe, Derksen et al. 1998; Franklin, Naylor et al.

2002). Some horses, however, do not make an audible abnormal respiratory noise while experiencing DDSP (Ahern 1999; Martin, Reef et al. 2000; Derksen, Holcombe et al. 2001; Parente, Martin et al. 2002; Lane, Bladon et al. 2006).

DDSP results in a partial obstruction of the nasopharynx, especially during expiration, limiting the airflow, which leads to reduced minute ventilation and oxygen supply, thus affecting athletic performance (Holcombe, Derksen et al. 1998; Franklin 2008; Barakzai and Hawkes 2010). Clinical signs of intermittent DDSP are often described by trainers as “choking down”, “swallowing the tongue”, “hitting a wall”, “fading rapidly” and “stopping suddenly as if shot” (Franklin, Naylor et al. 2002; Holcombe and Ducharme 2004).

DDSP can occur secondary to underlying abnormalities, such as primary cardiovascular or pulmonary disorders (e.g., small airway obstruction), disorders of the epiglottis (e.g., epiglottic entrapment, hypoplasia and deformities, subepiglottic cysts), conditions which increase negative pressure in the pharynx (e.g., excessive flexion of the neck when ridden), conditions causing pharyngeal discomfort (e.g., pharyngeal lymphoid hyperplasia, pharyngitis, pharyngeal cysts, soft palate defects, ulceration of the caudal border of the soft palate) (Kannegeiter and Dore 1995; Parente, Martin et al. 2002), and axial deviation of the aryepiglottic folds (Dart, Dowling et al. 2001; Barakzai and Hawkes 2010)

Diagnosis of DDSP is based on a combination of history, clinical signs, and endoscopic examination of the URT. It should be noted that DDSP can be observed during resting endoscopy in normal horses and it should not be regarded as an indication of dynamic dysfunction during exercise. The best way to diagnose DDSP is during dynamic endoscopy examination (Kannegeiter and Dore 1995; Holcombe and Ducharme 2004; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006), but examiners should be aware that clinically normal horses sometimes displace their soft palate during exercise but quickly swallow causing it to reposition it to its normal subepiglottic position. However, if a horse does frequently displace its soft palate at rest, it is more likely to also displace it at exercise (Parente, Martin et al. 2002; Lane, Bladon et al. 2006; Barakzai and Dixon 2011).

A variety of treatment options has been described, and they should be selected considering the causes and/or predisposing factors that led to the development of DDSP. Dental care and use of riding devices, such as a tongue-strap and the Cornell collar, may prevent DDSP. Medical treatment to decrease pharyngeal inflammation, which may cause primary palate dysfunction leading to DDSP, has been recommended (Gille and Lavoire 1996). Surgical treatments include myectomies of the caudal retractor muscles of the larynx to prevent caudal retraction of the larynx from the pharynx (Harrison and Raker 1988; Llewellyn 1997), staphylectomy to obtain a more rigid palate and the "tie forward" procedure to create a tighter palatopharyngeal seal (Ahern 1993; Anderson, Tulleners et al. 1995).

1.2.3.5.1.2.3 Pharyngeal collapse (PC)

This condition occurs less commonly than the palatal dysfunction complex (PI and/or DDSP) (Franklin 2008). It is the ventral displacement of the dorsal wall (roof) and/or the axial displacement of the lateral walls, occurring at the end of expiration and during early inspiration (Ducharme 1992; Strand and Staempfli 1993; Kannegeiter and Dore 1995; Boyle, Martin et al. 2006; Ducharme 2006). It has been described as one of the conditions predisposing to DDSP (Ducharme 1992). Some horses may present a combination of lateral and dorsal pharyngeal wall collapse and dorsal movements of the soft palate, leading to a circumferential pharyngeal collapse (Boyle, Martin et al. 2006). In severely affected horses, the nasopharynx collapses completely during inspiration.

The aetiology of PC is unclear. It is thought to be related to the negative pressures in the nasopharynx during high-speed exercise, and decreased strength of the stylopharyngeus muscles, which attach the axial surface of the stylohyoid bones to the roof of the nasopharynx (Tessier, Holcombe et al. 2005). It has also been observed to occur in Standardbred horses when the neck is hyperflexed ventrally (Smith, Taylor et al. 1994; Petsche, Derksen et al. 1995). Horses with PC are usually normal at rest, and the diagnosis is achieved only during dynamic, endoscopic examination (Strand and Staempfli 1993; Kannegeiter and Dore 1995; Martin, Reef et al. 2000; Boyle, Martin et al. 2006).

There is not known treatment for horses with PC. Use of a tongue-tie or figure-of-eight nosebands are used in attempt to correct the condition with no efficacy reported. Nonspecific treatments described include rest, systemic non-steroidal anti-inflammatory therapy or inhaled corticosteroids (Davidson and Martin 2003). Prognosis is guarded, and most racehorses with this condition are retired (Ducharme 1992; Strand and Staempfli 1993; Boyle, Martin et al. 2006). For other sport or pleasure horses, riding the horse with less flexion of the neck may improve the horse's athletic performance (Franklin 2008).

1.2.3.5.2 Larynx

The larynx is a tubular anatomical structure connecting to the pharynx rostrally and to the trachea caudally. It is composed of three single cartilages (the thyroid, cricoid and epiglottis) and one pair of cartilages(the arytenoids). These 5 cartilages are connected by ligaments (i.e., the cricothyroid, thyrohyoid, hyoepiglottic, thyroepiglottic, and vocal ligaments), extrinsic muscles (i.e., the sternothyroideus, thyrohyoideus and hyoepiglotticus muscles), and intrinsic muscles (i.e., the cricothyroideus, cricoarytenoideus dorsalis, cricoarytenoideus lateralis, arytenoideus transverss, thyroarytenoideus, accessory thyroarytenoideus and tensor ventriculi lateralis muscles) (Rush and Mair 2007). The laryngeal opening is an oval opening bounded by the epiglottis, the aryepiglottic folds, and the right and left corniculate process of the arytenoid cartilages. Caudally is the vestibule of the larynx, which contains the vestibular folds and laryngeal ventricles laterally, just caudal to the vocal cords. The larynx regulates the airflow and prevents aspiration of food. During swallowing, the airway is closed by adduction of the arytenoid cartilages and caudal movement of the epiglottis (Rush and Mair 2007).

1.2.3.5.2.1 Anatomical disorders

1.2.3.5.2.1.1 Arytenoid chondropathy

Arytenoid chondropathy (arytenoid chondritis) may affect one or both arytenoid cartilages. It is caused by infection of the cartilages which causes them to enlarge, and this enlargement restricts their mobility (Rush and Mair 2007).

Resting endoscopy and clinical history are useful tools to diagnose arytenoid chondropathy. Clinical signs displayed by horses with this condition vary according to the severity of the condition. Horses affected only with ulcerative lesions of the mucosa on the axial surface of the corniculate process of the arytenoids are usually asymptomatic at rest and at exercise (Holcombe and Ducharme 2004). Protrusions of cartilage or granulation tissue on the axial aspect of the arytenoid cartilage are often seen endoscopically in severely affected horses and may coexist with superficial, ulcerated, “kissing” lesions on the contralateral arytenoid. The condition alters arytenoid function and results in different degrees of respiratory obstruction (Parente 2007).

Treatments include administration of antimicrobial and anti-inflammatory drugs (Parente 2007). Arytenoidectomy may be necessary to treat severely horses that do not respond to medical treatment (Parente 2007).

1.2.3.5.2.2 Functional disorders

1.2.3.5.2.2.1 Recurrent laryngeal neuropathy (RLN)

A study of 375 horses with laryngeal paresis/paralysis revealed that in 94% of horses (351) the cause was considered to be idiopathic. In only 6% of horses was the cause of laryngeal paresis/paralysis identified. These causes included guttural pouch mycosis or trauma, pharyneal neoplasia, perivascular/perineural injection in the neck of an irritant, damage to the recurrent laryngeal nerve during surgery of the neck, hepatopathy, lead toxicosis, and hyperkalemic periodic paresis. Half of horses with laryngeal paresis/paralysis caused by hepatopathy, lead toxicosis, or hperkalemic periodic paresis were bilaterally affected (Dixon, McGorum et al. 2001). In horses where the cause of laryngeal paresis/paralysis is unknown the disease is termed recurrent laryngeal neuropathy (RLN). (RLN), previously known as laryngeal hemiplegia (LH), is a common cause of poor performance in racehorses (Anderson 2007; Perkins, Salz et al. 2009; Cramp and Barakzai 2012).

Itoccurs due to paresis or paralysis of the cricoarytenoideus dorsalis muscle as a result of progressive loss of large, myelinated axons in the left recurrent laryngeal nerve (Perkins, Salz et al. 2009; Cramp and Barakzai 2012). This neurogenic atrophy of the muscles of the larynx results in progressive loss of the ability of the arytenoid cartilages to abduct and adduct. The left side of the larynx (left arytenoid) is almost invariably involved (Tetens, Hillmann et al. 2001).

A definition of the terminology used to describe endoscopic appearance of the larynx is shown in Table 5.

Table 5. Definitions of terminology used to describe endoscopic appearance of the larynx. From The Havemeyer Foundation Monograph Series N°11, (2003).

Abduction	Movement of the corniculate process of the arytenoid cartilage away from the midline of the rima glottidis.
Adduction	Movement of the corniculate process of the arytenoid cartilage toward the midline of the rima glottidis.
Full abduction	Most of the corniculate process of the arytenoid cartilage lies horizontally (90° to the midline of the rima glottidis).
Asymmetry	A difference in position of the right and left corniculate processes relative to the midline of the rima glottidis.
Asynchrony	Movement of the corniculate processes occurs at different times. This can include twitching, shivering, and delayed or biphasic movement of an arytenoid.

During exercise, the corniculate process of the left arytenoid cartilage of horses with RLN moves towards the midline of the rima glottidis during inspiration (Franklin 2008). As a result of this, the ipsilateral aryepiglottic fold and vocal cord accompanies it, resulting in an substantial obstruction to airflow resulting in a low-grade “roaring” or “whistling” inspiratory noise with concurrent exercise intolerance (Lane, Bladon et al. 2006; Franklin 2008; Cramp and Barakzai 2012).

The prevalence of RLN varies between breeds, being highest in Thoroughbreds, hunter types, and draught horses (Dixon, McGorum et al. 2001). In a study of 427 Thoroughbred sale yearlings, 64% had asynchronous movements of the arytenoid cartilages, and 25% had laryngeal asymmetry. These abnormalities may portend decreased racing performance (Stick, Tulleners et al. 1999).

Laryngeal palpation to assess atrophy of the cricoarytenoideus dorsalis muscle, the "slap test" to assess the thoracolaryngeal reflex (Holcombe and Ducharme 2004), and resting endoscopy (with minimum restraint and without sedation) during quiet breathing, swallowing, and nasal occlusion are the first-line, diagnostic tools for assessing laryngeal function (Archer, Lindsay et al. 1991; Anderson 2007). Dynamic endoscopy (HSTE or DOE) provides a more detailed evaluation of laryngeal function (Derksen, Stick et al. 1986; Lane, Bladon et al. 2006; Franklin 2008; Barakzai and Dixon 2011).

The clinical significance of RLN may vary according to the degree of obstruction of the rima glottidis and the type of work for which the horse is used (Franklin 2008). Resting and dynamic grading systems for assessing laryngeal function have been developed to standardize interpretation of findings (tables shown in section 1.2.4.1.).

Treatments used to resolve clinical signs of RLN include ventriculectomy (with or without vocalcordectomy), prosthetic laryngoplasty (i.e., the "tie-back" procedure) various techniques of arytenoidectomy, and pedicle grafts composed of nerve and muscle (re-innervation surgery) (Derksen 2003).

1.2.3.5.2.2.2 4th branchial arch defect syndrome (4-BAD)

Although some horses are bilaterally affected with 4-BAD, this condition is commonly a unilateral disorder, usually of the right side of the larynx (Lane 2007). A study of Thoroughbred racehorses with 4-BAD reported by (Lane 2003) showed that the condition occurs approximately six times more frequently on the right side (66%) rather than the left side (10%) (Lane 2003).

During exercise, different degrees of collapse of the affected arytenoid may occur and, in some cases, other abnormalities, such as ADAF and DDSP, may occur as well (Lane, Bladon et al. 2006). Horses with this developmental abnormality are prone to early retirement.

Diagnosis can be made by palpating a large gap on the affected side, between the cricoid and thyroid cartilages (Lane 2007). During resting endoscopy some degree of immobility of the corniculate process of the affected sided of the larynx is observed. The palatopharyngeal arch of some affected horses is displaced rostrally and is seen covering the tips of the corniculate processes (Franklin 2008). Radiography of the pharynx/larynx area may show a continuous column of air in the oesophagus, which results from a defective muscular seal of the cranial oesophageal sphincter (Lane 2007) .

1.2.3.5.2.2.3 Left corniculate process collapse (LCPC)

Collapse of the left corniculate process (LCPC) so that its tip resides beneath the tip of the right corniculate process is an uncommon form of dynamic airway obstruction, only diagnosed during dynamic endoscopy examination (Dart, Dowling et al. 2005; Barakzai, Es et al. 2007) or at rest after occluding the nostrils to induce the horse to swallow (Barakzai, Es et al. 2007). The larynx of horses with only this condition may appear normal during endoscopic examination of the URT performed when the horse is resting (Franklin, Naylor et al. 2006).

Pathogenesis of this condition is currently unknown. One study suggested that atrophy or dysfunction of the transverse arytenoid muscle may be the cause (Dart, Dowling et al. 2005). However, another study identified significant widening of the transverse arytenoid ligament of affected horses. The function of this ligament is to keep the tips of the corniculate processes in apposition (Barakzai, Es et al. 2007).

LCPC has been reported to be associated with other abnormal dynamic conditions, such as VCC, ADAF and DDSP (Dart, Dowling et al. 2005), (Franklin 2008). No treatment has been reported.

1.2.3.5.2.2.4 Axial deviation of aryepiglottic folds (ADAF)

The aryepiglottic fold is normally tensed between the arytenoid cartilage and the epiglottis, and it extends between the lateral aspect of the corniculate process of the arytenoid cartilage and the lateral edge of the epiglottis. (King, Tulleners et al. 2001). The axial deviation is caused by a loss of tension in the folds secondary to a slight loss of abduction of the arytenoids or elevation of the epiglottis (Kannegeiter and Dore 1995; King, Tulleners et al. 2001). Immaturity or fatigue may also play a role in the pathogenesis of ADAF (King, Tulleners et al. 2001).

ADAF causes the horse to make an inspiratory “whistle” similar to the one heard in horses with VCC, and is observed only during dynamic endoscopic examination (Kannegeiter and Dore 1995; Martin, Reef et al. 2000; Dart, Dowling et al. 2001; Lane, Bladon et al. 2006).

ADAF has been reported to occur in racehorses and other sport horses (Franklin, Naylor et al. 2006), and it can occur as a sole entity (Kannegeiter and Dore 1995; Martin, Reef et al. 2000; King, Tulleners et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006) or with other abnormal dynamic abnormalities of the URT, such as VCC, RLN, and DDSP (Parente, Martin et al. 1994; King, Tulleners et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006). According to a previous study (King, Tulleners et al. 2001), the condition is almost always bilateral, and the degree of deviation is related to the degree of fatigue. The severity of ADAF can be classified as mild, moderate, or severe. A grading system for severity of ADAF is described in section 1.2.4.2.

Transendoscopic laser excision, performed with the horse sedated, is a common surgical treatment, but ADAF sometimes resolves when the horse is rested and administered anti-inflammatory therapy (Holcombe and Ducharme 2004). In one study, 70% of the horses receiving surgery and 50 % of those rested had an objective improvement in performance (King, Tulleners et al. 2001).

1.2.3.5.2.2.5 Vocal cord collapse (VCC)

Bilateral dynamic vocal cord collapse (VCC) can occur as a sole cause of airway obstruction and abnormal inspiratory noise, or it can occur in association with ADAF (Kannegeiter and Dore 1995; Dart, Dowling et al. 2001; Strand 2004; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006) (Franklin 2008). The degree of airway obstruction is less than that observed with RLN and performance may not be compromised if maximum exercise is not required (Franklin 2008). It has been reported to be associated with head flexion in Norwegian coldblooded trotter horses (Strand 2004) and may occur in horses of other breeds exercised with a similar head-carriage.

The vocal cord is normally stabilized when the cricothyroid muscle, which is innervated by a branch of the cranial laryngeal nerve, contracts. Authors of a study of horses with VCC hypothesised that VCC results from a failure of the arytenoid cartilages to completely abduct, secondary to conformational changes in the throat region associated with head flexion and tension applied to the reins (Strand 2004). Moderate VCC was also described to be associated with mild to moderate dorsoaxial collapse of the lateral edges of the epiglottis in two out of five horses in one study (Strand 2004).

VCC can only be diagnosed during high-speed endoscopic examination because the vocal cords of horses affected with VCC appear normal during resting evaluations (Strand 2004). Previous reports showed a 2 – 12% prevalence of VCC in horses undergoing treadmill endoscopic examinations (Kannegeiter and Dore 1995; Martin, Reef et al. 2000; Dart, Dowling et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006). Endoscopically-guided laser vocal cordectomy with the patient standing or under general anaesthesia is the surgical treatment of choice for this condition (Parente 2007).

1.2.3.5.2.2.6 Intermittent epiglottal entrapment

Epiglottal entrapment (EE) occurs when the epiglottis is enveloped by the subepiglottic mucosa and aryepiglottic folds. This results in concealment of the serrated and vascular margins of the epiglottis during endoscopic examination (Holcombe and Ducharme 2004; Franklin 2008).

During inspiration, the pressures are greater dorsal to the entrapping fold than ventral to it, forcing the entrapping fold to be drawn ventrally towards the epiglottis (Morris and Seeherman 1991). During expiration, the entrapping membranes fill with air, significantly obstructing the airflow and causing a loud expiratory noise. Noise may also be heard during inspiration (Morris and Seeherman 1991) (Franklin 2008). Horses with this abnormality also commonly suffer from intermittent DDSP (Kannegeiter and Dore 1995). Although the aetiology of this condition is not clear, it has been associated with ulceration of the aryepiglottic membrane (Holcombe and Ducharme 2004), inflammation of the subepiglottic or aryepiglottic tissue, subepiglottic cysts and epiglottic hypoplasia (Haynes 1983).

This condition can be diagnosed during resting endoscopy (Morris and Seeherman 1991; Kannegeiter and Dore 1995) and can be an incidental finding during the laryngeal examination. Some horses may be asymptomatic (Holcombe and Ducharme 2004). Radiographic examination may show excessive soft-tissue density surrounding the epiglottis and can be used as an ancillary diagnostic tool (Holcombe and Ducharme 2004). The epiglottis can be entrapped by aryepiglottic tissue intermittently, such as when the horse swallows or exercises, making dynamic endoscopic examination a useful diagnostic tool (Holcombe and Ducharme 2004).

Trans-axial division of the entrapping aryepiglottic membrane with a hooked bistoury or with laser may be performed as a treatment for horses with this condition (Holcombe and Ducharme 2004).

1.2.3.5.2.2.7 Epiglottic retroversion

Epiglottic retroversion (ER) is a very rare cause of respiratory noise and exercise intolerance in horses (Tulleners 1992). This condition is only detectable during dynamic endoscopic examination (Parente, Martin et al. 1998). During inspiration, the epiglottis is retroflexed caudally and lifted dorsally causing obstruction of the rima glottidis (Holcombe and Ducharme 2004; Franklin 2008). This leads to a loud inspiratory noise and major laryngeal obstruction. Studies have associated this abnormality with severe upper respiratory infection, disruption of the normal hyoid musculature (Parente, Martin et al. 1998), or extreme flexion of the neck (Franklin, Naylor et al. 2006). There is little described in the literature about treatments for ER, besides epiglottic augmentation with polytetrafluoroethylene (Teflon) in two horses, with successful return to racing in one of these cases (Holcombe and Ducharme 2004).

1.2.4 Grading systems

Grading systems are considered a useful tool to describe the different presentations of some URT diseases. These systems allow the examiner to categorise the severity of the abnormality, they facilitate communication among colleagues, and they provide accurate assessment of progression of disease.

1.2.4.1 Laryngeal function grading systems

Several grading systems of laryngeal function have been developed to create a standardised, practical method for assessing and interpreting laryngeal function with the horse at rest and at exercise (Dixon, McGorum et al. 2001; Perkins, Salz et al. 2009).
Published grading systems for evaluating laryngeal function with the horse at rest include a 4-grade grading system (Rakestraw, Hackett et al. 1991) , a 5-grade grading system (Lane 1993), a 6-grade grading system (Dixon, McGorum et al. 2002) and a 7-grade grading system (Dixon, Robinson et al. 2003) .

Concerns about the wide range of abnormal motions included in the grade 3 of the 4-grade grading system, led to the 5-grade and 6-grade grading systems, which subdivide grade 3 of the 4-grade grading system (Dixon, McGorum et al. 2001). The Workshop on Equine Recurrent Laryngeal Neuropathy attended by experts in equine respiratory disease and sponsored by the Havemeyer Foundation in 2003, presented the 7-grade system designed to minimize variability within the criteria used (Dixon, Robinson et al. 2003), as shown in Table 6.

Table 6. Grading system of laryngeal function performed in the standing unsedated horse. Modified from Anderson (2007).

Grade	Description	Sub-grade
I	All arytenoid cartilage movements are synchronous and symmetrical, and full arytenoid cartilage abduction can be achieved and maintained.	
II	Arytenoid cartilage movements are asynchronous and/or larynx is asymmetric at times, but full arytenoid cartilage abduction can be achieved and maintained.	a. Transient asynchrony, flutter or delayed movements are seen. b. There is asymmetry of the rima glottidis much of the time due to reduced mobility of the affected arytenoid and vocal fold, but there are occasions, typically after swallowing or nasal occlusion, when full symmetrical abduction is achieved and maintained.
III	Arytenoid cartilage movements are asynchronous and/or asymmetric. Full arytenoid cartilage abduction cannot be achieved and maintained.	a. There is asymmetry of the rima glottidis much of the time due to reduced mobility of the arytenoid cartilage and vocal fold, but there are occasions, typically after swallowing or nasal occlusion, when full symmetrical abduction is achieved and maintained. b. Obvious arytenoid abductor muscle deficit and arytenoid cartilage asymmetry. Full abduction is never achieved. c. Marked but not total arytenoid abductor muscle deficit and arytenoid cartilage asymmetry with little arytenoid cartilage movement. Full abduction is never achieved.
IV	Complete immobility of the arytenoid cartilage and vocal fold.	

- Description generally refers to the left arytenoid cartilage in reference to the right, but it can be applied to the right side.

A grading system for assessing laryngeal function of horses during exercise has also been developed (Rakestraw, Hackett et al. 1991). This grading system divides laryngeal function into three grades: full abduction (grade A); partial abduction, between full abduction and the resting position (grade B); and less than resting position, including collapsing to the contralateral side (grade C) (see Table 7).

Table 7. Subjective grading system of laryngeal function performed in horses during exercise. Modified from Anderson (2007).

Grade	Description
A	Full abduction of the arytenoid cartilages during inspiration.
B	Partial abduction of the affected arytenoid cartilages (between full abduction and the resting position).
C	Abduction less than resting position, including collapse into the contralateral half of the rima glottidis during inspiration.

- Description generally refers to the left arytenoid cartilage in reference to the right, but it can be apply to the right side.

Validated grading systems for assessing laryngeal function with the horse at rest agree that the inability to achieve full abduction of the affected arytenoid during the examination is likely to be associated with compromised respiratory function during exercise. These systems also agree that glottic asymmetry and asynchronous movement of the arytenoid cartilages during inhalation are not cause for concern as long as the horse can attain and maintain full bilateral abduction of the arytenoid cartilages (Dixon, Robinson et al. 2003).

1.2.4.2 Grading system for axial deviation of aryepiglottic folds

A grading system has been proposed to classify the degree of ADAF. The percentage of obstruction of the glottis caused by ADAF is graded as mild (20% or less obstruction); moderate (21-40% obstruction); or severe (41-63%) (see Table 8) (King, Tulleners et al. 2001).

Table 8. Axial deviation of aryepiglottic folds grading system. Modified from King et. al. (2001)

Obstruction grade	**Definition**
A (MILD)	The axially collapsed aryepiglottic fold remains abaxial to the vocal cord.
B (MODERATE)	The aryepiglottic fold has collapsed to a point less than halfway between the vocal cord and the midline.
C (SEVERE)	The aryepiglottic fold has collapsed more than halfway between the vocal cord and the midline.

For some horses, the degree of deviation can progress from mild through severe, depending on the degree of fatigue (King, Tulleners et al. 2001).

1.2.4.3 Pharyngeal collapse grading system

Two grading systems have been developed to evaluate the degree of dynamic pharyngeal collapse (Boyle, Martin et al. 2006). One system is related to the number of walls [left lateral, right lateral, dorsal, ventral (soft palate)] affected (see Table 9).

Table 9. Pharyngeal collapse grading system (number of walls affected). Modified from Boyle, et.al (2006).

Obstruction grade	Definition
0	Normal pharynx.
1	Deviation of one pharyngeal wall.
2	Deviation of two pharyngeal walls.
3	Deviation of 3 pharyngeal walls.
4	Deviation of 4 pharyngeal walls.

The second grading system, takes into consideration the area of the glottis that is obstructed (Boyle, Martin et al. 2006). With this system, grades of collapse range from mild collapse through two different intermediate grades of collapse to severe collapse where the pharyngeal walls may touch each other (see Table 10).

Table 10. Grading system for pharyngeal collapse (glottis obstruction). Modified from Boyle, et.al (2006).

Obstruction grade	Definition
1 (MILD)	Closure of the pharynx to the rima glottidis
2 (LOW-MODERATE)	Closure of the pharynx obstructing 30% of the rima glottidis
3 (HIGH-MODERATE)	Closure of the pharynx obstructing 50% of the rima glottidis
4 (SEVERE)	Complete closure of the pharynx with opposing pharyngeal walls touching each other

2 Chapter 2: Descriptive study of dynamic upper respiratory abnormalities in Thoroughbred racehorses in South Africa presented because of poor performance and/or abnormal respiratory noise at exercise

2.1 Aims of the study

To describe the upper airway abnormalities detected by using dynamic overground endoscopy in Thoroughbred racehorses in South Africa presenting because of poor performance and/or abnormal respiratory noise at exercise.
We hypothesised that the major abnormalities detected during dynamic endoscopic examinations would be similar to those detected in studies done in other populations of Thoroughbred racehorses presented for poor performance and/or respiratory noise.

2.2 Materials and methods

The study was designed as a retrospective study. Patient records of Thoroughbred racehorses that underwent overground endoscopy by the Onderstepoort Veterinary Academic Hospital (OVAH) for investigation of poor performance and/or respiratory noise from November 2011 to August 2012 were reviewed. Each horse was examined once at a racetrack or training centre. The dynamic overground endoscopic examinations were done at different racetracks and training centres around South Africa (Randjiesfontain racecourse, Summerveld training centre, Durbanville racecourse, The Vaal racecourse, Ashburton racecourse, Kenilworth racecourse, Turffontein racecourse, Clairwood racecourse, Phillipi racecourse, Kyalami racecourse, Arlington racecourse, Milnerton racecourse and Drakenstein stud).

All horses were referred by veterinarians for consultation to determine the cause of abnormal respiratory noise (whistling / roaring, rough /gurgling / rattling) and/or poor performance (pulling up abruptly late in work or fading over the duration of the exercise). Overground endoscopy was carried out using the Videomed Overground system[5]. Speed attained and distances exercised were recorded using a global positioning system monitor (GPS)[6].

The data were obtained from the overground endoscopy reports and organized in a Microsoft Excel®[7] spreadsheet. Information included the date and location of the examination, name of the trainer and the horse, signalment, primary complaint (abnormal respiratory noise, poor performance, or both), surface, distance exercised, and maximum speed attained. The number of horses with single or multiple abnormalities detected was recorded. The abnormalities detected were recorded and the relationships of the abnormalities detected to the primary complaint were also recorded.

2.3 Results

Fifty-two horses undergoing DOE were identified. Twenty-two colts (43%), nine geldings (17%), and 21 females (40%) were examined. The median age of these horses was 3.6 years (range 2 - 9 years) (see Table 11). The horses were exercised over a mean distance of 1146 metres (range, 600 – 1600 m) and the mean maximum speed attained was 58.39 km/h (range 43.4 to 66.5 km/h).

Table 11. Gender categories of the horses evaluated in the study.

Gender	Number of horses	Percentage (%)
Colts	22	43
Geldings	9	17
Fillies	21	40
Total	**52**	**100**

The primary complaints for horses presenting for overground endoscopy were abnormal respiratory noise at exercise (34/52 horses, 66%), poor performance (9/52 horses, 17%) and a combination of abnormal respiratory noise and poor performance (9/52 horses, 17%), as shown in Table 12.

[5] VideoMed, GmbH, Germany
[6] Garmin ®, USA
[7] Microsoft Excel ®, USA

For horses presented because of abnormal respiratory noise or the combination of abnormal respiratory noise and poor performance (43/52 cases), single abnormalities were observed in 13 horses (25%), and multiple abnormalities in 25 horses (48%). No abnormalities were found in 5 horses presented because of those complaints. For horses presented because of poor performance (9/52 horses), single abnormalities were observed in 2 horses (4%) and no abnormalities were detected in 7 of the horses. A respiratory abnormality was more likely to be diagnosed in horses presented because of abnormal respiratory noise or abnormal respiratory noise associated with poor performance (38/43 cases, 88%) than in horses presented only because of poor performance (2/9 cases, 22%).

Of the 52 horses examined using DOE, 40 had one or more respiratory abnormalities (77%), 15 (29%) had a single respiratory abnormality, and 25 (48%) had multiple respiratory abnormalities. No respiratory abnormalities were detected in 12 horses (23%) (see Table 12).

Table 12. Abnormalities found in relation to primary complaint:

Primary complaint	Number of horses examined			Total number of horses
	No abnormalities	Single abnormalities	Multiple abnormalities	
Respiratory noise	3 (6%)	13 (25%)	18 (35%)	34 (66%)
Respiratory noise & Poor performance	2 (4%)	0 (0%)	7 (13%)	9 (17%)
Poor performance	7 (13%)	2 (4%)	0 (0%)	9 (17%)
Total	**12 (23%)**	**15 (29%)**	**25 (48%)**	**52 (100%)**

The single abnormalities observed were PI (1/52, 2%), DDSP (8/52, 15%), RLN (2/52, 4%; one with grade B and one with grade C), ADAF (1/52, 2%) and PC (1/52, 2%). Multiple abnormalities were observed in several different combinations. Of those 25 horses for which multiple abnormalities were detected, 2 abnormalities were observed in 13 horses (25%), 3 abnormalities were observed in 9 horses (17%), 4 abnormalities were observed in 2 horses (4%), and 6 abnormalities were observed in 1 horse (2%) (see Table 13).

Table 13. Total of respiratory abnormalities (single and multiple) found

No abnormalities	**Number of horses**	**Percentage of total cases (%)**
Total	**12**	**23**
Single abnormalities	**Number of horses**	**Percentage of total cases (%)**
PI	1	2
DDSP	8	15
RLN (B)	1	2
RLN (C)	1	2
VCC	0	0
LCPC	0	0
ADAF	2	4
PC	2	4
Total	**15**	**29**
Multiple abnormalities	**Number of horses**	**Percentage of total cases (%)**
2 abnormalities		
PI + PC	1	2
DDSP + ADAF	1	2
RLN (C) + VCC	4	8
RLN (C) + ADAF	1	2
VCC + ADAF	3	6
ADAF + PC	2	4
PI + DDSP + ADAF	1	2
Total	**13**	**25**
3 abnormalities		
DDSP + RLN (B) + VCC	1	2
RLN (B) + ADAF + VCC	5	10
RLN (B) + ADAF + PC	1	2
RLN (C) + VCC + ADAF	2	4
Total	**9**	**18**
4 abnormalities		
DDSP + ADAF + VCC + LCPC	1	2
VCC + ADAF + LCPC + PC	1	2
Total	**2**	**4**
6 abnormalities		
DDSP + ADAF + VCC + LCPC + RLN (B) + PI	1	2
Total	**1**	**2**
Total	**52**	**100**

The most commonly detected abnormalities were:

1) ADAF was found to be present in (21/52 horses, 40%). It was found as a single abnormality in 2 horses (2/21 cases, 9%), and it was found with other abnormal conditions in 19 horses (see Table 14).

2) VCC was detected in (18/52 horses, 35%) and was always associated with other conditions such as DDSP,PC, ADAF,LCPC, RLN (grade 3 B) and RLN (grade 3 C) as seen in Table 15.

3) RLN was observed in 17/52 horses (33%). This condition was presented as grade B in 9 horses, seen as a single abnormality one time and in combination with other abnormalities in 8 horses. Grade C RLN was detected in 8 horses as a single abnormality one time (1/8 horses, 13%), and 7 times in association with other abnormalities (see Table 16).

4) DDSP was observed in13/52 horses (25%). It was the sole abnormality found in 8/13 horses (60%) and was associated with other abnormalities in 5/13 horses (40%) (see Table 17).

Other abnormalities not observed as frequently were PC, PI, and LCPC. PC was observed in 7/52 horses (13%). It was the sole abnormality found in 2 of the 7 affected horses (28%) and was found in combination with other abnormalities in the other 5 horses (see Table 18). PI was observed in 4/52 horses (8%).

It was the sole abnormality found in one affected horse and was found in combination with other abnormalities in 3 horses (Table 19).

Only 3/52 horses (6%) were observed to have LCPC. It was always found combination with other abnormalities (Table 20).

Table 14. Horses with ADAF:

ADAF	Number of horses	Percentage (%)
ADAF	2	9
ADAF + PI + DDSP	1	5
ADAF + DDSP	1	5
ADAF + DDSP + VCC + LCPC	1	5
ADAF + DDSP + VCC + LCPC + RLN (B) + PI	1	5
ADAF + RLN (B) + VCC	5	23
ADAF + RLN (B) + PC	1	5
ADAF + RLN (C) + VCC	2	9
ADAF + RLN (C)	1	5
ADAF + VCC	3	14
ADAF + VCC + LCPC + PC	1	5
ADAF + PC	2	9
Total	21	**100**

Table 15. Horses with VCC:

VCC	Number of horses	Percentage (%)
VCC	0	0
VCC + DDSP + ADAF + LCPC	1	6
VCC + DDSP + ADAF + LCPC + RLN (B) + PI	1	6
VCC + DDSP + RLN (B)	1	6
VCC + RLN (B) + ADAF	5	28
VCC + RLN (C)	4	22
VCC + RLN (C) + ADAF	2	11
VCC + ADAF	3	16
VCC + ADAF + LCPC + PC	1	6
Total	**18**	**100**

Table 16. Horses with RLN:

RLN (17 cases)	Number of horses	Percentage (%)
RLN (B)	1	11
RLN (B) + DDSP + ADAF + VCC + LCPC + PI	1	11
RLN (B) + DDSP + VCC	1	11
RLN (B) + ADAF + VCC	5	56
RLN (B) + ADAF + PC	1	11
Total RLN (B)	**9**	**100**
RLN (C)	1	13
RLN (C) + VCC	4	50
RLN (C) + VCC + ADAF	2	24
RLN (C) + ADAF	1	13
Total RLN (C)	**8**	**100**

Table 17. Horses with DDSP:

DDSP	Number of horses	Percentage (%)
DDSP	8	**60**
DDSP + ADAF	1	8
DDSP + ADAF+ PI	1	8
DDSP + ADAF + VCC + LCPC	1	8
DDSP + ADAF + VCC + LCPC + RLN (B) + PI	1	8
DDSP + RLN (B) + VCC	1	8
Total	**13**	**100**

Table 18. Horses with PC:

PC	Number of horses	Percentage (%)
PC	2	**28**
PC + PI	1	14
PC + RLN (B) + ADAF	1	14
PC + VCC + ADAF + LCPC	1	14
PC + ADAF	2	28
Total	**7**	**100**

Table 19. Horses with PI:

PI	Number of horses	Percentage (%)
PI	1	25
PI + PC	1	25
PI + DDSP + ADAF	1	25
PI + DDSP + ADAF + VCC + LCPC + RLN (B)	1	25
Total	**4**	**100**

Table 20. Horses with LCPC:

LCPC	Number of horses	Percentage (%)
LCPC	0	0
LCPC + DDSP + ADAF + VCC	1	33
LCPC + DDSP + ADAF + VCC + RLN (B) + PI	1	33
LCPC + VCC + ADAF + PC	1	33
Total	**3**	**100**

2.4 Discussion

HSTE and DOE of the URT have been shown to be very useful for determining the cause of abnormal respiratory noise at exercise and/or poor performance (Morris and Seeherman 1991; Parente and Martin 1995; Lane, Bladon et al. 2006; Lane, Bladon et al. 2006). These techniques allow detection of single and multiple abnormalities that may not be evident under resting conditions (Lumsden, Stick et al. 1995; Parente, Martin et al. 2002).

Dynamic collapse of various structures of the URT is a frequent cause of abnormal respiratory noise and/or poor performance in athletic horses (Morris and Seeherman 1991; Kannegeiter and Dore 1995; Martin, Reef et al. 2000; Dart, Dowling et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006). Previous studies found a prevalence of dynamic obstruction in 77% (Franklin, Naylor et al. 2006), 72% (Davidson, Martin et al. 2011), 73% (Dart, Dowling et al. 2001), 82% (Witte, Witte et al. 2011), and 65% (Desmaizieres, Serraud et al. 2009) of horses in similar study populations.

From the total of 52 horses evaluated in our study, forty showed dynamic pathological conditions (77%). These results are similar to those of previous studies In our study population, multiple abnormalities were observed in 50% of the horses. These results are similar to those found by Tan et al (2005), who reported 49% of horses in their study population had multiple respiratory abnormalities (Tan, Dowling et al. 2005) but different from other studies where the authors reported that only 7 to 38% of horses in their study population had multiple respiratory abnormalities (Lumsden, Stick et al. 1995; Dart, Dowling et al. 2001; King, Tulleners et al. 2001; Parente, Martin et al. 2002). The detection of multiple abnormalities may be influenced by the population examined, evaluator expertise, and the type of exercise performed (e.g., distance run, speed attained, degree of fatigue achieved). Horses that run shorter distances or attained lower speeds may not have developed any detectable conditions,

DDSP is a common cause of poor performance in racehorses (Morris and Seeherman 1991; Kannegeiter and Dore 1995; Lumsden, Stick et al. 1995; Martin, Reef et al. 2000; Lane, Bladon et al. 2006) because it causes expiratory obstruction, which results in decreased ventilation and exercise intolerance (Parente, Martin et al. 2002). DDSP was one of the most commonly detected abnormalities in our study (15/52 horses, 25%), and the percentage of horses with this abnormality was similar to the proportion of horses affected with DDSP in studies of other, similar study groups: 19% (Pollock, Reardon et al. 2009), 26% (Witte, Witte et al. 2011), and 28% (Desmaizieres, Serraud et al. 2009).

Another frequently observed, dynamic abnormality commonly associated with poor performance and/or respiratory noise in horses is RLN (Franklin, Naylor et al. 2002; Brown, Derksen et al. 2004). The prevalence of this condition is highest in breeds whose members are large, such as Thoroughbreds, hunter types, and draught horses (Cahill and Goulden 1987; Dixon, McGorum et al. 2001). It is difficult to determine the true prevalence of this condition as results from different studies vary due to different diagnostic criteria and methods used to detect the disease. Clinical manifestations only become readily apparent when the abductor muscles, particularly the cricoarytenoideus dorsalis muscle, are unable to maintain abduction of the arytenoid cartilage during exercise (Duncan, Reifenrath et al. 1991; Stick, Tulleners et al. 1999; Tetens, Hillmann et al. 2001).
Dynamic endoscopy evaluation of 37 Thoroughbred horses presented with poor performance associated with respiratory noise showed the prevalence of RLN to be 40% (Dart, Dowling et al. 2001). In our study, RLN was observed in 35% of the horses evaluated for laryngeal or pharyngeal dysfunction. These results are comparable to the above mentioned, but differ from those reported by Desmizieres et al (2009) who found that only 18% of horses in their study group suffered from RLN (Desmaizieres, Serraud et al. 2009). The latter study was performed on 68 horses used for different purposes (Standardbred, Thoroughbred and Saddlebred horses) and presented for investigation of poor performance and/or respiratory noise.

VCC can be found as the sole abnormality, or it can be associated with RLN (Kannegeiter and Dore 1995; Dart, Dowling et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006).In a study of Thoroughbred horses that underwent dynamic respiratory endoscopy because of abnormal respiratory noise and/or poor performance (Witte, Witte et al. 2011), VCC was detected in 11% of horses (in 4% as the sole abnormality). Although prevalence of this condition in the general population of horses is still to be determined, horses referred for HSTE in overseas studies showed a 2 – 12% prevalence (Kannegeiter and Dore 1995; Martin, Reef et al. 2000; Dart, Dowling et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006). These results differ from ours. We observed VCC in the 18% of horses making it one of the commonly observed pathological conditions.

ADAF, has shown to have a prevalence of 5 – 55% of horses referred for HSTE (Kannegeiter and Dore 1995; Martin, Reef et al. 2000; Dart, Dowling et al. 2001; King, Tulleners et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006; Desmaizieres, Serraud et al. 2009). Horses with ADAF frequently have other associated dynamic abnormalities of the URT (Tan, Dowling et al. 2005; Lane, Bladon et al. 2006), but ADAF may occur as the sole abnormality (Kannegeiter and Dore 1995; King, Tulleners et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006). In our study, ADAF was identified in 40% of the horses, making it one of the most frequently seen abnormalities. This was in contrast to findings in other similar studies by Dart et al (2001), who found ADAF in 27% of their study population and Lane et al (2006), and Franklin (2008) who each found ADAF in 24% of their study population. (Dart, Dowling et al. 2001); (Lane, Bladon et al. 2006); (Franklin 2008). Our findings were similar to findings of another study where ADAF was seen in 37% of horses (King, Tulleners et al. 2001). We found ADAF to be the sole abnormality in only 1 horse (2%) and to be associated with other conditions in 38% of the horses.

PC has been observed during dynamic endoscopy examinations to be a cause of respiratory noise and/or exercise intolerance in performance horses and racehorses (Strand and Staempfli 1993; Kannegeiter and Dore 1995; Martin, Reef et al. 2000; Boyle, Martin et al. 2006). Other studies have found PC to occur with considerably less frequency than other dynamic abnormalities of the URT reporting a prevalence of 1.3 – 8% in racehorses examined because of respiratory noise and/or poor performance (Morris and Seeherman 1991; Kannegeiter and Dore 1995; Dart, Dowling et al. 2001; Tan, Dowling et al. 2005; Lane, Bladon et al. 2006). Results from our investigation revealed 7 horses (14%) with PC, a prevalence close to that found in a study performed by Franklin et al (2006), who found an incidence of 18%

(Franklin, Naylor et al. 2006). Interestingly, 27% prevalence was reported in a study of Standardbred horses that were examined because of abnormal respiratory noise or poor performance (Martin, Reef et al. 2000). The authors stated that this high percentage may have been due to the enforced neck flexion caused by the harness, a finding similar to that of other studies that showed that PC occurs more frequently in sport horses who perform with the neck flexed than in racehorses (Davidson, Martin et al. 2002; Franklin, Naylor et al. 2006).

Three horses with LCPC, representing 6% of the horses evaluated, were detected in our study population. This percentage is similar to that found in another similar study, where the condition was detected in 4.9% (15/309) of horses examined because of respiratory noise and/or poor performance during exercise (Dart, Dowling et al. 2005).

The prevalence of the IEE has been reported to be 0.1 – 2% (Raphel 1982; Sweeney, Maxson et al. 1991; Brown, Hinchcliff et al. 2005) in a random population of horses examined at sales or after racing, but IEE may become apparent only during strenuous exercise (Morris and Seeherman 1991; Kannegeiter and Dore 1995). No cases of IEE were observed in our study; this may be due to the small number of horses in this study.

In summary the prevalence of upper airway disorders in our study population was similar to that in other populations of horses with respiratory noise and/or poor performance, consistent with our hypothesis.

This study was limited to the evaluation of 52 horses, and therefore, the descriptive study only reflects a sample of Thoroughbred racehorses with poor performance and/or respiratory noise rather than the whole population of Thoroughbred horses in the country. Horses presented for DOE may be more valuable horses or horses with more severe disease, and therefore, this sample may not reflect the Thoroughbred horse population in South Africa as a whole.The distance run and speed attained were variable for each horse as this was affected by the trainer and jockey. Horses that ran short distances or attained low speeds may not have developed any detectable conditions or the actual performance-limiting condition that may have occurred during actual training or racing.

3 Chapter 3: Intra- and inter-observer variability of grading systems in the assessment of dynamic upper respiratory tract abnormalities in horses presented because of poor performance and/or respiratory noise

3.1 Aims of the study

To evaluate the intra- and inter-observer variability of the assessment of the following abnormalities of the URT when performing DOE:

a) Recurrent laryngeal neuropathy

b) Axial deviation of the aryepiglottic folds, left (L) and right (R) sides and

c) Vocal cord collapse, left (L) and right (R) sides.

We hypothesised that there would be substantial agreement between the grading scores given by a single observer on two different occasions and between the grading scores given by multiple examiners for all three abnormalities described above.

3.2 Materials and methods

The study was designed as a retrospective study, evaluating a total of 52 patient records from the equine section of the OVAH on Thoroughbred Racehorses, aged 2 – 9 years old (mean 3.6) in training at different racetracks in South Africa. These horses had undergone DOE examination for investigation of poor performance and/or respiratory noise between December 2011 and August 2012.

3.2.1 Study design & setting

3.2.1.1 Randomisation of the recordings

The DOE examination recordings were randomized to allow blinded viewing by the investigators. All 52 endoscopic recordings were assigned a number based on alphabetical order of horse names. Each recording was then assigned two numbers by random number generation using Microsoft Excel®[8] software. Each recording was re-saved under each of these random numbers in two separate electronic folders (folder 1 and folder 2). These random numbers determined the order in which the recordings were viewed by the investigators.

3.2.1.2 Evaluation of dynamic grading systems

3.2.1.2.1 Intra-observer evaluation

All the recordings from folder 1 were viewed in numerical order by two of the investigators (investigator 1 and investigator 2) simultaneously, on separate lap-top computers. Investigators were in the same room but were not allowed to confer. A description of the grading systems was provided (see Appendix 6). Each recording was watched in real-time (RT) then in slow motion (SM) (0.5 x real-time speed), and data were recorded on a scoring sheet (see Appendix 7) after each viewing. The two investigators were then allowed to watch any chosen part of the recording at frame-by-frame (FF) speed for 2 minutes, after which they completed a third scoring sheet. Investigators were not allowed to alter scoring sheets after a recording was viewed.

Each investigator scored ADAF based on the published grading system for this condition (King, Tulleners et al. 2001) (see Appendix 6). Laryngeal (arytenoid) function was scored using a modification of a previously published grading system (Rakestraw et.al.1991). In this modified grading system, we proposed an intermediate category between grades B and C, where abduction was less than the resting position, but the arytenoid does not collapse into the contralateral half of the rima glottidis. In this proposed grading system such function was classified as a grade C1 and function previously classified as grade C was classified as grade C2. In addition, the VCC was scored by using a new, proposed grading system (see Appendix 6).

[8] Microsoft Excel ®, USA

3.2.1.2.2 Inter-observer evaluation

All the recordings were watched by four investigators, who had variable degrees of expertise (one equine intern in medicine and surgery, one equine medicine specialist and two equine surgeons). Years of expertise in evaluating dynamic equine URT endoscopy among the investigators ranged from 0 to 21 years (0, 14, 9, and 21 years). Recordings from folder 2 were watched in numerical order, and scoring sheets were completed as described for the intra-observer evaluation (RT, SM and FF).

3.3 Data analyses

3.3.1 Intra-observer analyses

Intra-observer variability was analysed for both investigator 1 and investigator 2 for RT, SM and FF speeds. The observations of investigator 1 and investigator 2 made by watching the RT recording in the first viewing session were compared to the observations of investigator 1 and investigator 2 respectively made by watching the RT recording in the second viewing session, for laryngeal (arytenoid) function, ADAF and VCC. A second, similar analysis was done by comparing the observations of investigator 1 and investigator 2 made by watching the recording at SM speed with the observations of investigator 1 and investigator 2 respectively made by watching the RT recording in the second viewing session, for laryngeal (arytenoid) function, ADAF and VCC. A third, similar analysis was done by comparing the observations of investigator 1 and investigator 2 made by watching the recording at FF speed with the observations of investigator 1 and investigator 2 respectively made by watching the RT recording in the second viewing session, for laryngeal (arytenoid) function, ADAF and VCC. The three comparisons were done using Scott’s Pi statistic.

3.3.2 Inter-observer analyses

To assess inter-observer variability, the observations of all four investigators were compared with the other investigators (investigator 1 VS. investigator 2 VS. investigator 3 VS. investigator 4) for each condition at each of the three viewing speeds. The three comparisons were done using the Fleiss's Kappa statistic.

For the intra-observer evaluation, all 52 recordings were watched and assessed, but for the inter-observer evaluation the recordings of only half of the horses were watched in RT and at SM speeds. The inter-observer evaluation at FF speed was done for all the 52 horses.

3.3.3 Agreement statistics

Agreement was calculated by kappa statistics using Microsoft Excel © software charts.

The kappa statistic (or kappa coefficient) is the most commonly used statistic for studies that involve some degree of subjective interpretations by observers. The statistic calculates the degree of agreement in classification over that which would be expected by chance and is scored as a number between 0 and 1. A kappa of 1 indicates perfect agreement, whereas a kappa of 0 indicates agreement equivalent to chance (Viera and Garrett 2005). A description is showed in Table 21.

Table 21. Interpretation of Kappa. Modified from Viera et al. (2005)

Interpretation of Kappa

	Poor	Slight	Fair	Moderate	Substantial	Almost perfect
Kappa	0.0	0.20	0.40	0.60	0.80	1.0

Kappa	Agreement
< 0	Less than chance agreement
0.01 – 0.20	Slight agreement
0.21 – 0.40	Fair agreement
0.41 – 0.60	Moderate agreement
0.61 – 0.80	Substantial agreement
0.81 – 0.99	Almost perfect agreement

Two different types of agreement statistics were used for the intra-observer reviews and for the inter-observer reviews. Scott's pi was used to analyze the intra-observer variability. It is a statistic for measuring inter-rater reliability for nominal data from two observers (Scott 1955). Scott's pi provides a measure of the observed agreement allowing for the extent of agreement that might be expected by chance. Fleiss' kappa is an extension of Scott's pi statistic (Fleiss 1971) and was used to assess the inter-observer variability. It is a statistic for measuring inter-rater reliability for nominal data from multiple observers.

3.4 Results

3.4.1 Intra-observer results

For laryngeal function (RLN), substantial agreement was observed by observer 1 on all 3 speeds, with kappa values ranging 70 – 74. Observer 2 had similar agreement values for that condition (*K* = 80), as shown in Table 22.

Both observers had fair agreement for ADAF (L) for the RT speed evaluation (*K* = 36 - 40). Observer 1 had moderate agreement on the SM speed evaluation (*K* = 42) and fair agreement on the FF speed evaluation (*K* = 37), whereas observer 2 had fair agreement on the SM (*K* = 37) and FF (*K* = 40) speed evaluations. For the ADAF (R), observer 1 had moderate agreement on all three speed evaluations (*K* = 49 - 56), and observer 2 had fair agreement on all three speeds evaluations (*K* = 34 - 39).

Both observers showed moderate agreement for VCC (L) on the RT speed evaluation (*K* = 54 - 58). Observer 1 had moderate agreement on the SM speed evaluation (*K* = 60) and substantial agreement on the FF speed evaluation (*K* = 63), whereas observer 2 had substantial agreement for SM speed evaluation (*K* = 61) and moderate agreement (*K* = 53) for the FF speed evaluation. Moderate agreement was achieved for VCC (R) by both observers at the RT speed evaluation (*K* = 57 – 60), and substantial agreement was achieved by both investigators on the SM and FF speed evaluations (*K* = 61 – 65), as shown in Table 22.

Table 22. Kappa agreement results for all conditions – Intra-observer evaluations.

TYPE	OBSERVER	SPEED	WHAT	K	Agreement
INTRA	1	RT	RLN	70	Substantial
			ADAF L	40	Fair
			ADAF R	56	Moderate
			VCC L	58	Moderate
			VCC R	57	Moderate

OBSERVER	OBSERVER	SPEED	WHAT	K	Agreement
INTRA	2	RT	RLN	80	Substantial
			ADAF L	36	Fair
			ADAF R	34	Fair
			VCC L	54	Moderate
			VCC R	60	Moderate

TYPE	OBSERVER	SPEED	WHAT	K	Agreement
INTRA	1	SM	RLN	73	Substantial
			ADAF L	42	Moderate
			ADAF R	49	Moderate
			VCC L	60	Moderate
			VCC R	65	Substantial

TYPE	OBSERVER	SPEED	WHAT	K	Agreement
INTRA	2	SM	RLN	80	Substantial
			ADAF L	40	Fair
			ADAF R	39	Fair
			VCC L	61	Substantial
			VCC R	61	Substantial

TYPE	OBSERVER	SPEED	WHAT	K	Agreement
INTRA	1	FF	RLN	74	Substantial
			ADAF L	37	Fair
			ADAF R	52	Moderate
			VCC L	63	Substantial
			VCC R	62	Substantial

TYPE	OBSERVER	SPEED	WHAT	K	Agreement
INTRA	2	FF	RLN	80	Substantial
			ADAF L	37	Fair
			ADAF R	36	Fair
			VCC L	53	Moderate
			VCC R	61	Substantial

3.4.2 Inter-observer results

Substantial inter-observer agreement was shown for RLN at the RT and FF speed evaluations (*K* = 61 - 62). This was the highest value shown for inter-observer variability. Moderate agreement was shown for the SM speed evaluation (*K* = 58), as shown in Table 23.

Inter-observer agreement for identification of ADAF (R) at all three speed evaluations was slight (*K* = 6 – 14). Inter-observer agreement for identification of ADAF (L) for the RT and SM evaluations was slight (*K* = 6 – 8) and fair for the FF evaluation (*K* = 22).

Inter-observer agreement for identification of VCC (L) was moderate for the RT and FF speed evaluations (*K* = 47) and fair for the SM evaluation (*K* = 40), whereas inter-observer agreement for identification of VCC (R) was substantial for the RT speed evaluation (*K* = 62) and moderate at the SM and FF evaluations (*K* = 54), as shown in Table 23.

Table 23. Kappa agreement results for all conditions – Inter observer evaluations.

TYPE	CLINICIAN	SPEED	WHAT	K	Agreement
INTER	ALL	RT	RLN	61	Substantial
			ADAF L	6	Slight
			ADAF R	6	Slight
			VCC L	47	Moderate
			VCC R	62	Substantial

TYPE	CLINICIAN	SPEED	WHAT	K	Agreement
INTER	ALL	SM	RLN	58	Moderate
			ADAF L	8	Slight
			ADAF R	9	Slight
			VCC L	40	Fair
			VCC R	54	Moderate

TYPE	CLINICIAN	SPEED	WHAT	K	Agreement
INTER	ALL	FF	RLN	62	Substantial
			ADAF L	22	Fair
			ADAF R	14	Slight
			VCC L	47	Moderate
			VCC R	54	Moderate

3.4.2.1 Inter-observer evaluation for RLN

The inter-observer evaluations for the 52 horses at the FF speed evaluation identified 24 to 38 horses presenting grade A laryngeal function (46 - 73%, mean 59%).

Five to 9 horses were identified as suffering from grade B RLN (10 – 17%, mean 13%); 10 to 13 identified as suffering from grade C1 RLN (19 – 25%, mean 22%); and 2 to 6 horses were identified as suffering from grade C2 RLN (4 – 11%, mean 7%). Either C1 or C2 RLN was observed in 12 to 19 horses (23 – 36%, mean 29%), and either B or C1 RLN was observed in 10 to 25 horses (19-48%, mean 34 %).

Table 24. Inter-observer RLN evaluation at FF speed.

Observers	A	B	C1	C2
Observer 1	24	9	13	6
Observer 2	30	10	10	2
Observer 3	31	7	11	3
Observer 4	**28**	**5**	**13**	**6**

3.5 Discussion

Three analyses were performed for each video. The first and second analyses allowed assessment of agreement within observers when exactly the same footage was viewed. The third analysis allowed assessment of agreement within observers when a choice was given to the observers as to which bit of a recording to watch, a situation more akin to the clinical situation.

The study results showed different degrees of agreement for each abnormality rejecting the hypothesis that substantial agreement would be obtained after the evaluation of all three abnormalities within and between observers.

Evaluations at the FF speed for the intra-observer assessments showed substantial agreement between observers 1 and 2 for identification of RLN. Evaluations at the FF speed for the inter-observer assessments also showed substantial agreement among all observers for identification of RLN.

Intra-observer Identification of VCC L by observer 2 had a moderate agreement, but identification of VCC R and VCC (L & R) by observer 1 achieved substantial agreements, whereas inter-observer evaluations for the same conditions showed only moderate agreement.

ADAF (L &/or R) was the abnormality with least intra- and inter-observer agreement, clearly showing that this abnormality was the most difficult to assess.

Studies looking at reliability of ECG evaluations in human beings, (Weston, Bett et al. 1976; Holmvang, Hasbak et al. 1998; Massel 2003) and another study looking at reliability of laryngeal function in horses (Hackett, Ducharme et al. 1991) also found that intra-observer agreement was greater than inter-observer agreement. This difference in reliability could be due to the number of observers assessing the evaluations. It has been shown that the more observers, the more different are the assessments. Several studies reported that the inter-observer assessment results are influenced by the level of expertise of the observers (Gillespie, Brett et al. 1996; Massel 2003; Eslava, Dhillon et al. 2009).

RLN was the easiest abnormality to assess. This may be because the arytenoid cartilages are larger than the aryepiglottic folds and the vocal cords, making their function easier to evaluate. Furthermore, the laryngeal (arytenoid) dysfunction was manifested at a slower speed, making this abnormality easier to assess.

Aryepiglottic folds are located abaxial to the epiglottis. The fast speed of the aryepiglottic folds towards the midline of the larynx may have contributed to the difficulty of the assessment, leading to less agreement among evaluators in identification of ADAF.

Agreement among intra- and inter-observer evaluations for identification and quantification of VCC was greater than that for identification and quantification of ADAF. This could be related to the fact that the VCC grading system has only two categories of severity (i.e., mild and severe), whereas the grading system for ADAF has three categories of severity (i.e., mild, moderate and severe) making the evaluation of ADAF more complex.

The intra- and inter-observer agreements of assessments of all the abnormalities had similar strength of agreement regardless of the speed at which the videos were watched. Intra- and inter-observer agreements of assessments of RLN and VCC were stronger than those for ADAF at all speeds and for all assessments.

Strong intra-observer agreement on two blinded evaluations of the same horse shows the observer to have a strong consistency on the diagnosis of a certain condition. This is an important fact while performing regular URT dynamic evaluation of horses, or following an individual case over time.
A high degree of agreement among observers on blinded evaluations indicates a shared concept on the classification and diagnosis of a certain abnormality, whereas a low degree of agreement between observes indicates difficulties while discussing approaching, treatment options and prognosis for certain abnormalities.

Grading systems are useful to clinicians and researchers because they provide a detailed method of categorizing URT function for certain abnormalities (Hackett, Ducharme et al. 1991Hackett, Ducharme et al. 1991).

For this study, the RLN function was scored using a modification of the previously published grading system. We introduced an intermediate category between grades B and C. Using this new category, abduction of the arytenoid cartilage to a position less than the resting position but where the cartilage did not collapse into the contralateral half of the *rima glottidis* was classified as a grade C1, and function previously classified as grade C was classified as grade C2. In this study, the new C1 grade, rather than grades B and C2 (previously grade C), was observed in most of the horses suffering from RLN. It was found to be useful to add an extra category for assessment of this condition. This new grade could be helpful in the accuracy of the assessment of the condition and in evaluating its progression or after treatment, although it may not be helpful in determining treatment.

The grading system for VCC reported in this study appears to be the first grading system reported for this laryngeal abnormality. Using our grading system, we found relatively strong agreements among intra- and inter-observer assessments, showing that this system may be a useful tool when evaluating DOE.

In the present study, the ADAF grading system was found to be not useful; at all speeds, the intra-observer evaluations of this condition showed only fair to slight agreement, and the inter-observer evaluations showed only slight agreement.

It is important to consider that the grading evaluations were performed by four investigators who varied in education and expertise, and this variation may have affected the assessment and final results of assessment of the dynamic abnormalities.

A limitation of this study was the relatively low number horses (52) that were evaluated. This low number of horses resulted in a low number of horses with each condition to grade.

Another limitation was the inter-observer grading evaluations for RT and SM speeds. Unfortunately, due to a misunderstanding between investigators both speed reviews were done in only 50% of the total number of horses, and only the FF speed evaluation was performed in all 52 horses. Not being able to use the same amount of horses to perform the evaluations may have altered the final results. A bigger sample to evaluate may have produced slightly different K values for some RT or SM video reviewing.

4 CHAPTER 4: RESULTS AND GENERAL CONCLUSIONS

4.1 Results

The main abnormalities detected included DDSP (13/52 horses, 25%), present as a sole entity in 8 horses and associated with other abnormalities in the other 5; RLN (17/52 horses, 35%) grade B in 9 horses and grade C in 8; ADAF (21/52 horses, 40%); and VCC (18/52 horses, 35%). The presence of ADAF and VCC together was detected in 12 horses (23%). Other abnormalities detected included PI (4/52 horses, 8%), LCPC (3/52 horses, 6%) and PC (7/52 horses, 13%).

A total of 40 horses had one or more pathological condition (77%). Fifteen horses (29%) had a single abnormality, and 25 horses (48%) had multiple abnormalities. No abnormalities were detected in 12 horses (23%). An abnormality was more likely to be observed during DOE in horses presented because of abnormal respiratory noise and/or abnormal respiratory noise with poor performance (38/52 horses, 73%) than in horses presented only because of poor performance (2/52 horses, 4%).

At FF speed, the results from the intra-observer evaluations showed substantial agreement for RLN by both observers (K = 74 and 80). For VCC the values indicated moderate to substantial agreement (K = 53 and 63). ADAF was the most difficult URT abnormality to assess for both observers, indicating a fair to moderate agreement (K = 36 and 52).

Results at FF speed from the inter-observer evaluations showed moderate to substantial agreement among the observers for RLN (K = 62) and moderate agreement for VCC (K = 47 – 54). Inter-observer evaluations for ADAF showed only slight to fair agreement (K = 14 – 22), giving ADAF the lowest values of agreement.

4.2 General conclusions

The results of this study show that overground endoscopy is a useful technique and provides valuable information regarding disease of the URT of South African Thoroughbred racehorses that suffer from poor performance and/or abnormal respiratory noise.

The main abnormalities detected were DDSP, RLN, ADAF, and VCC. The findings of our study are comparable to studies in other populations.

Detection of multiple abnormalities in 50% of horses suggests that dynamic endoscopy is also indicated to better evaluate horses with an obvious abnormality detected during resting endoscopy, particularly when surgical intervention is being considered.

The intra-observer evaluations showed that RLN had the higher agreement values at all speeds than did evaluations for ADAF and VCC, and that ADAF had lower agreement values at all speeds than did evaluations for VCC and RLN, making ADAF the most difficult condition to assess. A higher grade of disagreement was obtained at the inter-observer evaluations, presumably because more observers were involved in the assessment.

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APPENDICES

Appendix 1. VIDEOMED ® dynamic overground endoscopy system

Figure 1. Placement of the endoscope at the racetrack.

Figure 2. Endoscope in position prior to examination.

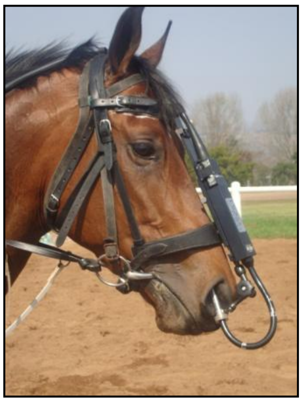

Figure 3. Dynamic overground endoscopy examination at gallop

Figure 4. Wireless console showing laryngeal function.

Figure 5. Evaluation of the recordings at the OVAH

Appendix 2. Components and instructions of use of the VIDEOMED® dynamic endoscopy system.

The different components of the Videomed ® dynamic endoscopy system are shown on the following table:

System components:	System specifications:
▪ Light source, insufflations pump and umbilicus with quick release mechanism ▪ Battery pack ▪ Laptop for recording video sequences ▪ Water bottle with sterile water ▪ Neoprene-Saddle blanket with pockets for the above components ▪ Laryngoscope with quick release mechanism and endoscope retaining arm ▪ Adjustable halter with endoscope securing system ▪ Deflecting, insufflations and video control console	• Endoscope length: 670mm • Endoscope diameter: 11.3mm • Field of view: 120° • Deflecting: 4 way - down 120°, up 90°, left\right 90° • Flush: Air\water, manual or automatic • Light source: 24w Xenon, quad light guide • Battery life: Light source and insufflation pump - 1.5hours, computer on horse – 2.5-3 hours, computer on control console – 6-8 hours • Video format: AVI

The electronic devices must be checked for normal function and communication between them before placing them in the horse. The horse is tacked up as for a normal training session (inside or outside its stall), and restrained using a nose twitch. It does not receive sedation of any kind for the dynamic endoscopy examination.

For each of the examinations performed, the DOE video set-up followed a guide of use:

The notebook computers were switched on, and a wireless network was established between them. The halter and saddle blanket were fitted as for standard equipment, and the noseband and cheek straps were adjusted. The light source was placed in the appropriate saddle blanket pocket and closed. The water bottle was filled with distilled water and attached to the light source in the saddle´s blanket pocket. The notebook was placed in the opposite saddle blanket pocket and connected with the light source by a fibre optic cable. A protective cover was placed over the laptop and light source. Finally, the endoscope was inserted into the right nostril through the ventral meatus, and its tip placed just rostral to the tip of the epiglottis for a complete overview of the larynx´s anatomy and function. After the wireless connection between the laptops was ensured and the correct endoscope position was attained, the video recording was started. The rider wore a GPS watch, which was used to establish his position during the examination and to allow measurement of speed, distance, time, and inclination during the 1000- to 1400-meter gallops.

For some of the examinations, to get a better wireless signal and communication between the laptop and the console, the investigators were able to drive a car on the satellite track following the horse at its speed. After the examinations were done, all the Videomed® components were carefully removed from the horse, thoroughly cleaned and packed away. Horses remained stalled with comfortable bedding, food, and water available. The notebook was checked to ensure that the diagnostic recording has been obtained and so that it could be reviewed later. A record stating the reason for the DOE examination, the description of the respiratory noise detected and/or suspected reason for poor racing performance, previous URT surgeries, the location of the DOE examination, and characteristics of the tack used, surface, distance, time, and incline, and any gross findings detected at the site of the examination was made for every horse.

Appendix 3. Onderstepoort Equine Clinic Overground dynamic endoscopy evaluation form.

Figure 6. OVAH overground endoscopy evaluation form (page 1):

ONDERSTEPOORT EQUINE CLINIC

University of Pretoria

OVERGROUND ENDOSCOPY EVALUATION FORM

Sticker

Horse name: ____________

Age: ____________

Breed: ____________

Sex: ____________

Colour: ____________

Date: ____________

Clinician: ____________

Owner/ Trainer: ____________

Referring vet: ____________

Horse use: ____________

Presenting complaint:

Respiratory noise	Poor performance		Other
	Stopping[1]	Fading[2]	Specify:

Description of respiratory noise:

Whistling/roaring	Rough/gurgling/rattling	Other (e.g. gasping, choking) Specify:

Previous respiratory surgery:

None	Laryngoplasty	Ventriculectomy	Laryngeal	Staphylectomy	Other
		Ventriculocordectomy	tie-forward	Llewellyn proc	Specify:

Location overground endoscopy:

Randjesfontein	Vaal	Turffontein	Kyalami
Summerveld	Ashburton	Clairwood	Arlington
Durbanville	Kenilworth	Philippi	Milnerton
Other:			

Tack:

Standard[3]	Cornell collar	Tongue tie	Nose band			Martingale	Other
			Figure 8	Flash	Drop		Specify:

Surface:

Sand	Grass	Synthetic Polytrack (Randjesfontein)	Synthetic ViscoRide (Summerveld)	Treadmill	Other Specify:

Level maximal exercise:

Trot	Canter	Gallop	Other Specify:

Distance exercised (m):

Warm up	Overground test	Total

[1] Stopping: pulling up abruptly later in work
[2] Fading over the duration of exercise
[3] Standard tack: Videomed-customised English bridle & plain cavesson noseband, loose ring snaffle bit, no additional noseband, Videomed breast plate

Figure 7. OVAH overground endoscopy evaluation form (page 2):

Time (s):

Warm up	Overground test	Total

Speed (km/h):

Warm up		Overground test	
Average:	Maximal:	Average:	Maximal:

Incline (deg):

Average:	Maximal:

Respiratory noise during overground endoscopy:

None	Whistling/roaring	Rough/gurgling/rattling	Other (e.g. gasping, choking) Specify:

Diagnosis[4]:

No abnormalities detected	Palatal instability	DDSP at speed	DDSP at pull up
RLN Grade III A	RLN Grade III B	RLN Grade III C	RLN Grade IV
Vocal cord collapse	Dynamic apex left corniculate process	Axial deviation aryepiglottic folds	Dynamic pharyngeal collapse
Intermittent epiglottic entrapment	Permanent epiglottic entrapment	Retroversion epiglottis	EIPH
Other Specify:			

Endoscopy complications:

None	Scope displaced	Pump disconnected	Haemorrhage nostril	Other Specify:

Comments:

Recommendation:

[4] Palatal instability (PI): progressive dorso-ventral billowing of the soft palate (Lane *et al.* 2006a).
Dorsal displacement of the soft palate (DDSP): movement of the caudal portion of the soft palate to a position dorsal to the epiglottis, where it remains through multiple respiratory cycles and swallows. This may occur once or repeatedly (Lane *et al.* 2006a).
Recurrent laryngeal neuropathy (RLN) *Grade III A*: full symmetrical abduction maintained throughout inspiration during maximal exercise (Rakestraw *et al.* 1991).
RLN *Grade III B*: left arytenoid cartilage not fully abducted during strenuous exercise, but no tendency to further dynamic displacement toward the midline during inspiration (Rakestraw *et al.* 1991).
RLN *Grade III C*: dynamic movement of the corniculate process of the left arytenoid cartilage toward the midline of the *rima glottidis* during inspiration, resulting in severe narrowing of the respiratory tract. This is invariably accompanied by ipsilateral vocal cord collapse (VCC), except when the cord has been removed during previous surgery (Rakestraw *et al.* 1991).
RLN *Grade IV*: complete absence of movement in the left arytenoid cartilage when the horse is at rest (Rakestraw *et al.* 1991).
Vocal cord collapse (VCC): dynamic collapse of one or both vocal folds toward the midline during inspiration (Lane *et al.* 2006a).
Dynamic collapse of the apex of the left corniculate process (LCPC): the apex of the left corniculate process displaces ventrally and axially under the abducted right corniculate process, partially obstructing the dorsal aspect of the larynx (Dart *et al.* 2005).
Axial deviation of the aryepiglottic folds (ADAF): medial displacement of the vertical margins of the aryepiglottic folds (King *et al.* 2001).
Intermittent epiglottic entrapment (IEE): temporary displacement of the sub-epiglottic mucosa over the dorsal surface of the epiglottis (Boles *et al.* 1978).
Permanent epiglottic entrapment (PEE): permanent displacement of the sub-epiglottic mucosa over the dorsal surface of the epiglottis (Boles *et al.* 1978).
Dynamic pharyngeal collapse (DPC): moderate to severe obstruction of the *rima glottidis* by the dorsal and lateral walls of the pharynx, resulting in 50–

Appendix 4. Table of data of the 52 endoscopy evaluations

N°	YR	DAY	MO	Vets Referred	Vet OP	Location	Age	Br.	Sex			Level	Surface			Distance	Max.	Resp	Poor	Resp	Resp	Resp	Poor	Poor	TOTAL	TOYAL				RLN-III	RLN-III	RLN-III						Comments
									Male	Gel	Fem	exer.	Grass	Sand	Synth	of test	Speed			Poor	SING	MULT	SING	MULT	SING	MULT	NONE	PI	DDSP	A	B	C	VCC	LCPC	ADAF	PC	IEE	
1	2011	5	12	GA EC	PP	Randjesf	4	TB			1	Gallop	1			1400		1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	
2	2011	6	12	FEC	PP	Randjesf	4	TB			1	Gallop	1			1400		1	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	
3	2011	7	12	GA EC	PP	Randjesf	5	TB			1	Gallop	1			1400		1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
4	2011	7	12	GA EC	PP	Randjesf	4	TB	1			Gallop	1			1400		0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
5	2011	8	12	GA EC	PP	Randjesf	9	TB	1			Gallop			1	1600		1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	
6	2011	8	12	GA EC	PP	Randjesf	5	TB	1			Gallop			1	1600		0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
7	2012	4	1	FEC	PP	Randjesf	5	TB			1	Gallop		1		1000		1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
8	2012	11	1	GA EC	PP	Randjesf	6	TB		1		Gallop			1	1600		1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	Previous laryngoplast
9	2012	17	1	GA EC	PP	Randjesf	4	TB	1			Gallop			1	1600		0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
10	2012	17	1	BMcV - KZN	PP CL	Summerv	4	TB	1			Gallop	1			800	61,6	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	Laringopl. Ventric
11	2012	17	1	BMcV - KZN	PP CL	Summerv	4	TB	1			Gallop	1			800		0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
12	2012	17	1	BMcV - KZN	PP CL	Clairwood	4	TB	1			Gallop		1		600		0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	
13	2012	17	1	BMcV - KZN	PP CL	Summerv	4	TB	1			Gallop		1		1000	56,9	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
14	2012	17	1	BMcV - KZN	PP CL	Summerv	5	TB	1			Gallop		1		600	59,9	0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	
15	2012	17	1	BMcV - KZN	PP CL	Summerv	3	TB			1	Gallop		1		600	56,3	0	0	1	0	1	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	
16	2012	17	1	BMcV - KZN	PP CL	Summerv	3	TB	1			Gallop		1		600	59,6	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	Use Cornell Collar
17	2012	20	1	BMcV - Cape	PP	Durbanv	4	TB	1			Gallop	1			1400	60,2	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
18	2012	20	1	BMcV - Cape	PP	Durbanv	3	TB			1	Gallop	1			1400	59,1	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	
19	2012	20	1	BMcV - Cape	PP	Durbanv	3	TB		1		Gallop	1			1400		1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	1	1	1	0	0	
20	2012	21	2	BMcV - Cape	PP	Drakenst	3	TB			1	Gallop			1	1000	50,2	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	
21	2012	21	2	BMcV - Cape	PP	Drakenst	4	TB			1	Gallop			1	1000	45,9	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	Rep Laringopl. Vent
22	2012	21	2	BMcV - Cape	PP	Drakenst	5	TB		1		Gallop			1	1000	43,4	0	0	1	0	1	0	0	0	1	0	0	1	0	1	0	1	0	0	0	0	Poor prognosis
23	2012	21	2	BMcV - Cape	PP	Drakenst	3	TB			1	Gallop			1	1000	54,6	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
24	2012	21	2	BMcV - Cape	PP	Drakenst	2	TB	1			Gallop			1	1000	45,9	1	0	0	0	1	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	Laringopl. Ventric
25	2012	23	2	BMcV - Cape	PP	Durbanv	3	TB		1		Gallop	1			1400	62,1	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	
26	2012	23	2	BMcV - Cape	PP	Durbanv	2	TB	1			Gallop	1			1000	61,5	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	Laringopl. Ventric
27	2012	28	2	GA EC	CL	Randjesf	2	TB	1			Gallop	1			1400	62	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
28	2012	29	2	GA EC	JM PP JMM	The Vaal	7	TB		1		Gallop		1		1200	61,5	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	
29	2012	29	2	GA EC	JM PP JMM	The Vaal	3	TB			1	Gallop		1		1200	58	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	
30	2012	29	2	GA EC	JM PP JMM	The Vaal	2	TB		1		Gallop		1		1200	49,8	1	0	0	0	1	0	0	0	1	0	0	1	1	0	0	0	0	0	0	0	
31	2012	13	3	GA EC	JM PP	Turffont	3	TB			1	Gallop	1			1200	64,1	1	0	0	0	1	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	
32	2012	14	3	FEC	JM PP	Randjesf	3	TB			1	Gallop	1			1400	62,4	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	
33	2012	23	3	GA EC	JM PP	Other	3	TB			1	Gallop	1			1400	63,3	1	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	
34	2012	29	3	GA EC	CL	North Rand		TB		1		Gallop	1			1200	63,9	0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	
35	2012	5	4	BMcV - Cape	AV LRM	Durbanv	5	TB	1			Gallop	1			1400		1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	
36	2012	5	4	BMcV - Cape	AV LRM	Durbanv	4	TB			1	Gallop	1			1200		1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	1	1	1	0	
37	2012	5	4	BMcV - Cape	AV LRM	Durbanv	3	TB			1	Gallop	1			800		0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
38	2012	22	5	BMcV - KZN	CL	Summerv	2	TB			1	Gallop		1		600	59,1	1	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	
39	2012	22	5	BMcV - KZN	CL	Summerv	3	TB	1			Gallop		1		1000	65,9	1	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	
40	2012	22	5	North Rand	CL	Summerv	3	TB			1	Gallop	1			1000	65,9	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	
41	2012	29	5	North Rand	PP JMM	Turffont	2	TB			1	Gallop	1			800		0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	
42	2012	31	5	BMcV - KZN	CL	Summerv	3	TB	1			Gallop	1			1000	65,5	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0	
43	2012	31	5	BMcV - KZN	CL	Summerv	3	TB	1			Gallop	1			1000	66,5	1	0	0	0	1	0	0	0	1	0	1	1	0	1	0	1	1	1	0	0	
44	2012	7	8	BMcV - Cape	PP	Durbanv	4	TB	1			Gallop	1			1200	58,5	0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	1	0	
45	2012	7	8	BMcV - Cape	PP	Durbanv	3	TB	1			Gallop	1			1200	58,6	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	
46	2012	7	8	BMcV - Cape	PP	Durbanv	3	TB			1	Gallop	1			1400	56,7	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	
47	2012	24	8	BMcV - KZN	LRM JMM	Clairwood	3	TB			1	Gallop		1		800	59,5	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	
48	2012	24	8	BMcV - KZN	LRM JMM	Summerv	3	TB	1			Gallop	1			1200	52,5	0	0	1	0	1	0	0	0	1	0	1	1	0	0	0	0	0	1	0	0	
49	2012	24	8	BMcV - KZN	LRM JMM	Summerv	3	TB	1			Gallop	1			1200	66,1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	0	1	0	0	
50	2012	24	8	BMcV - KZN	LRM JMM	Summerv	3	TB			1	Gallop	1			1200	56,7	1	0	0	0	1	0	0	0	1	0	0	0	0	1	0	1	0	1	0	0	
51	2012	31	8	Cape	PP AV	Durbanv	3	TB		1		Gallop	1			1400	45,1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	
52	2012	31	8	Cape	PP AV	Durbanv	4	TB		1		Gallop	1			1400		1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0	
							3,627	TB	22	9	21		31	12	9	1146,154	58,25	34	9	9	12	26	2	0	14	26	12	4	13	1	9	8	18	3	21	7	0	
N°	YR	DAY	MO	Vets Referred	Vet OP	Location	Age	Br.	Sex			Level	Surface			Distance	Max.	Resp	Poor	Resp	RESP	RESP	POOR	POOR	TOTAL	TOTAL				RLN-III	RLN-III	RLN-III						Comments
									Male	Gel	FEM	exer.	Grass	Sand	Synth	of test	Speed			Poor	SING	MULT	SINGL	MULT	SING	MULT	NONE	PI	DDSP	A	B	C	VCC	LCPC	ADAF	PC	IEE	

Appendix 5. Single and multiple abnormalities found on DOE examinations.

Figure 8. Normal larynx

Figure 9. Single abnormalities observed in the study

DDSP

PC

LCPC

Figure 10. Multiple abnormalities observed in the study

DDSP, VCC, LCPC

LCPC, ADAF, VCC

RLN, VCC, ADAF

Appendix 6. Scoring sheet definitions for intra- and inter-observer assessment of dynamic URT abnormalities.

TABLE 1 (Laryngeal dysfunction – RLN) (**New proposed grading system**):

DYSFUNCTION GRADE	DEFINITION
A	**Full abduction** of the arytenoids cartilages during inspiration
B	Partial abduction of the left arytenoids cartilages **(between full abduction and the resting position**).
C_1	Abduction less than resting position, but arytenoid does **not collapse into the contralateral half** of the rima glottidis during inspiration.
C_2	Abduction less than resting position, including **collapse into the contralateral half** of the rima glottidis during inspiration.

Modified from: Rakestraw et.al. (1991).

TABLE 2 (Axial deviation of aryepiglottic folds - ADAF):

DEVIATION GRADE	DEFINITION
A (MILD)	Axial collapse of both aryepiglottic folds. Each remains **abaxial** to the vocal cords.
B (MODERATE)	The aryepiglottic folds are collapsed to a point **less than halfway** between the vocal cords and the midline.
C (SEVERE)	Both aryepiglottic folds have collapsed **more than halfway** between the vocal cords and the midline.

Modified from: King et. Al. (2001).

TABLE 3 (Vocal Cord Collapse - VCC) (**New proposed grading system**):

OBSTRUCTION GRADE	DEFINITION
A (MILD)	Collapse of the vocal cords to a point **less than halfway** between normal position and the midline.
B (SEVERE)	Collapse of the vocal cords to a point **between halfway position and the midline**.

Source: New.

Appendix 7 Scoring sheet definitions for intra- and inter-observer assessment of dynamic URT abnormalities.

N°		RLN				ADAF (L)				ADAF (R)				VCC (L)			VCC (R)		
		A	B	C1	C2	No	A	B	C	No	A	B	C	No	A	B	No	A	B
1																			
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
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48																			
49																			
50																			
51																			
52																			
			0		0		0	0			0	0			0			0	
N°		RLN				ADAF (L)				ADAF (R)				VCC (L)			VCC (R)		
		A	B	C1	C2	No	A	B	C	No	A	B	C	No	A	B	No	A	B

Appendix 8. Intra and Inter-observer evaluations

Intra-observer evaluation – Observer 1 – Real time speed – RLN

DAY 1						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A
2			1			C1
3				1		C2
4		1				B
5	1					A
6			1			C1
7			1			C1
8	1					A
9		1				B
10	1					A
11	1					A
12	1					A
13	1					A
14	1					A
15	1					A
16	1					A
17			1			C1
18	1					A
19				1		C2
20	1					A
21	1					A
22	1					A
23	1					A
24	1					A
25	1					A
26	1					A
27		1				B
28	1					A
29		1				B
30					1	NE
31		1				B
32	1					A
33		1				B
34	1					A
35	1					A
36				1		C2
37	1					A
38		1				B
39	1					A
40	1					A
41	1					A
42			1			C1
43	1					A
44				1		C2
45	1					A
46			1			C1
47		1				B
48		1				B
49				1		C2
50			1			C1
51			1			C1
52	1					A

DAY 2						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
52	1					A
12			1			C1
50				1		C2
4			1			C1
25	1					A
38			1			C1
18				1		C2
1	1					A
26			1			C1
14	1					A
30		1				B
22	1					A
24	1					A
31	1					A
41	1					A
32	1					A
21			1			C1
40	1					A
13				1		C2
3	1					A
33	1					A
5	1					A
16	1					A
48	1					A
36		1				B
46	1					A
20		1				B
15	1					A
17		1				B
49		1				B
39		1				B
6	1					A
45			1			C1
23	1					A
44	1					A
35				1		C2
27	1					A
47			1			C1
43	1					A
8	1					A
11	1					A
29			1			C1
9	1					A
51				1		C2
19	1					A
37			1			C1
7			1			C1
2			1			C1
28				1		C2
34			1			C1
42			1			C1
10	1					A

Intra-observer evaluation – Observer 2 – Real time speed – RLN

DAY 1								DAY 2						
		condition:	RLN							condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION		HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A		52	1					A
2		1				B		12		1				B
3				1		C2		50				1		C2
4		1				B		4		1				B
5	1					A		25	1					A
6			1			C1		38			1			C1
7				1		C2		18				1		C2
8	1					A		1	1					A
9		1				B		26		1				B
10	1					A		14	1					A
11	1					A		30	1					A
12	1					A		22	1					A
13	1					A		24	1					A
14	1					A		31	1					A
15	1					A		41	1					A
16	1					A		32	1					A
17			1			C1		21			1			C1
18	1					A		40	1					A
19				1		C2		13			1			C1
20	1					A		3	1					A
21	1					A		33	1					A
22	1					A		5	1					A
23	1					A		16	1					A
24	1					A		48	1					A
25			1			C1		36			1			C1
26	1					A		46	1					A
27	1					A		20	1					A
28	1					A		15	1					A
29		1				B		17		1				B
30	1					A		49	1					A
31	1					A		39		1				B
32	1					A		6	1					A
33	1					A		45	1					A
34	1					A		23	1					A
35	1					A		44	1					A
36			1			C1		35			1			C1
37	1					A		27	1					A
38		1				B		47		1				B
39					1	NE		43	1					A
40	1					A		8	1					A
41	1					A		11	1					A
42			1			C1		29		1				B
43	1					A		9	1					A
44			1			C1		51			1			C1
45	1					A		19	1					A
46			1			C1		37			1			C1
47		1				B		7		1				B
48		1				B		2		1				B
49				1		C2		28			1			C1
50	1					A		34			1			C1
51			1			C1		42			1			C1
52	1					A		10	1					A

Intra-observer evaluation – Observer 1 – Real time speed – ADAF (L)

DAY 1							DAY 2						
		condition:	ADAF (L)						condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION	HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO	52	1					NO
2					1	NE	12					1	NE
3		1				A	50		1				A
4			1			B	4		1				A
5	1					NO	25	1					NO
6		1				A	38		1				A
7				1		C	18		1				A
8	1					NO	1		1				A
9		1				A	26		1				A
10	1					NO	14	1					NO
11		1				A	30		1				A
12	1					NO	22	1					NO
13				1		C	24			1			B
14		1				A	31	1					NO
15			1			B	41		1				A
16					1	NE	32		1				A
17		1				A	21		1				A
18		1				A	40	1					NO
19			1			B	13		1				A
20		1				A	3		1				A
21			1			B	33			1			B
22			1			B	5		1				A
23		1				A	16		1				A
24	1					NO	48		1				A
25		1				A	36		1				A
26	1					NO	46		1				A
27		1				A	20		1				A
28		1				A	15		1				A
29		1				A	17		1				A
30		1				A	49		1				A
31		1				A	39		1				A
32	1					NO	6		1				A
33		1				A	45		1				A
34		1				A	23		1				A
35		1				A	44		1				A
36			1			B	35		1				A
37		1				A	27		1				A
38			1			B	47			1			B
39		1				A	43		1				A
40		1				A	8		1				A
41	1					NO	11	1					NO
42			1			B	29		1				A
43		1				A	9		1				A
44			1			B	51		1				A
45	1					NO	19	1					NO
46		1				A	37		1				A
47		1				A	7		1				A
48		1				A	2		1				A
49		1				A	28		1				A
50		1				A	34		1				A
51		1				A	42					1	NE
52	1					NO	10	1					NO

Intra-observer evaluation – Observer 2 – Real time speed – ADAF (L)

DAY 1								DAY 2						
		condition:	ADAF (L)							condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION		HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO		52	1					NO
2					1	NE		12					1	NE
3			1			B		50		1				A
4		1				A		4			1			B
5		1				A		25	1					NO
6				1		C		38		1				A
7				1		C		18				1		C
8	1					NO		1	1					NO
9			1			B		26			1			B
10	1					NO		14	1					NO
11	1					NO		30		1				A
12		1				A		22	1					NO
13				1		C		24				1		C
14	1					NO		31		1				A
15	1					NO		41		1				A
16	1					NO		32	1					NO
17		1				A		21		1				A
18	1					NO		40	1					NO
19			1			B		13		1				A
20		1				A		3		1				A
21			1			B		33				1		C
22		1				A		5	1					NO
23	1					NO		16	1					NO
24		1				A		48	1					NO
25			1			B		36		1				A
26	1					NO		46		1				A
27	1					NO		20	1					NO
28			1			B		15			1			B
29		1				A		17		1				A
30	1					NO		49		1				A
31	1					NO		39		1				A
32	1					NO		6	1					NO
33			1			B		45			1			B
34					1	NE		23	1					NO
35	1					NO		44		1				A
36				1		C		35				1		C
37		1				A		27	1					NO
38		1				A		47			1			B
39					1	NE		43	1					NO
40		1				A		8		1				A
41	1					NO		11	1					NO
42		1				A		29			1			B
43	1					NO		9	1					NO
44			1			B		51			1			B
45	1					NO		19	1					NO
46			1			B		37		1				A
47		1				A		7		1				A
48		1				A		2		1				A
49				1		C		28			1			B
50		1				A		34		1				A
51			1			B		42			1			B
52	1					NO		10	1					NO

Intra-observer evaluation – Observer 1 – Real time speed – ADAF (R)

DAY 1								DAY 2						
		condition:	ADAF (R)							condition:	ADAF (R)			
ORSE I	NO	A	B	C	NE	DECISION		HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO		52	1					NO
2					1	NE		12					1	NE
3		1				A		50		1				A
4		1				A		4	1					NO
5	1					NO		25	1					NO
6		1				A		38		1				A
7			1			B		18			1			B
8	1					NO		1		1				A
9		1				A		26		1				A
10	1					NO		14	1					NO
11		1				A		30		1				A
12	1					NO		22	1					NO
13				1		C		24			1			B
14		1				A		31	1					NO
15			1			B		41		1				A
16					1	NE		32	1					NO
17	1					NO		21		1				A
18		1				A		40	1					NO
19			1			B		13		1				A
20		1				A		3		1				A
21			1			B		33			1			B
22			1			B		5		1				A
23		1				A		16		1				A
24	1					NO		48		1				A
25		1				A		36		1				A
26	1					NO		46		1				A
27	1					NO		20	1					NO
28		1				A		15		1				A
29		1				A		17		1				A
30					1	NE		49		1				A
31	1					NO		39	1					NO
32					1	NE		6		1				A
33			1			B		45			1			B
34		1				A		23		1				A
35		1				A		44		1				A
36		1				A		35		1				A
37		1				A		27		1				A
38			1			B		47			1			B
39		1				A		43		1				A
40		1				A		8		1				A
41	1					NO		11	1					NO
42		1				A		29		1				A
43		1				A		9		1				A
44			1			B		51			1			B
45	1					NO		19	1					NO
46			1			B		37		1				A
47			1			B		7			1			B
48	1					NO		2	1					NO
49			1			B		28			1			B
50		1				A		34		1				A
51		1				A		42		1				A
52	1					NO		10	1					NO

Intra-observer evaluation – Observer 2 – Real time speed – ADAF (R)

DAY 1							DAY 2						
		condition:	ADAF (R)						condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION	HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO	52	1					NO
2					1	NE	12					1	NE
3		1				A	50				1		C
4	1					NO	4		1				A
5		1				A	25	1					NO
6			1			B	38			1			B
7		1				A	18			1			B
8	1					NO	1	1					NO
9			1			B	26			1			B
10	1					NO	14	1					NO
11	1					NO	30		1				A
12		1				A	22	1					NO
13				1		C	24				1		C
14	1					NO	31	1					NO
15	1					NO	41		1				A
16	1					NO	32	1					NO
17	1					NO	21			1			B
18	1					NO	40	1					NO
19			1			B	13			1			B
20		1				A	3		1				A
21			1			B	33				1		C
22		1				A	5	1					NO
23	1					NO	16	1					NO
24		1				A	48	1					NO
25			1			B	36					1	NE
26	1					NO	46		1				A
27	1					NO	20	1					NO
28			1			B	15			1			B
29		1				A	17		1				A
30	1					NO	49		1				A
31	1					NO	39		1				A
32	1					NO	6	1					NO
33			1			B	45			1			B
34		1				A	23	1					NO
35	1					NO	44		1				A
36		1				A	35		1				A
37		1				A	27	1					NO
38		1				A	47			1			B
39					1	NE	43	1					NO
40		1				A	8		1				A
41	1					NO	11	1					NO
42			1			B	29		1				A
43	1					NO	9	1					NO
44			1			B	51			1			B
45	1					NO	19	1					NO
46			1			B	37		1				A
47		1				A	7	1					NO
48		1				A	2		1				A
49				1		C	28			1			B
50		1				A	34		1				A
51			1			B	42			1			B
52	1					NO	10	1					NO

Intra-observer evaluation – Observer 1 – Real time speed – VCC (L)

DAY 1							DAY 2					
		condition:	VCC (L)						condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION		HORSE N°	NO	A	B	NE	DECISION
1	1				NO		52	1				NO
2				1	NE		12				1	NE
3			1		B		50			1		B
4		1			A		4		1			A
5	1				NO		25	1				NO
6		1			A		38			1		B
7			1		B		18			1		B
8	1				NO		1	1				NO
9		1			A		26		1			A
10	1				NO		14		1			A
11	1				NO		30	1				NO
12	1				NO		22	1				NO
13			1		B		24			1		B
14	1				NO		31	1				NO
15	1				NO		41	1				NO
16				1	NE		32	1				NO
17		1			A		21		1			A
18	1				NO		40	1				NO
19			1		B		13			1		B
20	1				NO		3	1				NO
21				1	NE		33	1				NO
22		1			A		5	1				NO
23		1			A		16	1				NO
24	1				NO		48		1			A
25		1			A		36	1				NO
26	1				NO		46	1				NO
27	1				NO		20		1			A
28	1				NO		15	1				NO
29		1			A		17			1		B
30	1			1	NO		49	1				NO
31	1				NO		39	1				NO
32	1				NO		6	1				NO
33			1		B		45			1		B
34	1				NO		23	1				NO
35		1			A		44	1				NO
36			1		B		35			1		B
37		1			A		27		1			A
38				1	NE		47		1			A
39	1				NO		43	1				NO
40	1				NO		8	1				NO
41		1			A		11	1				NO
42		1			A		29		1			A
43	1				NO		9	1				NO
44			1		B		51			1		B
45	1				NO		19	1				NO
46			1		B		37			1		B
47		1			A		7		1			A
48		1			A		2			1		B
49		1			A		28		1			A
50			1		B		34			1		B
51	1				NO		42	1				NO
52	1				NO		10	1				NO

Intra-observer evaluation – Observer 2 – Real time speed – VCC (L)

DAY 1							DAY 2					
		condition:	VCC (L)						condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION		HORSE N°	NO	A	B	NE	DECISION
1	1				NO		52	1				NO
2				1	NE		12				1	NE
3			1		B		50			1		B
4		1			A		4			1		B
5	1				NO		25	1				NO
6	1				NO		38		1			A
7			1		B		18			1		B
8	1				NO		1	1				NO
9	1				NO		26	1				NO
10	1				NO		14	1				NO
11	1				NO		30	1				NO
12	1				NO		22	1				NO
13			1		B		24			1		B
14	1				NO		31	1				NO
15	1				NO		41	1				NO
16	1				NO		32	1				NO
17	1				NO		21		1			A
18	1				NO		40	1				NO
19			1		B		13			1		B
20	1				NO		3	1				NO
21				1	NE		33	1				NO
22	1				NO		5	1				NO
23	1				NO		16	1				NO
24	1				NO		48	1				NO
25		1			A		36			1		B
26	1				NO		46	1				NO
27	1				NO		20	1				NO
28		1			A		15	1				NO
29		1			A		17		1			A
30	1				NO		49	1				NO
31		1			A		39	1				NO
32	1				NO		6	1				NO
33			1		B		45			1		B
34	1				NO		23	1				NO
35	1				NO		44	1				NO
36			1		B		35			1		B
37		1			A		27	1				NO
38	1				NO		47		1			A
39				1	NE		43	1				NO
40	1				NO		8	1				NO
41	1				NO		11	1				NO
42		1			A		29		1			A
43	1				NO		9	1				NO
44			1		B		51			1		B
45	1				NO		19	1				NO
46			1		B		37			1		B
47			1		B		7	1				NO
48		1			A		2		1			A
49			1		B		28		1			A
50			1		B		34		1			A
51		1			A		42			1		B
52	1				NO		10	1				NO

Intra-observer evaluation – Observer 1 – Real time speed – VCC (R)

DAY 1					
		condition	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2				1	NE
3			1		B
4		1			A
5	1				NO
6		1			A
7			1		B
8	1				NO
9	1				NO
10	1				NO
11	1				NO
12	1				NO
13			1		B
14	1				NO
15	1				NO
16				1	NE
17		1			A
18	1				NO
19			1		B
20	1				NO
21				1	NE
22		1			A
23		1			A
24	1				NO
25		1			A
26	1				NO
27	1				NO
28	1				NO
29		1			A
30				1	NE
31	1				NO
32	1				NO
33			1		B
34	1				NO
35		1			A
36			1		B
37		1			A
38				1	NE
39	1				NO
40	1				NO
41	1				NO
42	1				NO
43	1				NO
44			1		B
45	1				NO
46			1		B
47		1			A
48		1			A
49		1			A
50			1		B
51	1				NO
52	1				NO

DAY 2					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
52	1				NO
12				1	NE
50			1		B
4	1				NO
25	1				NO
38		1			A
18			1		B
1	1				NO
26	1				NO
14		1			A
30	1				NO
22	1				NO
24			1		B
31	1				NO
41	1				NO
32	1				NO
21	1				NO
40	1				NO
13			1		B
3	1				NO
33	1				NO
5	1				NO
16		1			A
48	1				NO
36	1				NO
46	1				NO
20	1				NO
15	1				NO
17			1		B
49	1				NO
39	1				NO
6	1				NO
45			1		B
23	1				NO
44	1				NO
35			1		B
27		1			A
47	1				NO
43	1				NO
8	1				NO
11	1				NO
29	1				NO
9	1				NO
51			1		B
19	1				NO
37			1		B
7	1				NO
2	1				NO
28		1			A
34			1		B
42	1				NO
10	1				NO

Intra-observer evaluation – Observer 2 – Real time speed – VCC (R)

DAY 1						DAY 2					
		condition:	VCC (R)					condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION	HORSE N°	NO	A	B	NE	DECISION
1	1				NO	52	1				NO
2				1	NE	12				1	NE
3			1		B	50			1		B
4		1			A	4			1		B
5	1				NO	25	1				NO
6	1				NO	38		1			A
7			1		B	18			1		B
8	1				NO	1	1				NO
9	1				NO	26	1				NO
10	1				NO	14	1				NO
11	1				NO	30	1				NO
12	1				NO	22	1				NO
13			1		B	24			1		B
14	1				NO	31	1				NO
15	1				NO	41	1				NO
16	1				NO	32	1				NO
17	1				NO	21		1			A
18	1				NO	40	1				NO
19			1		B	13			1		B
20	1				NO	3	1				NO
21				1	NE	33	1				NO
22	1				NO	5	1				NO
23	1				NO	16	1				NO
24	1				NO	48	1				NO
25			1		B	36			1		B
26	1				NO	46	1				NO
27	1				NO	20	1				NO
28		1			A	15	1				NO
29		1			A	17		1			A
30	1				NO	49	1				NO
31		1			A	39	1				NO
32	1				NO	6	1				NO
33			1		B	45			1		B
34	1				NO	23	1				NO
35	1				NO	44	1				NO
36			1		B	35			1		B
37		1			A	27	1				NO
38	1				NO	47		1			A
39				1	NE	43	1				NO
40	1				NO	8	1				NO
41	1				NO	11	1				NO
42		1			A	29		1			A
43	1				NO	9	1				NO
44			1		B	51			1		B
45	1				NO	19	1				NO
46			1		B	37			1		B
47			1		B	7	1				NO
48		1			A	2		1			A
49			1		B	28		1			A
50			1		B	34			1		B
51		1			A	42			1		B
52	1				NO	10	1				NO

Intra-observer evaluation – Observer 1 – Slow Motion (50% speed) – RLN

DAY 1 — condition: RLN

HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A
2			1			C1
3				1		C2
4		1				B
5	1					A
6			1			C1
7				1		C2
8	1					A
9		1				B
10	1					A
11	1					A
12	1					A
13	1					A
14	1					A
15	1					A
16	1					A
17			1			C1
18	1					A
19				1		C2
20	1					A
21	1					A
22	1					A
23	1					A
24	1					A
25	1					A
26	1					A
27		1				B
28	1					A
29		1				B
30					1	NE
31		1				B
32	1					A
33		1				B
34	1					A
35	1					A
36				1		C2
37		1				B
38			1			C1
39	1					A
40	1					A
41	1					A
42			1			C1
43	1					A
44				1		C2
45	1					A
46			1			C1
47		1				B
48		1				B
49				1		C2
50			1			C1
51			1			C1
52	1					A

DAY 2 — condition: RLN

HORSE N°	A	B	C1	C2	NE	DECISION
52	1					A
12			1			C1
50				1		C2
4			1			C1
25	1					A
38			1			C1
18				1		C2
1	1					A
26			1			C1
14	1					A
30		1				B
22	1					A
24	1					A
31	1					A
41		1				A
32	1					A
21			1			C1
40	1					A
13			1			C2
3	1					A
33		1				A
5	1					A
16	1					A
48	1					A
36			1			B
46	1					A
20		1				B
15	1					A
17		1				B
49		1				B
39		1				B
6	1					A
45			1			C1
23	1					A
44	1					A
35				1		C2
27		1				A
47			1			C1
43	1					A
8	1					A
11	1					A
29			1			C1
9	1					A
51				1		C2
19	1					A
37			1			C1
7			1			C1
2			1			C1
28				1		C2
34			1			C1
42			1			C1
10	1					A

Intra-observer evaluation – Observer 2 – Slow Motion (50% speed) – RLN

DAY 1						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A
2			1			C1
3				1		C2
4		1				B
5	1					A
6			1			C1
7				1		C2
8	1					A
9		1				B
10	1					A
11	1					A
12	1					A
13	1					A
14	1					A
15	1					A
16	1					A
17			1			C1
18	1					A
19				1		C2
20	1					A
21	1					A
22	1					A
23	1					A
24	1					A
25			1			C1
26	1					A
27		1				B
28	1					A
29		1				B
30	1					A
31	1					A
32	1					A
33	1					A
34	1					A
35	1					A
36			1			C1
37	1					A
38		1				B
39	1				1	A
40	1					A
41	1					A
42			1			C1
43	1					A
44			1			C1
45	1					A
46			1			C1
47		1				B
48		1				B
49				1		C2
50	1					A
51			1			C1
52	1					A

DAY 2						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
52	1					A
12		1				B
50				1		C2
4		1				B
25	1					A
38			1			C1
18				1		C2
1	1					A
26		1				B
14	1					A
30	1					A
22	1					A
24	1					A
31	1					A
41	1					A
32	1					A
21			1			C1
40	1					A
13			1			C1
3	1					A
33	1					A
5	1					A
16	1					A
48	1					A
36			1			C1
46	1					A
20		1				B
15	1					A
17		1				B
49	1					A
39		1				B
6	1					A
45	1					A
23	1					A
44	1					A
35			1			C1
27	1					A
47		1				B
43	1					A
8	1					A
11	1					A
29		1				B
9	1					A
51			1			C1
19	1					A
37			1			C1
7		1				B
2		1				B
28			1			C1
34			1			C1
42			1			C1
10	1					A

Intra-observer evaluation – Observer 1 – Slow Motion (50% speed) – ADAF (L)

DAY 1						
		condition	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO
2					1	NE
3		1				A
4			1			B
5		1				A
6		1				A
7				1		C
8	1					NO
9		1				A
10	1					NO
11		1				A
12	1					NO
13				1		C
14		1				A
15			1			B
16	1				1	NO
17		1				A
18		1				A
19			1			B
20		1				A
21			1			B
22			1			B
23		1				A
24	1					NO
25		1				A
26	1					NO
27		1				A
28		1				A
29		1				A
30		1				A
31		1				A
32		1				A
33		1				A
34		1				A
35		1				A
36		1				A
37		1				A
38			1			B
39		1				A
40		1				A
41	1					NO
42			1			B
43		1				A
44		1				A
45	1					NO
46		1				A
47		1				A
48		1				A
49		1				A
50		1				A
51		1				A
52	1					NO

DAY 2						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
52	1					NO
12					1	NE
50		1				A
4		1				A
25	1					NO
38		1				A
18		1				A
1		1				A
26		1				A
14	1					NO
30		1				A
22	1					NO
24			1			B
31	1					NO
41		1				A
32	1					NO
21		1				A
40	1					NO
13		1				A
3		1				A
33			1			B
5		1				A
16		1				A
48		1				A
36		1				A
46		1				A
20		1				A
15		1				A
17		1				A
49		1				A
39	1					NO
6		1				A
45		1				A
23		1				A
44		1				A
35		1				A
27		1				A
47			1			B
43		1				A
8		1				A
11	1					NO
29		1				A
9		1				A
51		1				A
19	1					NO
37		1				A
7		1				A
2		1				A
28		1				A
34		1				A
42		1				A
10		1				A

Intra-observer evaluation – Observer 2 – Slow Motion (50% speed) – ADAF (L)

DAY 1						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
1		1				A
2					1	NE
3		1				A
4		1				A
5		1				A
6			1			B
7				1		C
8	1					NO
9			1			B
10	1					NO
11		1				A
12		1				A
13				1		C
14	1					NO
15	1					NO
16	1					NO
17		1				A
18	1					NO
19				1		C
20		1				A
21			1			B
22		1				A
23	1					NO
24		1				A
25			1			B
26	1					NO
27	1					NO
28			1			B
29		1				A
30	1					NO
31	1					NO
32	1					NO
33			1			B
34					1	NE
35	1					NO
36			1			B
37		1				A
38			1			B
39		1			1	A
40		1				A
41	1					NO
42		1				A
43		1				A
44			1			B
45	1					NO
46			1			B
47		1				A
48		1				A
49				1		C
50		1				A
51			1			B
52	1					NO

DAY 2						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
52	1					NO
12					1	NE
50		1				A
4		1				A
25		1				A
38			1			B
18			1			B
1	1					NO
26			1			B
14	1					NO
30		1				A
22	1					NO
24				1		C
31		1				A
41		1				A
32		1				A
21		1				A
40	1					NO
13		1				A
3		1				A
33				1		C
5	1					NO
16		1				A
48	1					NO
36			1			B
46		1				A
20	1					NO
15			1			B
17		1				A
49		1				A
39		1				A
6	1					NO
45			1			B
23		1				A
44		1				A
35				1		C
27		1				A
47			1			B
43	1					NO
8		1				A
11	1					NO
29			1			B
9	1					NO
51			1			B
19	1					NO
37		1				A
7		1				A
2		1				A
28			1			B
34		1				A
42			1			B
10	1					NO

Intra-observer evaluation – Observer 1 – Slow Motion (50% speed) – ADAF (R)

DAY 1								DAY 2						
		condition	ADAF (R)							condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION		HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO		52	1					NO
2					1	NE		12					1	NE
3		1				A		50		1				A
4		1				A		4	1					NO
5		1				A		25	1					NO
6		1				A		38		1				A
7			1			B		18			1			B
8	1					NO		1		1				A
9		1				A		26		1				A
10	1					NO		14	1					NO
11		1				A		30		1				A
12	1					NO		22	1					NO
13				1		C		24			1			B
14		1				A		31	1					NO
15			1			B		41		1				A
16	1				1	NO		32	1					NO
17	1					NO		21		1				A
18		1				A		40	1					NO
19			1			B		13		1				A
20		1				A		3		1				A
21			1			B		33			1			B
22			1			B		5		1				A
23		1				A		16		1				A
24	1					NO		48		1				A
25		1				A		36		1				A
26	1					NO		46		1				A
27	1					NO		20	1					NO
28		1				A		15		1				A
29		1				A		17		1				A
30					1	NE		49		1				A
31	1					NO		39	1					NO
32					1	NE		6		1				A
33			1			B		45			1			B
34		1				A		23		1				A
35		1				A		44		1				A
36		1				A		35		1				A
37		1				A		27		1				A
38			1			B		47			1			B
39		1				A		43		1				A
40		1				A		8		1				A
41	1					NO		11	1					NO
42		1				A		29		1				A
43		1				A		9		1				A
44			1			B		51			1			B
45	1					NO		19	1					NO
46			1			B		37		1				A
47				1		C		7			1			B
48	1					NO		2	1					NO
49			1			B		28			1			B
50		1				A		34		1				A
51		1				A		42		1				A
52	1					NO		10		1				A

Intra-observer evaluation – Observer 2 – Slow Motion (50% speed) – ADAF (R)

DAY 1						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
1		1				A
2					1	NE
3		1				A
4		1				A
5		1				A
6		1				A
7		1				A
8	1					NO
9			1			B
10	1					NO
11		1				A
12		1				A
13				1		C
14	1					NO
15	1					NO
16	1					NO
17	1					NO
18	1					NO
19		1				A
20		1				A
21			1			B
22		1				A
23	1					NO
24		1				A
25			1			B
26	1					NO
27		1				A
28			1			B
29		1				A
30	1					NO
31	1					NO
32	1					NO
33			1			B
34		1				A
35	1					NO
36		1				A
37		1				A
38			1			B
39		1			1	A
40		1				A
41	1					NO
42			1			B
43		1				A
44			1			B
45	1					NO
46			1			B
47		1				A
48		1				A
49				1		C
50		1				A
51			1			B
52	1					NO

DAY 2						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
52	1					NO
12					1	NE
50				1		C
4			1			B
25		1				A
38		1				A
18				1		C
1	1					NO
26			1			B
14	1					NO
30		1				A
22	1					NO
24				1		C
31	1					NO
41		1				A
32	1					NO
21			1			B
40	1					NO
13			1			B
3		1				A
33				1		C
5	1					NO
16		1				A
48		1				A
36	1				1	NO
46		1				A
20		1				A
15			1			B
17		1				A
49		1				A
39		1				A
6	1					NO
45			1			B
23	1					NO
44		1				A
35		1				A
27			1			B
47			1			B
43	1					NO
8		1				A
11	1					NO
29		1				A
9	1					NO
51			1			B
19	1					NO
37			1			B
7		1				A
2		1				A
28			1			B
34		1				A
42			1			B
10	1					NO

Intra-observer evaluation – Observer 1 – Slow Motion (50% speed) – VCC (L)

DAY 1						DAY 2					
		condition	VCC (L)					condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION	HORSE N°	NO	A	B	NE	DECISION
1	1				NO	52	1				NO
2				1	NE	12				1	NE
3			1		B	50			1		B
4		1			A	4			1		B
5	1				NO	25	1				NO
6			1		B	38			1		B
7			1		B	18			1		B
8	1				NO	1	1				NO
9		1			A	26		1			A
10		1			A	14		1			A
11		1			A	30	1				NO
12	1				NO	22	1				NO
13			1		B	24			1		B
14	1				NO	31	1				NO
15		1			A	41	1				NO
16		1		1	A	32	1				NO
17		1			A	21		1			A
18		1			A	40		1			A
19			1		B	13			1		B
20	1				NO	3	1				NO
21		1		1	A	33	1				NO
22		1			A	5	1				NO
23		1			A	16	1				NO
24	1				NO	48		1			A
25		1			A	36		1			A
26	1				NO	46	1				NO
27		1			A	20		1			A
28		1			A	15	1				NO
29			1		B	17			1		B
30	1			1	NO	49	1				NO
31		1			A	39	1				NO
32	1				NO	6	1				NO
33			1		B	45			1		B
34	1				NO	23	1				NO
35		1			A	44		1			A
36			1		B	35			1		B
37			1		B	27		1			A
38		1		1	A	47		1			A
39	1				NO	43	1				NO
40		1			A	8		1			A
41		1			A	11		1			A
42		1			A	29			1		B
43	1				NO	9	1				NO
44			1		B	51			1		B
45	1				NO	19	1				NO
46			1		B	37			1		B
47		1			A	7		1			A
48		1			A	2			1		B
49		1			A	28		1			A
50			1		B	34			1		B
51		1			A	42	1				NO
52	1				NO	10	1				NO

Intra-observer evaluation – Observer 2 – Slow Motion (50% speed) – VCC (L)

DAY 1							DAY 2					
		condition:	VCC (L)						condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION		HORSE N°	NO	A	B	NE	DECISION
1		1			A		52	1				NO
2				1	NE		12				1	NE
3			1		B		50			1		B
4		1			A		4		1			A
5	1				NO		25	1				NO
6		1			A		38		1			A
7			1		B		18			1		B
8	1				NO		1	1				NO
9	1				NO		26	1				NO
10	1				NO		14	1				NO
11	1				NO		30	1				NO
12	1				NO		22	1				NO
13			1		B		24			1		B
14	1				NO		31	1				NO
15	1				NO		41	1				NO
16	1				NO		32		1			A
17	1				NO		21		1			A
18	1				NO		40	1				NO
19			1		B		13			1		B
20	1				NO		3		1			A
21				1	NE		33	1				NO
22	1				NO		5	1				NO
23	1				NO		16	1				NO
24	1				NO		48	1				NO
25		1			A		36			1		B
26	1				NO		46		1			A
27		1			A		20		1			A
28	1				NO		15	1				NO
29		1			A		17		1			A
30	1				NO		49	1				NO
31		1			A		39	1				NO
32	1				NO		6	1				NO
33			1		B		45			1		B
34	1				NO		23	1				NO
35		1			A		44		1			A
36			1		B		35			1		B
37			1		B		27		1			A
38		1			A		47		1			A
39	1			1	NO		43	1				NO
40		1			A		8	1				NO
41	1				NO		11	1				NO
42		1			A		29		1			A
43	1				NO		9	1				NO
44			1		B		51			1		B
45	1				NO		19	1				NO
46			1		B		37			1		B
47			1		B		7	1				NO
48		1			A		2		1			A
49			1		B		28		1			A
50			1		B		34			1		B
51		1			A		42			1		B
52	1				NO		10	1				NO

Intra-observer evaluation – Observer 1 – Slow Motion (50% speed) – VCC (R)

DAY 1							DAY 2					
		condition	VCC (R)						condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION		HORSE N°	NO	A	B	NE	DECISION
1	1				NO		52	1				NO
2				1	NE		12				1	NE
3			1		B		50			1		B
4		1			A		4		1			A
5	1				NO		25	1				NO
6		1			A		38		1			A
7			1		B		18			1		B
8	1				NO		1	1				NO
9	1				NO		26		1			A
10		1			A		14		1			A
11		1			A		30	1				NO
12	1				NO		22	1				NO
13			1		B		24			1		B
14	1				NO		31	1				NO
15		1			A		41	1				NO
16	1			1	NO		32	1				NO
17		1			A		21		1			A
18		1			A		40		1			A
19			1		B		13			1		B
20	1				NO		3	1				NO
21		1		1	A		33	1				NO
22		1			A		5	1				NO
23		1			A		16		1			A
24	1				NO		48		1			A
25		1			A		36		1			A
26	1				NO		46	1				NO
27	1				NO		20	1				NO
28		1			A		15	1				NO
29			1		B		17			1		B
30				1	NE		49	1				NO
31	1				NO		39	1				NO
32	1				NO		6	1				NO
33			1		B		45			1		B
34	1				NO		23	1				NO
35		1			A		44		1			A
36			1		B		35			1		B
37			1		B		27		1			A
38		1		1	A		47	1				NO
39	1				NO		43	1				NO
40		1			A		8		1			A
41	1				NO		11	1				NO
42		1			A		29		1			A
43	1				NO		9	1				NO
44			1		B		51			1		B
45	1				NO		19	1				NO
46			1		B		37			1		B
47		1			A		7		1			A
48		1			A		2	1				NO
49		1			A		28		1			A
50			1		B		34			1		B
51		1			A		42	1				NO
52	1				NO		10	1				NO

Intra-observer evaluation – Observer 2 – Slow Motion (50% speed) – VCC (R)

DAY 1						DAY 2					
		condition:	VCC (R)					condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION	HORSE N°	NO	A	B	NE	DECISION
1		1			A	52	1				NO
2				1	NE	12				1	NE
3			1		B	50			1		B
4		1			A	4		1			A
5	1				NO	25	1				NO
6		1			A	38		1			A
7			1		B	18			1		B
8	1				NO	1	1				NO
9	1				NO	26	1				NO
10	1				NO	14	1				NO
11	1				NO	30	1				NO
12	1				NO	22	1				NO
13			1		B	24			1		B
14	1				NO	31	1				NO
15	1				NO	41	1				NO
16	1				NO	32		1			A
17	1				NO	21		1			A
18	1				NO	40	1				NO
19			1		B	13			1		B
20	1				NO	3		1			A
21				1	NE	33	1				NO
22	1				NO	5	1				NO
23	1				NO	16	1				NO
24	1				NO	48	1				NO
25			1		B	36			1		B
26	1				NO	46		1			A
27		1			A	20		1			A
28		1			A	15	1				NO
29		1			A	17		1			A
30	1				NO	49	1				NO
31		1			A	39	1				NO
32	1				NO	6	1				NO
33			1		B	45			1		B
34	1				NO	23	1				NO
35		1			A	44		1			A
36			1		B	35			1		B
37			1		B	27		1			A
38		1			A	47		1			A
39	1			1	NO	43	1				NO
40		1			A	8	1				NO
41	1				NO	11	1				NO
42		1			A	29		1			A
43	1				NO	9	1				NO
44			1		B	51			1		B
45	1				NO	19	1				NO
46			1		B	37			1		B
47			1		B	7	1				NO
48		1			A	2		1			A
49			1		B	28		1			A
50			1		B	34			1		B
51		1			A	42			1		B
52	1				NO	10	1				NO

Intra-observer evaluation – Observer 1 – Frame-by-Frame speed – RLN

DAY 1						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A
2			1			C1
3				1		C2
4			1			C1
5	1					A
6			1			C1
7				1		C2
8	1					A
9		1				B
10	1					A
11	1					A
12	1					A
13	1					A
14	1					A
15	1					A
16	1					A
17	1					A
18	1					A
19				1		C2
20	1					A
21	1					A
22	1					A
23	1					A
24	1					A
25	1					A
26	1					A
27		1				B
28	1					A
29		1				B
30					1	NE
31		1				B
32	1					A
33		1				B
34	1					A
35	1					A
36				1		C2
37		1				B
38			1			C1
39	1					A
40	1					A
41	1					A
42			1			C1
43	1					A
44				1		C2
45	1					A
46			1			C1
47		1				B
48		1				B
49				1		C2
50			1			C1
51			1			C1
52	1					A

DAY 2						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
52	1					A
12			1			C1
50				1		C2
4			1			C1
25	1					A
38			1			C1
18				1		C2
1	1					A
26			1			C1
14	1					A
30		1				B
22	1					A
24	1					A
31	1					A
41		1				B
32	1					A
21			1			C1
40	1					A
13				1		C2
3	1					A
33		1				B
5	1					A
16	1					A
48	1					A
36			1			C1
46	1					A
20		1				B
15	1					A
17		1				B
49		1				B
39		1				B
6	1					A
45			1			C1
23	1					A
44	1					A
35				1		C2
27		1				B
47			1			C1
43	1					A
8	1					A
11	1					A
29			1			C1
9	1					A
51				1		C2
19	1					A
37			1			C1
7			1			C1
2		1				B
28				1		C2
34			1			C1
42			1			C1
10	1					A

Intra-observer evaluation – Observer 2 – Frame-by-Frame speed – RLN

DAY 1								DAY 2						
		condition:	RLN							condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION		HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A		52	1					A
2			1			C1		12		1				B
3				1		C2		50				1		C2
4		1				B		4		1				B
5	1					A		25	1					A
6			1			C1		38			1			C1
7				1		C2		18				1		C2
8	1					A		1	1					A
9		1				B		26		1				B
10	1					A		14	1					A
11	1					A		30	1					A
12	1					A		22	1					A
13	1					A		24	1					A
14	1					A		31	1					A
15	1					A		41	1					A
16	1					A		32	1					A
17			1			C1		21			1			C1
18	1					A		40	1					A
19				1		C2		13			1			C1
20	1					A		3	1					A
21	1					A		33	1					A
22	1					A		5	1					A
23	1					A		16	1					A
24	1					A		48	1					A
25			1			C1		36			1			C1
26	1					A		46	1					A
27		1				B		20		1				B
28	1					A		15	1					A
29		1				B		17		1				B
30	1					A		49	1					A
31	1					A		39		1				B
32	1					A		6	1					A
33	1					A		45	1					A
34	1					A		23	1					A
35	1					A		44	1					A
36			1			C1		35			1			C1
37	1					A		27	1					A
38		1				B		47		1				B
39	1					A		43	1					A
40	1					A		8	1					A
41	1					A		11	1					A
42			1			C1		29		1				B
43	1					A		9	1					A
44			1			C1		51			1			C1
45	1					A		19	1					A
46			1			C1		37			1			C1
47		1				B		7		1				B
48		1				B		2		1				B
49				1		C2		28			1			C1
50	1					A		34			1			C1
51			1			C1		42			1			C1
52	1					A		10	1					A

Intra-observer evaluation – Observer 1 – Frame-by-Frame speed – ADAF (L)

DAY 1							DAY 2						
		condition:	ADAF (L)						condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION	HORSE N	NO	A	B	C	NE	DECISION
1	1					NO	52	1					NO
2					1	NE	12					1	NE
3		1				B	50		1				A
4		1				A	4		1				A
5		1				A	25	1					NO
6			1			B	38		1				A
7				1		C	18		1				A
8	1					NO	1		1				A
9		1				A	26		1				A
10	1					NO	14	1					NO
11		1				A	30		1				A
12		1				A	22		1				A
13				1		C	24			1			B
14		1				A	31	1					NO
15			1			B	41		1				A
16	1					NO	32	1					NO
17		1				A	21		1				A
18		1				A	40	1					NO
19			1			B	13		1				A
20		1				A	3		1				A
21			1			B	33			1			B
22			1			B	5		1				A
23		1				A	16		1				A
24	1					NO	48		1				A
25		1				A	36		1				A
26	1					NO	46		1				A
27		1				A	20		1				A
28		1				A	15		1				A
29		1				A	17		1				A
30		1				A	49		1				A
31		1				A	39	1					NO
32		1				A	6		1				A
33		1				A	45		1				A
34		1				A	23		1				A
35		1				A	44		1				A
36		1				A	35		1				A
37		1				A	27		1				A
38			1			B	47			1			B
39		1				A	43		1				A
40		1				A	8		1				A
41	1					NO	11	1					NO
42			1			B	29		1				A
43		1				A	9		1				A
44		1				A	51		1				A
45	1					NO	19	1					NO
46		1				A	37		1				A
47		1				A	7		1				A
48		1				A	2		1				A
49		1				A	28		1				A
50		1				A	34		1				A
51		1				A	42		1				A
52	1					NO	10		1				A

Intra-observer evaluation – Observer 2 – Frame-by-Frame speed – ADAF (L)

DAY 1							DAY 2						
		condition:	ADAF (L)						condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION	HORSE N°	NO	A	B	C	NE	DECISION
1		1				A	52	1					NO
2					1	NE	12					1	NE
3		1				A	50		1				A
4		1				A	4			1			B
5		1				A	25		1				A
6			1			B	38			1			B
7				1		C	18				1		C
8	1					NO	1	1					NO
9			1			B	26			1			B
10	1					NO	14	1					NO
11		1				A	30		1				A
12			1			B	22		1				A
13				1		C	24				1		C
14	1					NO	31		1				A
15	1					NO	41		1				A
16	1					NO	32		1				A
17		1				A	21		1				A
18	1					NO	40		1				A
19				1		C	13		1				A
20		1				A	3		1				A
21			1			B	33				1		C
22		1				A	5	1					NO
23		1				A	16		1				A
24		1				A	48	1					NO
25			1			B	36		1				A
26	1					NO	46		1				A
27		1				A	20		1				A
28			1			B	15			1			B
29			1			B	17		1				A
30	1					NO	49		1				A
31	1					NO	39		1				A
32		1				A	6	1					NO
33			1			B	45			1			B
34					1	NE	23	1					NO
35		1				A	44		1				A
36			1			B	35			1			B
37		1				A	27		1				A
38			1			B	47			1			B
39		1				A	43	1					NO
40		1				A	8		1				A
41	1					NO	11	1					NO
42		1				A	29			1			B
43		1				A	9	1					NO
44			1			B	51			1			B
45	1					NO	19	1					NO
46			1			B	37			1			B
47		1				A	7			1			B
48		1				A	2		1				A
49				1		C	28			1			B
50		1				A	34		1				A
51			1			B	42			1			B
52	1					NO	10	1					NO

Intra-observer evaluation – Observer 1 – Frame-by-Frame speed – ADAF (R)

DAY 1								DAY 2						
		condition:	ADAF (R)							condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION		HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO		52	1					NO
2					1	NE		12					1	NE
3		1				A		50		1				A
4		1				A		4		1				A
5		1				A		25	1					NO
6		1				A		38		1				A
7			1			B		18			1			B
8	1					NO		1		1				A
9		1				A		26		1				A
10	1					NO		14	1					NO
11		1				A		30		1				A
12			1			B		22		1				A
13				1		C		24			1			B
14		1				A		31	1					NO
15		1				A		41		1				A
16	1					NO		32	1					NO
17	1					NO		21		1				A
18		1				A		40	1					NO
19			1			B		13		1				A
20		1				A		3		1				A
21			1			B		33			1			B
22			1			B		5		1				A
23		1				A		16		1				A
24	1					NO		48		1				A
25		1				A		36		1				A
26	1					NO		46		1				A
27	1					NO		20	1					NO
28			1			B		15			1			B
29		1				A		17		1				A
30					1	NE		49		1				A
31	1					NO		39	1					NO
32		1				A		6		1				A
33			1			B		45			1			B
34		1				A		23		1				A
35		1				A		44		1				A
36		1				A		35		1				A
37		1				A		27		1				A
38			1			B		47			1			B
39		1				A		43		1				A
40		1				A		8		1				A
41	1					NO		11	1					NO
42		1				A		29			1			B
43		1				A		9		1				A
44			1			B		51			1			B
45	1					NO		19	1					NO
46			1			B		37		1				A
47				1		C		7			1			B
48	1					NO		2	1					NO
49			1			B		28			1			B
50		1				A		34		1				A
51		1				A		42		1				A
52	1					NO		10		1				A

Intra-observer evaluation – Observer 2 – Frame-by-Frame speed – ADAF (R)

DAY 1							DAY 2						
		condition:	ADAF (R)						condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION	HORSE N°	NO	A	B	C	NE	DECISION
1		1				A	52	1					NO
2					1	NE	12					1	NE
3		1				A	50				1		C
4		1				A	4			1			B
5		1				A	25		1				A
6		1				A	38		1				A
7			1			B	18			1			B
8	1					NO	1	1					NO
9			1			B	26			1			B
10	1					NO	14	1					NO
11		1				A	30		1				A
12			1			B	22		1				A
13				1		C	24				1		C
14	1					NO	31	1					NO
15	1					NO	41		1				A
16	1					NO	32		1				A
17	1					NO	21			1			B
18	1					NO	40		1				A
19			1			B	13			1			B
20		1				A	3		1				A
21			1			B	33				1		C
22		1				A	5	1					NO
23		1				A	16		1				A
24		1				A	48		1				A
25			1			B	36			1			B
26	1					NO	46		1				A
27	1					NO	20		1				A
28			1			B	15			1			B
29			1			B	17		1				A
30	1					NO	49		1				A
31	1					NO	39		1				A
32		1				A	6	1					NO
33			1			B	45			1			B
34		1				A	23		1				A
35		1				A	44		1				A
36		1				A	35		1				A
37		1				A	27			1			B
38			1			B	47			1			B
39		1				A	43	1					NO
40		1				A	8		1				A
41	1					NO	11	1					NO
42			1			B	29		1				A
43		1				A	9	1					NO
44			1			B	51			1			B
45	1					NO	19	1					NO
46			1			B	37		1				A
47		1				A	7			1			B
48		1				A	2		1				A
49				1		C	28			1			B
50		1				A	34		1				A
51			1			B	42			1			B
52	1					NO	10	1					NO

Intra-observer evaluation – Observer 1 – Frame-by-Frame speed – VCC (L)

DAY 1							DAY 2					
		condition:	VCC (L)						condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION		HORSE N°	NO	A	B	NE	DECISION
1	1				NO		52	1				NO
2				1	NE		12				1	NE
3			1		B		50			1		B
4		1			A		4			1		B
5	1				NO		25	1				NO
6			1		B		38			1		B
7			1		B		18			1		B
8	1				NO		1	1				NO
9		1			A		26		1			A
10		1			A		14		1			A
11		1			A		30	1				NO
12	1				NO		22	1				NO
13			1		B		24			1		B
14	1				NO		31	1				NO
15		1			A		41	1				NO
16		1			A		32	1				NO
17		1			A		21		1			A
18		1			A		40		1			A
19			1		B		13			1		B
20	1				NO		3	1				NO
21		1			A		33	1				NO
22		1			A		5	1				NO
23		1			A		16	1				NO
24	1				NO		48		1			A
25		1			A		36		1			A
26	1				NO		46		1			A
27		1			A		20		1			A
28		1			A		15	1				NO
29			1		B		17			1		B
30				1	NE		49	1				NO
31		1			A		39		1			A
32	1				NO		6	1				NO
33			1		B		45			1		B
34	1				NO		23	1				NO
35		1			A		44		1			A
36			1		B		35			1		B
37			1		B		27			1		B
38		1			A		47		1			A
39	1				NO		43	1				NO
40		1			A		8		1			A
41		1			A		11		1			A
42			1		B		29		1			A
43	1				NO		9	1				NO
44			1		B		51			1		B
45	1				NO		19	1				NO
46			1		B		37			1		B
47		1			A		7		1			A
48			1		B		2			1		B
49		1			A		28		1			A
50			1		B		34			1		B
51		1			A		42	1				NO
52	1				NO		10	1				NO

Intra-observer evaluation – Observer 2 – Frame-by-Frame speed – VCC (L)

DAY 1							DAY 2					
		condition:	VCC (L)						condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION		HORSE N°	NO	A	B	NE	DECISION
1		1			A		52	1				NO
2				1	NE		12				1	NE
3			1		B		50			1		B
4		1			A		4		1			A
5	1				NO		25	1				NO
6		1			A		38			1		B
7			1		B		18			1		B
8	1				NO		1	1				NO
9	1				NO		26	1				NO
10	1				NO		14	1				NO
11	1				NO		30	1				NO
12	1				NO		22	1				NO
13			1		B		24			1		B
14	1				NO		31	1				NO
15	1				NO		41	1				NO
16	1				NO		32		1			A
17	1				NO		21		1			A
18	1				NO		40	1				NO
19			1		B		13			1		B
20	1				NO		3		1			A
21				1	NE		33	1				NO
22	1				NO		5	1				NO
23	1				NO		16	1				NO
24	1				NO		48	1				NO
25		1			A		36			1		B
26	1				NO		46		1			A
27		1			A		20		1			A
28			1		B		15		1			A
29			1		B		17			1		B
30	1				NO		49	1				NO
31		1			A		39	1				NO
32	1				NO		6	1				NO
33			1		B		45			1		B
34	1				NO		23	1				NO
35		1			A		44		1			A
36		1			A		35			1		B
37			1		B		27			1		B
38		1			A		47		1			A
39	1				NO		43	1				NO
40		1			A		8	1				NO
41	1				NO		11	1				NO
42			1		B		29			1		B
43	1				NO		9	1				NO
44			1		B		51			1		B
45	1				NO		19	1				NO
46			1		B		37			1		B
47			1		B		7	1				NO
48		1			A		2			1		B
49			1		B		28		1			A
50			1		B		34		1			A
51			1		B		42			1		B
52	1				NO		10	1				NO

Intra-observer evaluation – Observer 1 – Frame-by-Frame speed – VCC (R)

DAY 1					
		condition	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2				1	NE
3			1		B
4		1			A
5	1				NO
6		1			A
7			1		B
8	1				NO
9	1				NO
10		1			A
11		1			A
12	1				NO
13			1		B
14	1				NO
15		1			A
16	1				NO
17		1			A
18		1			A
19			1		B
20	1				NO
21		1			A
22		1			A
23		1			A
24	1				NO
25		1			A
26	1				NO
27	1				NO
28		1			A
29			1		B
30				1	NE
31	1				NO
32	1				NO
33			1		B
34	1				NO
35		1			A
36			1		B
37			1		B
38		1			A
39	1				NO
40		1			A
41	1				NO
42		1			A
43	1				NO
44			1		B
45	1				NO
46			1		B
47		1			A
48		1			A
49		1			A
50			1		B
51	1				NO
52	1				NO

DAY 2					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
52	1				NO
12				1	NE
50			1		B
4			1		B
25	1				NO
38		1			A
18			1		B
1	1				NO
26		1			A
14		1			A
30	1				NO
22	1				NO
24			1		B
31	1				NO
41	1				NO
32	1				NO
21		1			A
40		1			A
13			1		B
3	1				NO
33	1				NO
5	1				NO
16		1			A
48		1			A
36		1			A
46		1			A
20	1				NO
15	1				NO
17			1		B
49	1				NO
39	1				NO
6	1				NO
45			1		B
23	1				NO
44		1			A
35			1		B
27		1			A
47	1				NO
43	1				NO
8		1			A
11	1				NO
29		1			A
9	1				NO
51			1		B
19	1				NO
37			1		B
7		1			A
2	1				NO
28		1			A
34			1		B
42	1				NO
10	1				NO

Intra-observer evaluation – Observer 2 – Frame-by-Frame speed – VCC (R)

DAY 1					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
1		1			A
2				1	NE
3			1		B
4		1			A
5	1				NO
6		1			A
7			1		B
8	1				NO
9	1				NO
10	1				NO
11	1				NO
12	1				NO
13			1		B
14	1				NO
15	1				NO
16	1				NO
17	1				NO
18	1				NO
19			1		B
20	1				NO
21				1	NE
22	1				NO
23	1				NO
24	1				NO
25			1		B
26	1				NO
27		1			A
28			1		B
29			1		B
30	1				NO
31		1			A
32	1				NO
33			1		B
34	1				NO
35		1			A
36			1		B
37			1		B
38		1			A
39	1				NO
40		1			A
41	1				NO
42			1		B
43	1				NO
44			1		B
45	1				NO
46			1		B
47			1		B
48		1			A
49			1		B
50			1		B
51			1		B
52	1				NO

DAY 2					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
52	1				NO
12				1	NE
50			1		B
4		1			A
25	1				NO
38			1		B
18			1		B
1	1				NO
26	1				NO
14	1				NO
30	1				NO
22	1				NO
24			1		B
31	1				NO
41	1				NO
32		1			A
21		1			A
40	1				NO
13			1		B
3		1			A
33	1				NO
5	1				NO
16	1				NO
48	1				NO
36			1		B
46		1			A
20		1			A
15		1			A
17			1		B
49	1				NO
39	1				NO
6	1				NO
45			1		B
23	1				NO
44		1			A
35			1		B
27			1		B
47		1			A
43	1				NO
8	1				NO
11	1				NO
29			1		B
9	1				NO
51			1		B
19	1				NO
37			1		B
7	1				NO
2			1		B
28		1			A
34			1		B
42			1		B
10	1				NO

Inter-observer evaluation – Real Time speed – RLN

OBSERVER 1		condition:	RLN			
HORSE N°	A	B	C1	C2		DECISION
25	1					A
26			1			C1
27	1					A
28				1		C2
29			1			C1
30		1				B
31	1					A
32	1					A
33	1					A
34			1			C1
35				1		C2
36		1				B
37			1			C1
38			1			C1
39		1				B
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45			1			C1
46	1					A
47			1			C1
48	1					A
49		1				B
50				1		C2
51				1		C2
52	1					A

OBSERVER 2		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
25	1					A
26		1				B
27	1					A
28			1			C1
29		1				B
30	1					A
31	1					A
32	1					A
33	1					A
34			1			C1
35			1			C1
36			1			C1
37			1			C1
38			1			C1
39		1				B
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45	1					A
46	1					A
47		1				B
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

OBSERVER 3		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
25	1					A
26		1				B
27	1					A
28			1			C1
29			1			C1
30	1					A
31	1					A
32	1					A
33	1					A
34		1				B
35			1			C1
36			1			C1
37			1			C1
38			1			C1
39	1					A
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45		1				B
46	1					A
47		1				B
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

OBSERVER 4		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
25	1					A
26			1			C1
27	1					A
28			1			C1
29			1			C1
30	1					A
31	1					A
32	1					A
33	1					A
34			1			C1
35				1		C2
36			1			C1
37			1			C1
38			1			C1
39		1				B
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45	1					A
46	1					A
47			1			C1
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

Inter-observer evaluation – Real Time speed – ADAF(L)

OBSERVER 1						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26		1				A
27		1				A
28		1				A
29		1				A
30		1				A
31	1					NO
32		1				A
33			1			B
34		1				A
35		1				A
36		1				A
37		1				A
38		1				A
39		1				A
40	1					NO
41		1				A
42					1	NE
43		1				A
44		1				A
45		1				A
46		1				A
47			1			B
48		1				A
49		1				A
50		1				A
51		1				A
52	1					NO

OBSERVER 2						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26			1			B
27	1					NO
28			1			B
29			1			B
30		1				A
31		1				A
32	1					NO
33				1		C
34		1				A
35				1		C
36		1				A
37		1				A
38		1				A
39		1				A
40	1					NO
41		1				A
42			1			B
43	1					NO
44		1				A
45			1			B
46		1				A
47			1			B
48	1					NO
49		1				A
50		1				A
51			1			B
52	1					NO

OBSERVER 3						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26		1				A
27	1					NO
28		1				A
29		1				A
30	1					NO
31	1					NO
32	1					NO
33		1				A
34	1					NO
35	1					NO
36	1					NO
37	1					NO
38		1				A
39	1					NO
40	1					NO
41	1					NO
42		1				A
43					1	NE
44	1					NO
45	1					NO
46	1					NO
47		1				A
48	1					NO
49	1					NO
50	1					NO
51		1				A
52	1					NO

OBSERVER 4						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26		1				A
27	1					NO
28	1					NO
29		1				A
30	1					NO
31	1					NO
32	1					NO
33		1				A
34	1					NO
35		1				A
36	1					NO
37	1					NO
38		1				A
39	1					NO
40	1					NO
41	1					NO
42		1				A
43	1					NO
44	1					NO
45	1					NO
46	1					NO
47		1				A
48	1					NO
49	1					NO
50			1			B
51		1				A
52	1					ON

Inter-observer evaluation – Real Time speed – ADAF(R)

OBSERVER 1						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26		1				A
27		1				A
28			1			B
29		1				A
30		1				A
31	1					NO
32	1					NO
33			1			B
34		1				A
35		1				A
36		1				A
37		1				A
38		1				A
39	1					NO
40	1					NO
41		1				A
42		1				A
43		1				A
44		1				A
45			1			B
46		1				A
47			1			B
48		1				A
49		1				A
50		1				A
51			1			B
52	1					NO

OBSERVER 2						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26			1			B
27	1					NO
28			1			B
29		1				A
30		1				A
31	1					NO
32	1					NO
33				1		C
34		1				A
35		1				A
36					1	NE
37		1				A
38			1			B
39		1				A
40	1					NO
41		1				A
42			1			B
43	1					NO
44		1				A
45			1			B
46		1				A
47			1			B
48	1					NO
49		1				A
50				1		C
51			1			B
52	1					NO

OBSERVER 3						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26	1					NO
27	1					NO
28		1				A
29	1					NO
30	1					NO
31	1					NO
32	1					NO
33		1				A
34	1					NO
35	1					NO
36					1	NE
37	1					NO
38	1					NO
39	1					NO
40	1					NO
41	1					NO
42	1					NO
43					1	NE
44	1					NO
45		1				A
46	1					NO
47	1					NO
48	1					NO
49	1					NO
50	1					NO
51		1				A
52	1					NO

OBSERVER 4						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
25		1				A
26		1				A
27	1					NO
28		1				A
29	1					NO
30		1				A
31	1					NO
32	1					NO
33		1				A
34	1					NO
35	1					NO
36	1					NO
37	1					NO
38	1					NO
39	1					NO
40	1					NO
41	1					NO
42	1					NO
43	1					NO
44	1					NO
45			1			B
46	1					NO
47		1				A
48	1					NO
49	1					NO
50	1					NO
51		1				A
52	1					NO

Inter-observer evaluation – Real Time speed – VCC (L)

OBSERVER 1					
		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26		1			A
27		1			A
28		1			A
29		1			A
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36	1				NO
37			1		B
38			1		B
39	1				NO
40	1				NO
41	1				NO
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47		1			A
48		1			A
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 2					
		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27	1				NO
28		1			A
29		1			A
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34		1			A
35			1		B
36			1		B
37			1		B
38		1			A
39	1				NO
40	1				NO
41	1				NO
42			1		B
43	1				NO
44	1				NO
45			1		B
46	1				NO
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 3					
		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27	1				NO
28	1				NO
29		1			A
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34		1			A
35			1		B
36	1				NO
37			1		B
38		1			A
39	1				NO
40	1				NO
41	1				NO
42	1				NO
43				1	NE
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51	1				NO
52	1				NO

OBSERVER 4					
		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26		1			A
27	1				NO
28	1				NO
29	1				NO
30	1				NO
31	1				NO
32		1			A
33	1				NO
34			1		B
35			1		B
36		1			A
37			1		B
38		1			A
39	1				NO
40		1			A
41		1			A
42		1			A
43	1				NO
44	1				NO
45			1		B
46	1				NO
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				

Inter-observer evaluation – Real Time speed – VCC (R)

OBSERVER 1

		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27		1			A
28		1			A
29	1				NO
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36	1				NO
37			1		B
38		1			A
39	1				NO
40	1				NO
41	1				NO
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 2

		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27	1				NO
28		1			A
29		1			A
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36			1		B
37			1		B
38		1			A
39	1				NO
40	1				NO
41	1				NO
42			1		B
43	1				NO
44	1				NO
45			1		B
46	1				NO
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 3

		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27	1				NO
28		1			A
29	1				NO
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34		1			A
35			1		B
36				1	NE
37			1		B
38	1				NO
39	1				NO
40	1				NO
41	1				NO
42	1				NO
43				1	NE
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 4

		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27		1			A
28	1				NO
29	1				NO
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36	1				NO
37			1		B
38		1			A
39	1				NO
40	1				NO
41		1			A
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

Inter-observer evaluation – Slow Motion (50% speed) – RLN

OBSERVER 1		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
25	1					A
26			1			C1
27		1				B
28				1		C2
29			1			C1
30		1				B
31	1					A
32	1					A
33		1				B
34			1			C1
35				1		C2
36			1			C1
37			1			C1
38			1			C1
39		1				B
40	1					A
41		1				B
42			1			C1
43	1					A
44	1					A
45			1			C1
46	1					A
47			1			C1
48	1					A
49		1				B
50				1		C2
51				1		C2
52	1					A

OBSERVER 2		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
25	1					A
26		1				B
27	1					A
28			1			C1
29		1				B
30	1					A
31	1					A
32	1					A
33	1					A
34			1			C1
35			1			C1
36			1			C1
37			1			C1
38			1			C1
39		1				B
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45	1					A
46	1					A
47		1				B
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

OBSERVER 3		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
25	1					A
26		1				B
27	1					A
28			1			C1
29			1			C1
30	1					A
31	1					A
32	1					A
33	1					A
34			1			C1
35			1			C1
36			1			C1
37			1			C1
38			1			C1
39	1					A
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45		1				B
46	1					A
47		1				B
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

OBSERVER 4		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
25	1					A
26			1			C1
27	1					A
28			1			C1
29			1			C1
30	1					A
31	1					A
32		1				B
33	1					A
34			1			C1
35				1		
36			1			C1
37			1			C1
38			1			C1
39		1				B
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45			1			C1
46	1					A
47		1				B
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

Inter-observer evaluation – Slow Motion (50% speed) – ADAF(L)

OBSERVER 1						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26		1				A
27		1				A
28		1				A
29		1				A
30		1				A
31	1					NO
32	1					NO
33			1			B
34		1				A
35		1				A
36		1				A
37		1				A
38		1				A
39	1					NO
40	1					NO
41		1				A
42		1				A
43		1				A
44		1				A
45		1				A
46		1				A
47			1			B
48		1				A
49		1				A
50		1				A
51		1				A
52	1					NO

OBSERVER 2						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
25		1				A
26			1			B
27		1				A
28			1			B
29			1			B
30		1				A
31		1				A
32		1				A
33				1		C
34		1				A
35				1		C
36			1			B
37		1				A
38			1			B
39		1				A
40	1					NO
41		1				A
42			1			B
43	1					NO
44		1				A
45			1			B
46		1				A
47			1			B
48	1					NO
49		1				A
50		1				A
51			1			B
52	1					NO

OBSERVER 3						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26		1				A
27		1				A
28		1				A
29		1				A
30	1					NO
31	1					NO
32	1					NO
33			1			B
34	1					NO
35	1					NO
36	1					NO
37	1					NO
38		1				A
39	1					NO
40	1					NO
41	1					NO
42		1				A
43	1					NO
44	1					NO
45	1					NO
46	1					NO
47		1				A
48	1					NO
49	1					NO
50	1					NO
51		1				A
52	1					NO

OBSERVER 4						
		condition:	ADAF (L)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26		1				A
27	1					NO
28		1				A
29		1				A
30	1					NO
31	1					NO
32	1					NO
33		1				A
34	1					NO
35	1					NO
36		1				A
37	1					NO
38		1				A
39	1					NO
40	1					NO
41	1					NO
42		1				A
43	1					NO
44	1					NO
45	1					NO
46	1					NO
47			1			B
48	1					NO
49	1					NO
50			1			B
51		1				A
52	1					NO

Inter-observer evaluation – Slow Motion (50% speed) – ADAF(R)

OBSERVER 1						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26		1				A
27		1				A
28			1			B
29		1				A
30		1				A
31	1					NO
32	1					NO
33			1			B
34		1				A
35		1				A
36		1				A
37		1				A
38		1				A
39	1					NO
40	1					NO
41		1				A
42		1				A
43		1				A
44		1				A
45			1			B
46		1				A
47			1			B
48		1				A
49		1				A
50		1				A
51			1			B
52	1					NO

OBSERVER 2						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
25		1				A
26			1			B
27			1			B
28			1			B
29		1				A
30		1				A
31	1					NO
32	1					NO
33				1		C
34		1				A
35		1				A
36	1					NO
37			1			B
38		1				A
39		1				A
40	1					NO
41		1				A
42			1			B
43	1					NO
44		1				A
45			1			B
46		1				A
47			1			B
48		1				A
49		1				A
50				1		C
51			1			B
52	1					NO

OBSERVER 3						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
25	1					NO
26	1					NO
27		1				A
28		1				A
29	1					NO
30	1					NO
31	1					NO
32	1					NO
33			1			B
34	1					NO
35	1					NO
36					1	NE
37	1					NO
38	1					NO
39	1					NO
40	1					NO
41	1					NO
42	1					NO
43	1					NO
44	1					NO
45		1				A
46	1					NO
47		1				A
48	1					NO
49	1					NO
50	1					NO
51		1				A
52	1					NO

OBSERVER 4						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
25		1				A
26		1				A
27	1					NO
28	1					NO
29	1					NO
30		1				A
31	1					NO
32	1					NO
33			1			B
34	1					NO
35	1					NO
36	1					NO
37	1					NO
38	1					NO
39	1					NO
40	1					NO
41	1					NO
42	1					NO
43	1					NO
44		1				A
45			1			B
46	1					NO
47			1			B
48	1					NO
49	1					NO
50	1					NO
51		1				A
52	1					NO

Inter-observer evaluation – Slow Motion (50% speed) – VCC (L)

OBSERVER 1		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26		1			A
27		1			A
28		1			A
29			1		B
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36		1			A
37			1		B
38			1		B
39	1				NO
40		1			A
41	1				NO
42	1				NO
43	1				NO
44		1			A
45			1		B
46	1				NO
47		1			A
48		1			A
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 2		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27		1			A
28		1			A
29		1			A
30	1				NO
31	1				NO
32		1			A
33	1				NO
34			1		B
35			1		B
36			1		B
37			1		B
38		1			A
39	1				NO
40	1				NO
41	1				NO
42			1		B
43	1				NO
44		1			A
45			1		B
46		1			A
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 3		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27	1				NO
28	1				NO
29		1			A
30	1				NO
31	1				NO
32	1				NO
33		1			A
34			1		B
35			1		B
36		1			A
37			1		B
38			1		B
39	1				NO
40	1				NO
41	1				NO
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				ON
49	1				NO
50			1		B
51	1				NO
52	1				NO

OBSERVER 4		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26		1			A
27			1		B
28		1			A
29	1				NO
30	1				NO
31	1				NO
32		1			A
33	1				NO
34			1		B
35			1		B
36		1			A
37			1		B
38			1		B
39		1			A
40		1			A
41		1			A
42		1			A
43		1			A
44	1				NO
45			1		B
46	1				NO
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

Inter-observer evaluation – Slow Motion (50% speed) – VCC (R)

OBSERVER 1					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26		1			A
27		1			A
28		1			A
29		1			A
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36		1			A
37			1		B
38		1			A
39	1				NO
40		1			A
41	1				NO
42	1				NO
43	1				NO
44		1			A
45			1		B
46	1				NO
47	1				NO
48		1			A
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 2					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27		1			A
28		1			A
29		1			A
30	1				NO
31	1				NO
32		1			A
33	1				NO
34			1		B
35			1		B
36			1		B
37			1		B
38		1			A
39	1				NO
40	1				NO
41	1				NO
42			1		B
43	1				NO
44		1			A
45			1		B
46		1			A
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 3					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27	1				NO
28		1			A
29	1				NO
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36		1			A
37			1		B
38	1				NO
39	1				NO
40	1				NO
41	1				NO
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 4					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
25	1				NO
26	1				NO
27		1			A
28		1			A
29	1				NO
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36	1				NO
37			1		B
38			1		B
39	1				NO
40	1				NO
41		1			A
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

Inter-observer evaluation – Frame-by-Frame speed – RLN

OBSERVER 1						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A
2		1				B
3	1					A
4			1			C1
5	1					A
6	1					A
7			1			C1
8	1					A
9	1					A
10	1					A
11	1					A
12			1			C1
13				1		C2
14	1					A
15	1					A
16	1					A
17		1				B
18				1		C2
19	1					A
20		1				B
21			1			C1
22	1					A
23	1					A
24	1					A
25	1					A
26			1			C1
27		1				B
28				1		C2
29			1			C1
30		1				B
31	1					A
32	1					A
33		1				B
34			1			C1
35				1		C2
36			1			C1
37			1			C1
38			1			C1
39		1				B
40	1					A
41		1				B
42			1			C1
43	1					A
44	1					A
45			1			C1
46	1					A
47			1			C1
48	1					A
49		1				B
50				1		C2
51				1		C2
52	1					A

OBSERVER 2						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A
2		1				B
3	1					A
4		1				B
5	1					A
6	1					A
7		1				B
8	1					A
9	1					A
10	1					A
11	1					A
12		1				B
13			1			C1
14	1					A
15	1					A
16	1					A
17		1				B
18				1		C2
19	1					A
20		1				B
21			1			C1
22	1					A
23	1					A
24	1					A
25	1					A
26		1				B
27	1					A
28			1			C1
29		1				B
30	1					A
31	1					A
32	1					A
33	1					A
34			1			C1
35			1			C1
36			1			C1
37			1			C1
38			1			C1
39		1				B
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45	1					A
46	1					A
47		1				B
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

OBSERVER 3						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A
2		1				B
3	1					A
4			1			C1
5	1					A
6	1					A
7		1				B
8	1					A
9	1					A
10	1					A
11	1					A
12		1				B
13			1			C1
14	1					A
15	1					A
16	1					A
17		1				B
18				1		C2
19	1					A
20	1					A
21			1			C1
22	1					A
23	1					A
24	1					A
25	1					A
26		1				B
27	1					A
28			1			C1
29			1			C1
30	1					A
31	1					A
32	1					A
33	1					A
34			1			C1
35				1		C2
36			1			C1
37			1			C1
38			1			C1
39	1					A
40	1					A
41	1					A
42			1			C1
43	1					A
44	1					A
45		1				B
46	1					A
47		1				B
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

OBSERVER 4						
		condition:	RLN			
HORSE N°	A	B	C1	C2	NE	DECISION
1	1					A
2		1				B
3		1				B
4			1			C1
5	1					A
6	1					A
7			1			C1
8	1					A
9	1					A
10	1					A
11	1					A
12			1			C1
13				1		C2
14	1					A
15	1					A
16	1					A
17		1				B
18				1		C2
19	1					A
20	1					A
21			1			C1
22	1					A
23	1					A
24	1					A
25	1					A
26			1			C1
27	1					A
28			1			C1
29			1			C1
30	1					A
31	1					A
32		1				B
33	1					A
34			1			C1
35				1		C2
36			1			C1
37			1			C1
38				1		C2
39		1				B
40	1					A
41	1					A
42				1		C2
43	1					A
44	1					A
45			1			C1
46	1					A
47			1			C1
48	1					A
49	1					A
50				1		C2
51			1			C1
52	1					A

Inter-observer evaluation – Frame-by-Frame speed – ADAF(L)

OBSERVER 1		condition: ADAF (L)				
HORSE N°	NO	A	B	C	NE	DECISION
1		1				A
2		1				A
3		1				A
4		1				A
5		1				A
6		1				A
7		1				A
8		1				A
9		1				A
10		1				A
11	1					NO
12					1	NE
13		1				A
14	1					NO
15		1				A
16		1				A
17		1				A
18		1				A
19	1					NO
20		1				A
21		1				A
22		1				A
23		1				A
24			1			B
25	1					NO
26		1				A
27		1				A
28		1				A
29		1				A
30		1				A
31	1					NO
32	1					NO
33			1			B
34		1				A
35		1				A
36		1				A
37		1				A
38		1				A
39	1					NO
40	1					NO
41		1				A
42		1				A
43		1				A
44		1				A
45		1				A
46		1				A
47			1			B
48		1				A
49		1				A
50		1				A
51		1				A
52	1					NO

OBSERVER 2		condition: ADAF (L)				
HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO
2		1				A
3		1				A
4			1			B
5	1					NO
6	1					NO
7			1			B
8		1				A
9	1					NO
10	1					NO
11	1					NO
12					1	NE
13		1				A
14	1					NO
15			1			B
16		1				A
17		1				A
18				1		C
19	1					NO
20		1				A
21		1				A
22		1				A
23	1					NO
24				1		C
25		1				A
26			1			B
27		1				A
28			1			B
29			1			B
30		1				A
31		1				A
32		1				A
33				1		C
34		1				A
35			1			B
36		1				A
37			1			B
38			1			B
39		1				A
40		1				A
41		1				A
42			1			B
43	1					NO
44		1				A
45			1			B
46		1				A
47			1			B
48	1					NO
49		1				A
50		1				A
51			1			B
52	1					NO

OBSERVER 3		condition: ADAF (L)				
HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO
2		1				A
3	1					NO
4		1				A
5	1					NO
6	1					NO
7		1				A
8	1					NO
9	1					NO
10	1					NO
11	1					NO
12					1	NE
13	1					NO
14	1					NO
15		1				A
16		1				A
17		1				A
18		1				A
19	1					NO
20		1				A
21		1				A
22		1				A
23	1					NO
24			1			B
25	1					NO
26		1				A
27		1				A
28		1				A
29		1				A
30	1					NO
31	1					NO
32	1					NO
33			1			B
34	1					NO
35	1					NO
36		1				A
37	1					NO
38		1				A
39	1					NO
40	1					NO
41	1					NO
42		1				A
43	1					NO
44	1					NO
45	1					NO
46	1					NO
47		1				A
48		1				A
49	1					NO
50	1					NO
51		1				A
52	1					NO

OBSERVER 4		condition: ADAF (L)				
HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO
2			1			B
3		1				A
4				1		C
5	1					NO
6	1					NO
7			1			B
8	1					NO
9	1					NO
10		1				A
11	1					NO
12					1	NE
13	1					NO
14	1					NO
15		1				A
16		1				A
17	1					NO
18		1				A
19	1					NO
20			1			B
21		1				A
22	1					NO
23	1					NO
24			1			B
25	1					NO
26		1				A
27	1					NO
28		1				A
29		1				A
30	1					NO
31	1					NO
32	1					NO
33			1			B
34	1					NO
35	1					NO
36		1				A
37	1					NO
38		1				A
39	1					NO
40	1					NO
41	1					NO
42		1				A
43	1					NO
44	1					NO
45	1					NO
46	1					NO
47			1			B
48	1					NO
49	1					NO
50			1			B
51		1				A
52	1					NO

Inter-observer evaluation – Frame-by-Frame speed – ADAF(R)

OBSERVER 1						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
1		1				A
2	1					NO
3		1				A
4		1				A
5		1				A
6		1				A
7			1			B
8		1				A
9		1				A
10		1				A
11	1					NO
12					1	NE
13		1				A
14	1					NO
15			1			B
16		1				A
17		1				A
18			1			B
19	1					NO
20	1					NO
21		1				A
22		1				A
23		1				A
24			1			B
25	1					NO
26		1				A
27		1				A
28			1			B
29			1			B
30		1				A
31	1					NO
32	1					NO
33			1			B
34		1				A
35		1				A
36		1				A
37		1				A
38		1				A
39	1					NO
40	1					NO
41		1				A
42		1				A
43		1				A
44		1				A
45			1			B
46		1				A
47			1			B
48		1				A
49		1				A
50		1				A
51			1			B
52	1					NO

OBSERVER 2						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO
2		1				A
3		1				A
4			1			B
5	1					NO
6	1					NO
7			1			B
8		1				A
9	1					NO
10	1					NON
11	1					NO
12					1	NE
13			1			B
14	1					NO
15			1			B
16		1				A
17		1				A
18			1			B
19	1					NO
20		1				A
21			1			B
22		1				A
23		1				A
24				1		C
25		1				A
26			1			B
27			1			B
28			1			B
29		1				A
30		1				A
31	1					NO
32		1				A
33				1		C
34		1				A
35		1				A
36			1			B
37		1				A
38		1				A
39		1				A
40		1				A
41		1				A
42			1			B
43	1					NO
44		1				A
45			1			B
46		1				A
47			1			B
48		1				A
49		1				A
50				1		C
51			1			B
52	1					NO

OBSERVER 3						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO
2	1					NO
3	1					NO
4		1				A
5	1					NO
6	1					NO
7		1				A
8	1					NO
9	1					NO
10	1					NO
11	1					NO
12					1	NE
13	1					NO
14	1					NO
15			1			B
16			1			B
17		1				A
18		1				A
19	1					NO
20	1					NO
21	1					NO
22		1				A
23	1					NO
24			1			B
25	1					NO
26		1				A
27		1				A
28		1				A
29	1					NO
30	1					NO
31	1					NO
32	1					NO
33			1			B
34	1					NO
35	1					NO
36					1	NE
37	1					NO
38	1					NO
39	1					NO
40	1					NO
41	1					NON
42	1					NO
43	1					NO
44	1					NO
45		1				A
46	1					NO
47		1				A
48	1					NO
49	1					NO
50	1					NO
51		1				A
52	1					NO

OBSERVER 4						
		condition:	ADAF (R)			
HORSE N°	NO	A	B	C	NE	DECISION
1	1					NO
2		1				A
3	1					NO
4	1					NO
5			1			B
6	1					NO
7				1		C
8		1				A
9		1				A
10		1				A
11	1					NO
12					1	NE
13	1					NO
14	1					NO
15				1		C
16	1					NO
17	1					NO
18	1					NO
19	1					NO
20	1					NO
21	1					NO
22			1			B
23		1				A
24			1			B
25		1				A
26		1				A
27	1					NO
28		1				A
29	1					NO
30		1				A
31	1					NO
32	1					NO
33			1			B
34	1					NO
35	1					NO
36	1					NO
37	1					NO
38	1					NO
39	1					NO
40	1					NO
41	1					NO
42	1					NO
43	1					NO
44	1					NO
45			1			B
46		1				A
47			1			B
48		1				A
49	1					NO
50	1					NO
51		1				A
52	1					NO

Inter-observer evaluation – Frame-by-Frame speed – VCC (L)

OBSERVER 1					
		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2			1		B
3	1				NO
4			1		B
5	1				NO
6	1				NO
7		1			A
8		1			A
9	1				NO
10	1				NO
11		1			A
12				1	NE
13			1		B
14		1			A
15	1				NO
16	1				NO
17			1		B
18			1		B
19	1				NO
20		1			A
21		1			A
22	1				NO
23	1				NO
24			1		B
25	1				NO
26		1			A
27			1		B
28		1			A
29		1			A
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36		1			A
37			1		B
38			1		B
39		1			A
40		1			A
41	1				NO
42	1				NO
43	1				NO
44		1			A
45			1		B
46		1			A
47		1			A
48		1			A
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 2					
		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2			1		B
3		1			A
4		1			A
5	1				NO
6	1				NO
7	1				NO
8	1				NO
9	1				NO
10	1				NO
11	1				NO
12				1	NE
13			1		B
14	1				NO
15		1			A
16	1				NO
17			1		B
18			1		B
19	1				NO
20		1			A
21		1			A
22	1				NO
23	1				NO
24			1		B
25	1				NO
26	1				NO
27			1		B
28		1			A
29			1		B
30	1				NO
31	1				NO
32		1			A
33	1				NO
34		1			A
35			1		B
36			1		B
37			1		B
38			1		B
39	1				NO
40	1				NO
41	1				NO
42			1		B
43	1				NO
44		1			A
45			1		B
46		1			A
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 3					
		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2			1		B
3	1				NO
4			1		B
5	1				NO
6	1				NO
7	1				NO
8	1				NO
9	1				NO
10	1				NO
11	1				NO
12				1	NE
13			1		B
14	1				NO
15	1				NO
16	1				NO
17			1		B
18			1		B
19	1				NO
20	1				NO
21		1			A
22	1				NO
23	1				NO
24			1		B
25	1				NO
26	1				NO
27		1			A
28	1				NO
29		1			A
30	1				NO
31	1				NO
32	1				NO
33		1			A
34			1		B
35			1		B
36		1			A
37			1		B
38			1		B
39	1				NO
40	1				NO
41		1			A
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51	1				NO
52	1				NO

OBSERVER 4					
		condition:	VCC (L)		
HORSE N°	NO	A	B	NE	DECISION
1		1			A
2		1			A
3		1			A
4			1		B
5	1				NO
6	1				NO
7		1			A
8	1				NO
9	1				NO
10	1				NO
11	1				NO
12				1	NE
13		1			A
14	1				NO
15	1				NO
16	1				NO
17			1		B
18		1			A
19	1				NO
20	1				NO
21		1			A
22	1				NO
23	1				NO
24			1		B
25	1				NO
26		1			A
27			1		B
28		1			A
29	1				NO
30	1				NO
31	1				NO
32		1			A
33	1				NO
34			1		B
35			1		B
36			1		B
37			1		B
38			1		B
39		1			A
40		1			A
41		1			A
42		1			A
43		1			A
44	1				NO
45			1		B
46	1				NO
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

Inter-observer evaluation – Frame-by-Frame speed – VCC (R)

OBSERVER 1					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2	1				NO
3	1				NO
4			1		B
5	1				NO
6	1				NO
7		1			A
8		1			A
9	1				NO
10	1				NO
11	1				NO
12				1	NE
13			1		B
14		1			A
15	1				NO
16		1			A
17			1		B
18			1		B
19	1				NO
20	1				NO
21		1			A
22	1				NO
23	1				NO
24			1		B
25	1				NO
26		1			A
27		1			A
28		1			A
29		1			A
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36		1			A
37			1		B
38		1			A
39	1				NO
40		1			A
41	1				NO
42	1				NO
43	1				NO
44		1			A
45			1		B
46		1			A
47	1				NO
48		1			A
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 2					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2			1		B
3		1			A
4		1			A
5	1				NO
6	1				NO
7	1				NO
8	1				NO
9	1				NO
10	1				NO
11	1				NO
12				1	NE
13			1		B
14	1				NO
15		1			A
16	1				NO
17			1		B
18			1		B
19	1				NO
20		1			A
21		1			A
22	1				NO
23	1				NO
24			1		B
25	1				NO
26	1				NO
27			1		B
28		1			A
29			1		B
30	1				NO
31	1				NO
32		1			A
33	1				NO
34			1		B
35			1		B
36			1		B
37			1		B
38			1		B
39	1				NO
40	1				NO
41	1				NO
42			1		B
43	1				NO
44		1			A
45			1		B
46		1			A
47		1			A
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 3					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2	1				NO
3	1				NO
4			1		B
5	1				NO
6	1				NO
7	1				NO
8	1				NO
9	1				NO
10	1				NO
11	1				NO
12				1	NE
13			1		B
14	1				NO
15	1				NO
16	1				NO
17			1		B
18			1		B
19	1				NO
20	1				NO
21	1				NO
22	1				NO
23	1				NO
24			1		B
25	1				NO
26	1				NO
27	1				NO
28		1			A
29	1				NO
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36	1				NO
37			1		B
38			1		B
39	1				NO
40	1				NO
41		1			A
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

OBSERVER 4					
		condition:	VCC (R)		
HORSE N°	NO	A	B	NE	DECISION
1	1				NO
2	1				NO
3		1			A
4			1		B
5	1				NO
6	1				NO
7	1				NO
8	1				NO
9	1				NO
10	1				NO
11	1				NO
12				1	NE
13			1		B
14		1			A
15	1				NO
16	1				NO
17			1		B
18		1			A
19	1				NO
20	1				NO
21	1				NO
22	1				NO
23	1				NO
24			1		B
25	1				NO
26	1				NO
27		1			A
28		1			A
29	1				NO
30	1				NO
31	1				NO
32	1				NO
33	1				NO
34			1		B
35			1		B
36			1		B
37			1		B
38			1		B
39	1				NO
40	1				NO
41		1			A
42	1				NO
43	1				NO
44	1				NO
45			1		B
46	1				NO
47	1				NO
48	1				NO
49	1				NO
50			1		B
51			1		B
52	1				NO

K values charts – Intra-observer evaluation – Real Time Speed

OBSERVER 1

RLN		DAY 1					
		A	B	C1	C2	NE	Total
	A	27	2	0	0	0	29
DAY 2	B	0	3	6	0	0	9
	C1	0	0	7	1	0	8
	C2	0	0	0	5	0	5
	NE	0	1	0	0	0	1
	Total	27	6	13	6	0	52

Pr(a)		88%
Pr(b)		36%
K		70%

ADAF L		DAY 1					
		NO	A	B	C	NE	Total
	NO	7	4	0	0	0	11
DAY 2	A	2	25	0	0	1	28
	B	0	7	2	0	0	9
	C	0	1	1	0	0	2
	NE	0	1	0	0	1	2
	Total	9	38	3	0	2	52

Pr(a)		88%
Pr(b)		45%
K		40%

ADAF R		DAY 1					
		NO	A	B	C	NE	Total
	NO	10	4	0	0	0	14
DAY 2	A	3	19	0	0	0	22
	B	0	4	7	0	0	11
	C	0	0	1	0	0	1
	NE	1	2	0	0	1	4
	Total	14	29	8	0	1	52

Pr(a)		71%
Pr(b)		35%
K		56%

VCC L		DAY 1			
		NO	A	B	NE	Total
	NO	21	3	0	0	24
DAY 2	A	5	7	3	0	15
	B	0	0	9	0	9
	NE	2	1	0	1	4
	Total	28	11	12	1	52

Pr(a)		5%
Pr(b)		36%
K		58%

VCC R		DAY 1				
		NO	A	B	NE	Total
	NO	25	1	0	0	26
DAY 2	A	7	4	1	0	12
	B	0	0	9	0	9
	NE	4	0	0	1	5
	Total	36	5	10	1	52

Pr(a)		75%
Pr(b)		42%
K		57%

OBSERVER 2

RLN		DAY 1					
		A	B	C1	C2	NE	Total
	A	30	1	1	0	0	32
JEMM	B	0	7	0	0	0	7
	C1	0	1	7	0	0	8
	C2	0	0	2	2	0	4
	NE	1	0	0	0	0	1
	Total	31	9	10	2	0	52

Pr(a)		88%
Pr(b)		42%
K		80%

		DAY 1					
		NO	A	B	C	NE	Total
	NO	12	7	0	0	0	19
JEMM	A	5	7	3	0	0	15
	B	0	4	5	1	0	10
	C	0	1	1	3	0	5
	NE	2	0	0	0	1	3
	Total	19	19	9	4	1	52

Pr(a)		54%
Pr(b)		28%
K		36%

ADAF R		DAY 1					
		NO	A	B	C	NE	Total
	NO	13	7	1	0	0	21
DAY 2	A	7	6	2	1	0	16
	B	0	2	7	1	1	11
	C	0	0	1	1	0	2
	NE	1	0	0	0	1	2
	Total	21	15	11	3	2	52

Pr(a)		54%
Pr(b)		30%
K		34%

VCC L		DAY 1				
		NO	A	B	NE	Total
	NO	26	3	0	0	29
DAY 2	A	3	3	3	0	9
	B	1	2	8	0	11
	NE	2	0	0	1	3
	Total	32	8	11	1	52

Pr(a)		73%
Pr(b)		42%
K		54%

VCC R		DAY 1				
		NO	A	B	NE	Total
	NO	26	3	0	0	29
DAY 2	A	3	3	2	0	8
	B	1	1	10	0	12
	NE	2	0	0	1	3
	Total	32	7	12	1	52

Pr(a)		77%
Pr(b)		42%
K		60%

K values charts – Intra-observer evaluation – Slow motion (50% speed)

OBSERVER 1

RLN

		DAY 1					
		A	B	C1	C2	NE	Total
	A	26	2	0	0	0	28
DAY 2	B	1	3	5	0	0	9
	C1	0	0	8	0	0	8
	C2	0	0	0	6	0	6
	NE	0	1	0	0	0	1
	Total	27	6	13	6	0	52

Pr(a)	83%
Pr(b)	35%
K	73%

ADAF L

		DAY 1					
		NO	A	B	C	NE	Total
	NO	6	4	0	0	0	10
DAY 2	A	4	28	0	0	0	32
	B	0	5	2	0	0	7
	C	0	1	1	0	0	2
	NE	0	0	0	0	1	1
	Total	10	38	3	0	1	52

Pr(a)	71%
Pr(b)	50%
K	42%

ADAF R

		DAY 1					
		NO	A	B	C	NE	Total
	NO	9	5	0	0	0	14
DAY 2	A	4	19	0	0	0	23
	B	0	4	6	0	0	10
	C	0	0	2	0	0	2
	NE	0	2	0	0	1	3
	Total	13	30	8	0	1	52

Pr(a)	67%
Pr(b)	36%
K	49%

VCC L

		DAY 1				
		NO	A	B	NE	Total
	NO	14	1	0	0	15
DAY 2	A	9	12	3	0	24
	B	0	1	11	0	12
	NE	0	0	0	1	1
	Total	23	14	14	1	52

Pr(a)	73%
Pr(b)	33%
K	60%

VCC R

		DAY 1				
		NO	A	B	NE	Total
	NO	17	2	0	0	19
DAY 2	A	8	12	0	0	20
	B	0	1	10	0	11
	NE	1	0	0	1	2
	Total	26	15	10	1	52

Pr(a)	77%
Pr(b)	34%
K	65%

OBSERVER 2

RLN

		DAY 1					
		A	B	C1	C2	NE	Total
	A	30	1	1	0	0	32
DAY 2	B	0	7	0	0	0	7
	C1	0	2	7	0	0	9
	C2	0	0	2	2	0	4
	NE	0	0	0	0	0	0
	Total	30	10	10	2	0	52

Pr(a)	88%
Pr(b)	42%
K	80%

		DAY 1					
		NO	A	B	C	NE	Total
	NO	8	8	0	0	0	16
DAY 2	A	6	12	1	0	0	19
	B	0	1	8	2	0	11
	C	0	1	2	1	0	4
	NE	0	1	0	0	1	2
	Total	14	23	11	3	1	52

Pr(a)	58%
Pr(b)	30%
K	40%

		DAY 1					
		NO	A	B	C	NE	Total
	NO	9	6	1	0	0	16
DAY 2	A	6	12	3	2	0	23
	B	1	1	7	1	0	10
	C	0	0	1	1	0	2
	NE	0	0	0	0	1	1
	Total	16	19	12	4	1	52

Pr(a)	57%
Pr(b)	31%
K	38%

VCC L

		DAY 1				
		NO	A	B	NE	Total
	NO	21	4	0	0	25
DAY 2	A	3	8	2	0	13
	B	1	2	9	0	12
	NE	1	0	0	1	2
	Total	26	14	11	1	52

Pr(a)	75%
Pr(b)	36%
K	61%

VCC R

		DAY 1				
		NO	A	B	NE	Total
	NO	20	4	0	0	24
DAY 2	A	4	8	1	0	13
	B	1	2	10	0	13
	NE	1	0	0	1	2
	Total	26	14	11	1	52

Pr(a)	75%
Pr(b)	35%
K	61%

K values charts – Intra-observer evaluation – Frame-by-Frame Speed

OBSERVER 1

RLN				DAY 1			
		A	B	C1	C2	NE	Total
	A	24	3	2	0	0	29
DAY 2	B	0	5	3	0	0	8
	C1	0	0	8	0	0	8
	C2	0	0	0	6	0	6
	NE	0	1	0	0	0	1
	Total	24	9	13	6	0	52

Pr(a)		83%
Pr(b)		34%
K		74%

ADAF L				DAY 1			
		NO	A	B	C	NE	Total
	NO	5	4	0	0	0	9
DAY 2	A	4	28	0	0	0	32
	B	0	6	2	0	0	8
	C	0	1	1	0	0	2
	NE	0	0	0	0	1	1
	Total	9	39	3	0	1	52

Pr(a)		69%
Pr(b)		51%
K		37%

ADAF R				DAY 1			
		NO	A	B	C	NE	Total
	NO	8	5	0	0	0	13
DAY 2	A	3	20	1	0	0	24
	B	0	4	7	0	0	11
	C	0	0	2	0	0	2
	NE	0	1	0	0	1	2
	Total	11	30	10	0	1	52

Pr(a)		69%
Pr(b)		36%
K		52%

VCC L				DAY 1		
		NO	A	B	NE	Total
	NO	12	2	0	0	14
DAY 2	A	8	13	1	0	22
	B	0	1	13	0	14
	NE	1	0	0	1	2
	Total	21	16	14	1	52

Pr(a)		75%
Pr(b)		32%
K		63%

VCC R				DAY 1		
		NO	A	B	NE	Total
	NO	17	3	0	0	20
DAY 2	A	7	11	1	0	19
	B	0	1	10	0	11
	NE	1	0	0	1	2
	Total	25	15	11	1	52

Pr(a)		75%
Pr(b)		34%
K		62%

OBSERVER 2

RLN				DAY 1			
		A	B	C1	C2	NE	Total
	A	30	1	1	0	0	32
DAY 2	B	0	7	0	0	0	7
	C1	0	2	7	0	0	9
	C2	0	0	2	2	0	4
	NE	0	0	0	0	0	0
	Total	30	10	10	2	0	52

Pr(a)		88%
Pr(b)		42%
K		80%

ADAF L				DAY 1			
		NO	A	B	C	NE	Total
	NO	5	7	0	0	0	12
DAY 2	A	6	12	3	0	0	21
	B	0	3	9	1	0	13
	C	0	1	1	2	0	4
	NE	1	0	0	0	1	2
	Total	12	23	13	3	1	52

Pr(a)		56%
Pr(b)		30%
K		37%

ADAF R				DAY 1			
		NO	A	B	C	NE	Total
	NO	6	7	1	0	0	14
DAY 2	A	5	12	3	1	0	21
	B	0	4	9	1	0	14
	C	0	0	1	1	0	2
	NE	0	0	0	0	1	1
	Total	11	23	14	3	1	52

Pr(a)		56%
Pr(b)		31%
K		36%

				DAY 1		
		NO	A	B	NE	Total
	NO	20	4	0	0	24
DAY 2	A	3	4	4	0	11
	B	1	3	11	0	15
	NE	1	0	0	1	2
	Total	25	11	15	1	52

Pr(a)		69%
Pr(b)		35%
K		53%

				DAY 1		
		NO	A	B	NE	Total
	NO	20	4	0	0	24
DAY 2	A	3	4	2	0	9
	B	1	2	14	0	17
	NE	1	0	0	1	2
	Total	25	10	16	1	52

Pr(a)		75%
Pr(b)		36%
K		61%

K values charts – Inter-observer evaluation – Real Time Speed

RLN

Horses	28
Raters	4
Pr(a)	76%
Pr(b)	37%
K	61%

	A	B	C1	C2	NE	Total	P %
25	4	0	0	0	0	4	100%
26	0	2	2	0	0	4	33%
27	4	0	0	0	0	4	100%
28	0	0	3	1	0	4	50%
29	0	1	3	0	0	4	50%
30	3	1	0	0	0	4	50%
31	4	0	0	0	0	4	100%
32	4	0	0	0	0	4	100%
33	4	0	0	0	0	4	100%
34	0	1	3	0	0	4	50%
35	0	0	2	2	0	4	33%
36	0	1	3	0	0	4	50%
37	0	0	4	0	0	4	100%
38	0	0	4	0	0	4	100%
39	1	3	0	0	0	4	50%
40	4	0	0	0	0	4	100%
41	4	0	0	0	0	4	100%
42	0	0	4	0	0	4	100%
43	4	0	0	0	0	4	100%
44	4	0	0	0	0	4	100%
45	2	1	1	0	0	4	17%
46	4	0	0	0	0	4	100%
47	0	2	2	0	0	4	33%
48	4	0	0	0	0	4	100%
49	3	1	0	0	0	4	50%
50	0	0	0	4	0	4	100%
51	0	0	3	1	0	4	50%
52	4	0	0	0	0	4	100%
P%	51%	12%	30%	7%	0%	100%	

ADAF L

Horses	28
Raters	4
Pr(a)	43%
Pr(b)	39%
K	6%

	NO	A	B	C	NE	Total	P %
25	4	0	0	0	0	4	100%
26	0	3	1	0	0	4	50%
27	3	1	0	0	0	4	50%
28	1	2	1	0	0	4	17%
29	0	3	1	0	0	4	50%
30	2	2	0	0	0	4	33%
31	3	1	0	0	0	4	50%
32	3	1	0	0	0	4	50%
33	0	2	1	1	0	4	17%
34	2	2	0	0	0	4	33%
35	1	2	0	1	0	4	17%
36	2	2	0	0	0	4	33%
37	2	2	0	0	0	4	33%
38	0	4	0	0	0	4	100%
39	2	2	0	0	0	4	33%
40	4	0	0	0	0	4	100%
41	2	2	0	0	0	4	33%
42	0	2	1	0	1	4	17%
43	2	1	0	0	1	4	17%
44	2	2	0	0	0	4	33%
45	2	1	1	0	0	4	17%
46	2	2	0	0	0	4	33%
47	0	2	2	0	0	4	33%
48	3	1	0	0	0	4	50%
49	2	2	0	0	0	4	33%
50	1	2	1	0	0	4	17%
51	0	3	1	0	0	4	50%
52	4	0	0	0	0	4	100%
P%	44%	44%	9%	2%	2%	100%	

ADAF R

Horses	28
Raters	4
Pr(a)	42%
Pr(b)	38%
K	6%

	NO	A	B	C	NE	Total	P %
25	3	1	0	0	0	4	50%
26	1	2	1	0	0	4	17%
27	3	1	0	0	0	4	50%
28	0	2	2	0	0	4	33%
29	2	2	0	0	0	4	33%
30	1	3	0	0	0	4	50%
31	4	0	0	0	0	4	100%
32	4	0	0	0	0	4	100%
33	0	2	1	1	0	4	17%
34	2	2	0	0	0	4	33%
35	2	2	0	0	0	4	33%
36	1	1	0	0	2	4	17%
37	2	2	0	0	0	4	33%
38	2	1	1	0	0	4	17%
39	3	1	0	0	0	4	50%
40	4	0	0	0	0	4	100%
41	2	2	0	0	0	4	33%
42	2	1	1	0	0	4	17%
43	2	1	0	0	1	4	17%
44	2	2	0	0	0	4	33%
45	0	1	3	0	0	4	50%
46	2	2	0	0	0	4	33%
47	1	1	2	0	0	4	17%
48	3	1	0	0	0	4	50%
49	2	2	0	0	0	4	33%
50	2	1	0	1	0	4	17%
51	0	2	2	0	0	4	33%
52	4	0	0	0	0	4	100%
P%	50%	34%	12%	2%	3%	100%	

VCC L

Horses	28
Raters	4
Pr(a)	69%
Pr(b)	42%
K	47%

	NO	A	B	NE	Total	P %
25	4	0	0	0	4	100%
26	2	2	0	0	4	33%
27	3	1	0	0	4	50%
28	2	2	0	0	4	33%
29	1	3	0	0	4	50%
30	4	0	0	0	4	100%
31	4	0	0	0	4	100%
32	3	1	0	0	4	50%
33	4	0	0	0	4	100%
34	0	2	2	0	4	33%
35	0	0	4	0	4	100%
36	2	1	1	0	4	17%
37	0	0	4	0	4	100%
38	0	3	1	0	4	50%
39	4	0	0	0	4	100%
40	3	1	0	0	4	50%
41	3	1	0	0	4	50%
42	2	1	1	0	4	17%
43	3	0	0	1	4	50%
44	4	0	0	0	4	100%
45	0	0	4	0	4	100%
46	4	0	0	0	4	100%
47	1	3	0	0	4	50%
48	3	1	0	0	4	50%
49	4	0	0	0	4	100%
50	0	0	4	0	4	100%
51	1	0	3	0	4	50%
52	4	0	0	0	4	100%
P%	58%	20%	21%	1%	100%	

VCC R

Horses	28
Raters	4
Pr(a)	80%
Pr(b)	49%
K	62%

	NO	A	B	NE	Total	P %
25	4	0	0	0	4	100%
26	4	0	0	0	4	100%
27	2	2	0	0	4	33%
28	1	3	0	0	4	50%
29	3	1	0	0	4	50%
30	4	0	0	0	4	100%
31	4	0	0	0	4	100%
32	4	0	0	0	4	100%
33	4	0	0	0	4	100%
34	0	1	3	0	4	50%
35	0	0	4	0	4	100%
36	2	0	1	1	4	17%
37	0	0	4	0	4	100%
38	1	3	0	0	4	50%
39	4	0	0	0	4	100%
40	4	0	0	0	4	100%
41	3	1	0	0	4	50%
42	3	0	1	0	4	50%
43	3	0	0	1	4	50%
44	4	0	0	0	4	100%
45	0	0	4	0	4	100%
46	4	0	0	0	4	100%
47	3	1	0	0	4	50%
48	4	0	0	0	4	100%
49	4	0	0	0	4	100%
50	0	0	4	0	4	100%
51	0	0	4	0	4	100%
52	4	0	0	0	4	100%
P%	65%	11%	22%	2%	100%	

K values charts – Inter-observer evaluation – Slow motion (50% speed)

RLN

Horse	28	Pr(a)	73%
Raters	4	Pr(b)	34%
		K	58%

	A	B	C1	C2	NE	Total	P %
25	4	0	0	0	0	4	100%
26	0	2	2	0	0	4	33%
27	3	1	0	0	0	4	50%
28	0	0	3	1	0	4	50%
29	0	1	3	0	0	4	50%
30	3	1	0	0	0	4	50%
31	4	0	0	0	0	4	100%
32	3	1	0	0	0	4	50%
33	3	1	0	0	0	4	50%
34	0	0	4	0	0	4	100%
35	0	0	2	2	0	4	33%
36	0	0	4	0	0	4	100%
37	0	0	4	0	0	4	100%
38	0	0	4	0	0	4	100%
39	1	3	0	0	0	4	50%
40	4	0	0	0	0	4	100%
41	3	1	0	0	0	4	50%
42	0	0	4	0	0	4	100%
43	4	0	0	0	0	4	100%
44	4	0	0	0	0	4	100%
45	1	1	2	0	0	4	17%
46	4	0	0	0	0	4	100%
47	0	3	1	0	0	4	50%
48	4	0	0	0	0	4	100%
49	3	1	0	0	0	4	50%
50	0	0	0	4	0	4	100%
51	0	0	3	1	0	4	50%
52	4	0	0	0	0	4	100%
P%	46%	14%	32%	7%	0%	100%	

ADAF L

Horse	28	Pr(a)	43%
Raters	4	Pr(b)	38%
		K	8%

	NO	A	B	C	NE	Total	P %
25	3	1	0	0	0	4	50%
26	0	3	1	0	0	4	50%
27	1	3	0	0	0	4	50%
28	0	3	1	0	0	4	50%
29	0	3	1	0	0	4	50%
30	2	2	0	0	0	4	33%
31	3	1	0	0	0	4	50%
32	3	1	0	0	0	4	50%
33	0	1	2	1	0	4	17%
34	2	2	0	0	0	4	33%
35	2	1	0	1	0	4	17%
36	1	2	1	0	0	4	17%
37	2	2	0	0	0	4	33%
38	0	3	1	0	0	4	50%
39	3	1	0	0	0	4	50%
40	4	0	0	0	0	4	100%
41	2	2	0	0	0	4	33%
42	0	3	1	0	0	4	50%
43	3	1	0	0	0	4	50%
44	2	2	0	0	0	4	33%
45	2	1	1	0	0	4	17%
46	2	2	0	0	0	4	33%
47	0	1	3	0	0	4	50%
48	3	1	0	0	0	4	50%
49	2	2	0	0	0	4	33%
50	1	2	1	0	0	4	17%
51	0	3	1	0	0	4	50%
52	4	0	0	0	0	4	100%
P%	42%	44%	13%	2%	0%	100%	

ADAF R

Horse	28	Pr(a)	43%
Raters	4	Pr(b)	37%
		K	9%

	NO	A	B	C	NE	Total	P %
25	2	2	0	0	0	4	33%
26	1	2	1	0	0	4	17%
27	1	2	1	0	0	4	17%
28	1	1	2	0	0	4	17%
29	2	2	0	0	0	4	33%
30	1	3	0	0	0	4	50%
31	4	0	0	0	0	4	100%
32	4	0	0	0	0	4	100%
33	0	0	3	1	0	4	50%
34	2	2	0	0	0	4	33%
35	2	2	0	0	0	4	33%
36	2	1	0	0	1	4	17%
37	2	1	1	0	0	4	17%
38	2	2	0	0	0	4	33%
39	3	1	0	0	0	4	50%
40	4	0	0	0	0	4	100%
41	2	2	0	0	0	4	33%
42	2	1	1	0	0	4	17%
43	3	1	0	0	0	4	50%
44	1	3	0	0	0	4	50%
45	0	1	3	0	0	4	50%
46	2	2	0	0	0	4	33%
47	0	1	3	0	0	4	50%
48	2	2	0	0	0	4	33%
49	2	2	0	0	0	4	33%
50	2	1	0	1	0	4	17%
51	0	2	2	0	0	4	33%
52	4	0	0	0	0	4	100%
P%	47%	35%	15%	2%	1%	100%	

VCC L

Horse	28	Pr(a)	62%
Raters	4	Pr(b)	36%
		K	40%

	NO	A	B	NE	Total	P %
25	4	0	0	0	4	100%
26	2	2	0	0	4	33%
27	1	2	1	0	4	17%
28	1	3	0	0	4	50%
29	1	2	1	0	4	17%
30	4	0	0	0	4	100%
31	4	0	0	0	4	100%
32	2	2	0	0	4	33%
33	3	1	0	0	4	50%
34	0	0	4	0	4	100%
35	0	0	4	0	4	100%
36	0	3	1	0	4	50%
37	0	0	4	0	4	100%
38	0	1	3	0	4	50%
39	3	1	0	0	4	50%
40	2	2	0	0	4	33%
41	3	1	0	0	4	50%
42	2	1	1	0	4	17%
43	3	1	0	0	4	50%
44	2	2	0	0	4	33%
45	0	0	4	0	4	100%
46	3	1	0	0	4	50%
47	1	3	0	0	4	50%
48	3	1	0	0	4	50%
49	4	0	0	0	4	100%
50	0	0	4	0	4	100%
51	1	0	3	0	4	50%
52	4	0	0	0	4	100%
P%	47%	26%	27%	0%	100%	

VCC R

Horse	28	Pr(a)	73%
Raters	4	Pr(b)	41%
		K	54%

	NO	A	B	NE	Total	P %
25	4	0	0	0	4	100%
26	3	1	0	0	4	50%
27	1	3	0	0	4	50%
28	0	4	0	0	4	100%
29	2	2	0	0	4	33%
30	4	0	0	0	4	100%
31	4	0	0	0	4	100%
32	3	1	0	0	4	50%
33	4	0	0	0	4	100%
34	0	0	4	0	4	100%
35	0	0	4	0	4	100%
36	1	2	1	0	4	17%
37	0	0	4	0	4	100%
38	1	2	1	0	4	17%
39	4	0	0	0	4	100%
40	3	1	0	0	4	50%
41	3	1	0	0	4	50%
42	3	0	1	0	4	50%
43	4	0	0	0	4	100%
44	2	2	0	0	4	33%
45	0	0	4	0	4	100%
46	3	1	0	0	4	50%
47	3	1	0	0	4	50%
48	3	1	0	0	4	50%
49	4	0	0	0	4	100%
50	0	0	4	0	4	100%
51	0	0	4	0	4	100%
52	4	0	0	0	4	100%
P%	56%	20%	24%	0%	100%	

K values charts – Inter-observer evaluation – Frame-by-Frame speed

RLN

Horse	52	Pr(a)	76%
Raters	4	Pr(b)	38%
		K	62%

	A	B	C1	C2	NE	Total	P %
1	4	0	0	0	0	4	100%
2	0	4	0	0	0	4	100%
3	3	1	0	0	0	4	50%
4	0	1	3	0	0	4	50%
5	4	0	0	0	0	4	100%
6	4	0	0	0	0	4	100%
7	0	2	2	0	0	4	33%
8	4	0	0	0	0	4	100%
9	4	0	0	0	0	4	100%
10	4	0	0	0	0	4	100%
11	4	0	0	0	0	4	100%
12	0	2	2	0	0	4	33%
13	0	0	2	2	0	4	33%
14	4	0	0	0	0	4	100%
15	4	0	0	0	0	4	100%
16	4	0	0	0	0	4	100%
17	0	4	0	0	0	4	100%
18	0	0	0	4	0	4	100%
19	4	0	0	0	0	4	100%
20	2	2	0	0	0	4	33%
21	0	0	4	0	0	4	100%
22	4	0	0	0	0	4	100%
23	4	0	0	0	0	4	100%
24	4	0	0	0	0	4	100%
25	4	0	0	0	0	4	100%
26	0	2	2	0	0	4	33%
27	3	1	0	0	0	4	50%
28	0	0	3	1	0	4	50%
29	0	1	3	0	0	4	50%
30	3	1	0	0	0	4	50%
31	4	0	0	0	0	4	100%
32	3	1	0	0	0	4	50%
33	3	1	0	0	0	4	50%
34	0	0	4	0	0	4	100%
35	0	0	1	3	0	4	50%
36	0	0	4	0	0	4	100%
37	0	0	4	0	0	4	100%
38	0	0	3	1	0	4	50%
39	1	3	0	0	0	4	50%
40	4	0	0	0	0	4	100%
41	3	1	0	0	0	4	50%
42	0	0	3	1	0	4	50%
43	4	0	0	0	0	4	100%
44	4	0	0	0	0	4	100%
45	1	1	2	0	0	4	17%
46	4	0	0	0	0	4	100%
47	0	2	2	0	0	4	33%
48	4	0	0	0	0	4	100%
49	3	1	0	0	0	4	50%
50	0	0	0	4	0	4	100%
51	0	0	3	1	0	4	50%
52	4	0	0	0	0	4	100%
P%	54%	15%	23%	8%	0%	100%	

ADAF L

Horse	52	Pr(a)	51%
Raters	4	Pr(b)	37%
		K	22%

	NO	A	B	C	NE	Total	P %
1	3	1	0	0	0	4	50%
2	0	3	1	0	0	4	50%
3	1	3	0	0	0	4	50%
4	0	2	1	1	0	4	17%
5	3	1	0	0	0	4	50%
6	3	1	0	0	0	4	50%
7	0	2	2	0	0	4	33%
8	2	2	0	0	0	4	33%
9	3	1	0	0	0	4	50%
10	2	2	0	0	0	4	33%
11	4	0	0	0	0	4	100%
12	0	0	0	0	4	4	100%
13	2	2	0	0	0	4	33%
14	4	0	0	0	0	4	100%
15	0	3	1	0	0	4	50%
16	0	4	0	0	0	4	100%
17	1	3	0	0	0	4	50%
18	0	3	0	1	0	4	50%
19	4	0	0	0	0	4	100%
20	0	3	1	0	0	4	50%
21	0	4	0	0	0	4	100%
22	1	3	0	0	0	4	50%
23	3	1	0	0	0	4	50%
24	0	0	3	1	0	4	50%
25	3	1	0	0	0	4	50%
26	0	3	1	0	0	4	50%
27	1	3	0	0	0	4	50%
28	0	3	1	0	0	4	50%
29	0	3	1	0	0	4	50%
30	2	2	0	0	0	4	33%
31	3	1	0	0	0	4	50%
32	3	1	0	0	0	4	50%
33	0	0	3	1	0	4	50%
34	2	2	0	0	0	4	33%
35	2	1	1	0	0	4	17%
36	0	4	0	0	0	4	100%
37	2	1	1	0	0	4	17%
38	0	3	1	0	0	4	50%
39	3	1	0	0	0	4	50%
40	3	1	0	0	0	4	50%
41	2	2	0	0	0	4	33%
42	0	3	1	0	0	4	50%
43	3	1	0	0	0	4	50%
44	2	2	0	0	0	4	33%
45	2	1	1	0	0	4	17%
46	2	2	0	0	0	4	33%
47	0	1	3	0	0	4	50%
48	2	2	0	0	0	4	33%
49	2	2	0	0	0	4	33%
50	1	2	1	0	0	4	17%
51	0	3	1	0	0	4	50%
52	4	0	0	0	0	4	100%
P%	38%	46%	12%	2%	2%	100%	

ADAF R

Horse	52	Pr(a)	43%
Raters	4	Pr(b)	34%
		K	14%

	NO	A	B	C	NE	Total	P %
1	3	1	0	0	0	4	50%
2	2	2	0	0	0	4	33%
3	2	2	0	0	0	4	33%
4	1	2	1	0	0	4	17%
5	2	1	1	0	0	4	17%
6	3	1	0	0	0	4	50%
7	0	1	2	1	0	4	17%
8	1	3	0	0	0	4	50%
9	2	2	0	0	0	4	33%
10	2	2	0	0	0	4	33%
11	4	0	0	0	0	4	100%
12	0	0	0	0	4	4	100%
13	2	1	1	0	0	4	17%
14	4	0	0	0	0	4	100%
15	0	0	3	1	0	4	50%
16	1	2	1	0	0	4	17%
17	1	3	0	0	0	4	50%
18	1	1	2	0	0	4	17%
19	4	0	0	0	0	4	100%
20	3	1	0	0	0	4	50%
21	2	1	1	0	0	4	17%
22	0	3	1	0	0	4	50%
23	1	3	0	0	0	4	50%
24	0	0	3	1	0	4	50%
25	2	2	0	0	0	4	33%
26	0	3	1	0	0	4	50%
27	1	2	1	0	0	4	17%
28	0	2	2	0	0	4	33%
29	2	1	1	0	0	4	17%
30	1	3	0	0	0	4	50%
31	4	0	0	0	0	4	100%
32	3	1	0	0	0	4	50%
33	0	0	3	1	0	4	50%
34	2	2	0	0	0	4	33%
35	2	2	0	0	0	4	33%
36	1	1	1	0	1	4	0%
37	2	2	0	0	0	4	33%
38	2	2	0	0	0	4	33%
39	3	1	0	0	0	4	50%
40	3	1	0	0	0	4	50%
41	2	2	0	0	0	4	33%
42	2	1	1	0	0	4	17%
43	3	1	0	0	0	4	50%
44	2	2	0	0	0	4	33%
45	0	1	3	0	0	4	50%
46	1	3	0	0	0	4	50%
47	0	1	3	0	0	4	50%
48	1	3	0	0	0	4	50%
49	2	2	0	0	0	4	33%
50	2	1	0	1	0	4	17%
51	0	2	2	0	0	4	33%
52	4	0	0	0	0	4	100%
P%	42%	37%	16%	2%	2%	100%	

VCC L

Horse	52	Pr(a)	66%
Raters	4	Pr(b)	36%
		K	47%

	NO	A	B	NE	Total	P %
1	3	1	0	0	4	50%
2	0	1	3	0	4	50%
3	2	2	0	0	4	33%
4	0	1	3	0	4	50%
5	4	0	0	0	4	100%
6	4	0	0	0	4	100%
7	2	2	0	0	4	33%
8	3	1	0	0	4	50%
9	4	0	0	0	4	100%
10	4	0	0	0	4	100%
11	3	1	0	0	4	50%
12	0	0	0	4	4	100%
13	0	1	3	0	4	50%
14	3	1	0	0	4	50%
15	3	1	0	0	4	50%
16	4	0	0	0	4	100%
17	0	0	4	0	4	100%
18	0	1	3	0	4	50%
19	4	0	0	0	4	100%
20	2	2	0	0	4	33%
21	0	4	0	0	4	100%
22	4	0	0	0	4	100%
23	4	0	0	0	4	100%
24	0	0	4	0	4	100%
25	4	0	0	0	4	100%
26	2	2	0	0	4	33%
27	0	1	3	0	4	50%
28	1	3	0	0	4	50%
29	1	2	1	0	4	17%
30	4	0	0	0	4	100%
31	4	0	0	0	4	100%
32	2	2	0	0	4	33%
33	3	1	0	0	4	50%
34	0	1	3	0	4	50%
35	0	0	4	0	4	100%
36	0	2	2	0	4	33%
37	0	0	4	0	4	100%
38	0	0	4	0	4	100%
39	2	2	0	0	4	33%
40	2	2	0	0	4	33%
41	2	2	0	0	4	33%
42	2	1	1	0	4	17%
43	3	1	0	0	4	50%
44	2	2	0	0	4	33%
45	0	0	4	0	4	100%
46	2	2	0	0	4	33%
47	1	3	0	0	4	50%
48	3	1	0	0	4	50%
49	4	0	0	0	4	100%
50	0	0	4	0	4	100%
51	1	0	3	0	4	50%
52	4	0	0	0	4	100%
P%	49%	24%	25%	2%	100%	

VCC R

Horse	52	Pr(a)	73%
Raters	4	Pr(b)	42%
		K	54%

	NO	A	B	NE	Total	P %
1	4	0	0	0	4	100%
2	3	0	1	0	4	50%
3	2	2	0	0	4	33%
4	0	1	3	0	4	50%
5	4	0	0	0	4	100%
6	4	0	0	0	4	100%
7	3	1	0	0	4	50%
8	3	1	0	0	4	50%
9	4	0	0	0	4	100%
10	4	0	0	0	4	100%
11	4	0	0	0	4	100%
12	0	0	0	4	4	100%
13	0	0	4	0	4	100%
14	2	2	0	0	4	33%
15	3	1	0	0	4	50%
16	3	1	0	0	4	50%
17	0	0	4	0	4	100%
18	0	1	3	0	4	50%
19	4	0	0	0	4	100%
20	3	1	0	0	4	50%
21	2	2	0	0	4	33%
22	4	0	0	0	4	100%
23	4	0	0	0	4	100%
24	0	0	4	0	4	100%
25	4	0	0	0	4	100%
26	3	1	0	0	4	50%
27	1	2	1	0	4	17%
28	0	4	0	0	4	100%
29	2	1	1	0	4	17%
30	4	0	0	0	4	100%
31	4	0	0	0	4	100%
32	3	1	0	0	4	50%
33	4	0	0	0	4	100%
34	0	0	4	0	4	100%
35	0	0	4	0	4	100%
36	1	1	2	0	4	17%
37	0	0	4	0	4	100%
38	0	1	3	0	4	50%
39	4	0	0	0	4	100%
40	3	1	0	0	4	50%
41	2	2	0	0	4	33%
42	3	0	1	0	4	50%
43	4	0	0	0	4	100%
44	2	2	0	0	4	33%
45	0	0	4	0	4	100%
46	2	2	0	0	4	33%
47	3	1	0	0	4	50%
48	3	1	0	0	4	50%
49	4	0	0	0	4	100%
50	0	0	4	0	4	100%
51	0	0	4	0	4	100%
52	4	0	0	0	4	100%
P%	58%	16%	25%	2%	100%	